

FIRST *in the* NATION

Eighty Years of
Graduate Dental Public Health Education
At the University of North Carolina at
Chapel Hill, 1936-2016

ROSENAU HALL

R. Gary Rozier, DDS, MPH

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Library of Congress Cataloging-in-Publication Data

Names: Rozier, R. Gary, author. | University of North Carolina at Chapel Hill. Gillings School of Global Public Health, publisher.

Title: First in the nation : eighty years of graduate dental public health education at the University of North Carolina at Chapel Hill, 1936-2016 / Richard Gary Rozier, DDS, MPH.

Description: [Chapel Hill, North Carolina] : UNC Gillings School of Global Public Health, [2023] | Includes bibliographical references.

Identifiers: LCCN 2023000934 | ISBN 9781469673028 (paperback) | ISBN 9781469673035 (ebook)

Subjects: LCSH: University of North Carolina at Chapel Hill. Gillings School of Global Public Health—History. | Dental public health—Study and teaching (Graduate)—North Carolina—Chapel Hill—History. | Dental public health—Study and teaching (Residency)—North Carolina—Chapel Hill—History. | Dental public health—Research—North Carolina—Chapel Hill—History.

Classification: LCC RK52.3.N78 R69 2023 |

DDC 362.1976009756/56—dc23/eng/20230317

LC record available at <https://lcn.loc.gov/2023000934>

ISBN 978-1-4696-7302-8 (paperback)

ISBN 978-1-4696-7303-5 (ebook)

DOI: https://doi.org/10.5149/9781469673035_Rozier

Published by the UNC Gillings School of Global Public Health

Distributed by The University of North Carolina Press

www.uncpress.org

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Introduction

Advanced dental diseases were common in the first half of the twentieth century. Effective methods for prevention did not exist, and treatment on a regular basis was difficult to find. North Carolina had a small private dental workforce and a much smaller dental public health (DPH) workforce limited mostly to treatment of school children in a few counties. The state had no dental school or public health school. This combination of factors too often led to complete tooth loss, often at an early age. This review recounts the development of a small but high-impact discipline that emerged in the 1950s at the University of North Carolina at Chapel Hill (UNC-CH) to help confront this public health problem.

Academic studies in dental public health began at UNC-CH in 1936 with a six-week certificate course offered by the UNC-CH School of Medicine for dentists employed by the North Carolina state dental public health program. The Division of Public Health in the School of Medicine, which would become the School of Public Health in 1940, had just been approved by the university administration the year before. The classes, referred to as the Institute of Dental Public Health, were considered by the dean of the School of Medicine to be the first of their kind. The institute was offered every summer for seven years before it was interrupted by demands placed on the dental public health workforce by World War II. The University of North Carolina played an important, but little-known role in a second dental public health initiative started in the middle of the 1930s. Frederick H. Koch, who taught dramatic literature and playwriting at UNC for twenty-six years beginning in 1918 and is best known for establishing the Carolina Playmakers, collaborated with the Good Teeth Council for Children Inc., Chicago advertising executive Francis Hooper, and the North Carolina state health department to produce a puppet show to teach elementary schoolchildren good oral health practices. Expertise and resources at UNC were used to help write the script, hire and train the puppeteers and produce the play. An artist and puppeteers were hired by the state health department, which coordinated the scheduling. The Little Jack Puppet Shows played to elementary schools and endured as a popular statewide activity from 1936 to 1969, reaching thousands of schoolchildren with its educational messages. The initiative was not without controversy. The Good

Teeth Council for Children Inc. was an advertising agency funded by Wrigley Chewing Gum Company to promote Wrigley's products. It reportedly engaged in some unethical advertising practices. One of the key messages promoted by the Little Jack plays was the use of chewing gum for jaw exercise, at a time when sugarless gum was not available.

The decade beginning in the late 1940s was an important time in the professionalization of dental public health in the United States. The *Journal of Public Health Dentistry* was about a decade old and gaining an important place in dentistry; the American Board of Dental Public Health (ABDPH) was formed; academic coursework began at the University of Michigan and Harvard, in addition to the institute at UNC-CH. Competencies that defined the specialty and helped shape the curriculum in dental public health were developed first by the American Public Health Association, then by the American Association of Public Health Dentistry and the American Board of Dental Public Health. Water fluoridation, which was implemented in Charlotte in 1948, the third-largest city to be fluoridated at the time, provided the first population-based intervention for the control of dental caries.

The advances in dental public health created a demand for training by a public health workforce that was unable to enroll in a full-time master's degree program. This need was met with dental public health "short courses", usually two to three weeks in length, offered by the UNC-CH School of Public Health. Over the course of two and a half decades beginning in 1960, thirty-one courses were offered by the School of Public Health. These courses enrolled about 900 dentists and dental hygienists. Most of the course work consisted of basic public health principles taught in approved master's in public health (MPH) degree programs, like epidemiology, biostatistics, program planning, health education and environmental sciences. Aspects of dental public health also were included in the curriculum.

Advances in dental public health also created a demand for degree programs in dental public health. After the School of Dentistry was formed in 1950, School of Public Health faculty who were not dentists taught entire courses for dental students and dental hygienists and lectured in others. These arrangements were early acknowledgment that public health was an important part of the dental and dental hygiene curriculum, and that the School of Public Health should be a source of that expertise on the campus.

* * *

The history of academic dental public health at UNC-CH occurred in three major phases—the foundation era (1957–76) in which dental public health was established as a concentration in Health Administration; the growth era (1977–99); and the research era (2000–14). Coursework in dental public health for academic-degree

credit was first offered for dentists in the School of Public Health in 1957 when Dr. Harry Bruce, a United States Public Health Service (USPHS) dentist stationed in the Regional Office in Blacksburg, Virginia, taught a weekly seminar in dental public health practice for dentists enrolled in the School of Public Health master's degree program. Dr. John Fulton, an oral epidemiologist and administrator with the USPHS, joined the Department of Epidemiology in 1958 and taught the first course in oral epidemiology. A Hills-Rhodes Training Grant awarded in 1961 funded a faculty position for Dr. Frank Law (1961–63) in Health Administration. He strengthened the original course in dental public health practice and developed a second course in dental health administration, thus carving out nine credit hours of classes considered to be a “concentration” along with a six-week practicum and masters' paper. The appointment of Dr. Carl Holmes (1963–66) was quickly followed by the appointment of Dr. John Hughes (1966–83), the first doctoral student in the Department of Epidemiology, who joined the Department of Health Administration after being employed in the state health department for a short time.

In the growth era, education pathways were provided for dental students, active-duty military and public health service dentists, dentists in administrative or other public health positions, and pediatric dental residents and researchers. Enrollment in the dental public health concentration reached its largest number during this period, in large part because of enrollment in the executive master's degree program. In the most recent period, the predominant program emphasis shifted from a focus on educating practitioners to educating researchers and conducting research (2000–14). Since the first dentist enrolled in the School of Public Health in 1953, almost 300 dentists and dental hygienists have completed masters or doctoral degrees in the School of Public Health.

Several themes stand out across eras included in this review of the history of dental public health education at UNC-CH because of their persistence, support among university decision-makers, and impact on oral health. These themes are: (1) a consistent mission to educate leaders in population oral health; (2) a desire to have a strong, well-prepared dental public health workforce using the most up-to-date and effective methods supported by science for North Carolina and beyond; (3) a strong emphasis on public health practice and collaboration with state and federal programs; (4) maintenance of a robust research program creating evidence to solve practical, population-based problems; (5) a comprehensive dental public health program with identifiable dental public health master's degree academic courses that also support PhD students interested in epidemiology and health services research.

The dental public health residency program in the state health department is included in this history of dental public health education because of the strong partnership of more than fifty years between the program and UNC-CH. In 1965–66, the North Carolina state dental public health program was part of a new national

program organized by the Dental Health Center of the U.S. Public Health Service in San Francisco in 1963 to improve the quality of twelve-month residencies in dental public health. The Dental Health Center developed program guidelines for dental public health residency programs, recruited and approved residency sites and monitored the residents' activities. The North Carolina dental public health program participated in the third cohort (1965–66) as an approved site with the resident dividing time between San Francisco in the Dental Health Center and the N.C. State Health Department.

When the national program ended in 1966, Dr. Alex Pearson in collaboration with Dr. John Hughes continued the residency program in North Carolina, which was accredited by the American Dental Association in 1968. Dr. Hughes served as director of the residency program and coordinated dental public health activities in the school until his retirement in 1983, when Dr. Gary Rozier assumed those responsibilities followed by Dr. Rebecca King and Dr. Alex White.

Today, the North Carolina Dental Public Health Residency Program is one of sixteen programs approved by the American Dental Association, and one of only two located in a state or local health department. It is the only program remaining of the original residency programs approved by the Dental Health Center. During its first decade, North Carolina residency program directors were guided by the assumption that strong linkages between the public health agency in which training is taking place and an academic institution would provide residents with a comprehensive exposure to required knowledge, skills, and competencies.

The degree programs at UNC-CH and the residency certificate program in the state health department have served an important role in producing a more qualified dental public health workforce. Graduates have served important leadership roles in national, state, and local governmental agencies in North Carolina and beyond. Graduates have made important contributions to the advancement of dental public health, many of which are reviewed in this book.

This book reviews the history of dental public health research at UNC-CH, beginning with the NIH-funded research of Dr. John T. Fulton in which the first-ever statewide oral health survey was conducted from 1960 to 1963. This survey of oral health status would be the first of four statewide surveys over about four decades that formed the cornerstones for oral health policy in the state. A considerable amount of this book's narrative is devoted to research associated with two initiatives heavily influenced by the surveys—the N.C. Preventive Dentistry Program, targeted toward school-aged children in grades K–12, and *Into the Mouths of Babes*, targeted toward preschool-age children from birth to five years of age. Both initiatives, the starts of which were separated by about three decades, galvanized the interests and talents of health professionals including physicians and dentists, policy-makers, scientists, and the public in two enduring partnerships, supported by national perspectives that lent

extra support and legitimacy to the initiatives. The successes of the partnerships are told by the improvements in oral health status among school-age children, with the promise of similar trends in young children as some difficult to implement interventions mature.

Dental caries and its treatment were constant targets of inquiry throughout the period covered in this history. Research on the effectiveness of school-based preventive dentistry programs were initiated in the 1970s after a 1960–63 household survey. Periodontal diseases became the focus of attention in the 1980s after a 1976–77 statewide survey found an increase in disease in the North Carolina population. A focus on sealants focus occurred mostly in the 1990s, along with growing concerns about fluoride exposure and a focus on fluorosis, informed by a 1986–87 statewide oral health survey of schoolchildren.

Research turned to the prevention of early childhood caries in the 2000s. Into the Mouths of Babes and Early Head Start (ZOE) initiatives targeting disparities in pre-school-aged children were a major part of the research agenda for two decades beginning in the late 1990s. Between 2000 and 2015, just short of \$100 million was invested in preventing early childhood caries in North Carolina. Among the federal, state, and philanthropic organization providing funds were CMS, HRSA, CDC, NIH, the Blue Cross and Blue Shield Foundation, and the Kate B. Reynolds Foundation. Dozens of peer-reviewed papers related to the integration of oral health and primary care were published by UNC investigators. A remarkable turnaround in access to dental care occurred. In a little over a decade, N.C. Medicaid went from the bottom of states in dental use of preventive oral health services for children ages 0–5 to third in the nation. Most importantly, the fluoride varnish program (Into the Mouths of Babes) had sufficient penetration in the targeted population and a large enough impact on those reached to reverse the increase in dental caries first observe in the late 1990s and early 2000s.

Many agencies and individuals provided the dental public health program with support at crucial times in its eighty-year history. Among the long list of decision makers is Charles S. Magnum, dean of the Medical School who supported an Institute of Dental Public Health in 1936, which yielded the first formal coursework in dental public health in the nation. The volunteer efforts put forward by Dr. Harry Bruce, a USPHS dentist who taught the first course in dental public health for academic credit in the late 1950s was another. Bruce's course paved the way for subsequent dental public health courses in School of Public Health's Department of Public Health Administration. Support came from administrations at the departmental, school, and university levels, such as Edward G. McGavran, dean of the School of Public Health who helped define the discipline of dental public health with his seminal paper "What Is (Dental) Public Health?" and presentations at national dental conferences. John Hughes served as faculty for short courses, most of which he organized, every year for

two and a half decades. Also, John Fulton pioneered the first epidemiological survey of a sample representative of an entire statewide population. Dr. Jim Bawden was a major supporter of dental health prevention programs from the 1960s, when he was dean of the School of Dentistry, through the 2000s, when he helped mold public health prevention programs for preschool-aged children.

Since the mid-1940s health policy documents across the nation have consistently emphasized the need for more and better-educated public health dentists and other dental professionals. The greatest challenge facing dental public health is how to create demand for training to meet the continuing need for practitioners, educators, and scientists in public health. What will emerge as the major initiative to create effective demand and occupy the dental public health space for the next two decades? Teledentistry? Prenatal oral health? Precision dental public health? Big data surveillance? Geriatrics? Quality of care? A new type of dental provider? A novel delivery system? Something completely unknown as of this writing? What is an issue that can capture the attention of the public, a wide array of service providers, lawmakers, high-level government officials, philanthropic and government funding organizations, the dental and medical professions, and advocacy organizations?

This book does not make recommendations for a specific curriculum or needed research. In the late 1990s and early 2000s, a dental social wire seemed to have been tripped, resulting in a wealth of information on issues explored in reports by the government, philanthropic organizations, and professional organizations that can provide a foundation for a research agenda that meets the needs of the public. This information is readily accessible and well-suited for informing decisions about teaching and research content in dental public health and health policy.

Although specific recommendations are not made, even a superficial reading of this history should be helpful in identifying gaps in oral health knowledge that can and should be addressed through public health research. Some important history in dental public health occurred at the local level, most of which is not included in this review and has not been documented or accessed elsewhere. Attention to these pathways should help us understand some of the historical determinants of oral health in North Carolina and elsewhere.

Gillings School of Global Public Health is well suited for the exploration of public health issues because of the expertise available in the school, some of which is unavailable elsewhere on campus. Expertise exists in well-grounded academic disciplines such as economics, biostatistics, epidemiology, comparative effectiveness, financial management and performance, health outcomes, organization and implementation science, quality of and access to care, leadership, and equity and justice and other public health disciplines. This history provides confirmation that above all else, the issues must be broad enough and important enough to solicit the collaboration of multiple partners to complete research relevant to the oral health of the state.

A major health-sciences campus without a comprehensive dental public health academic program is intellectually and practically devoid of part of its purpose for being. In the words of John Fulton, “The future (of dental public health) is yet to be written . . .” The dental public health practitioner needed to work in the complex healthcare system in the future will assuredly be different than what currently exists or has existed in the past. Let history be the judge of whether UNC-CH is successful in meeting its academic public health responsibilities.

An Overview of Education in Public Health

The University of North Carolina at Chapel Hill, the nation's oldest public university, celebrated its 225th birthday in 2018. The dental public health (DPH) interest area at UNC-CH reached the eighty-year milestone for education in DPH in 2016. The timeline for DPH education and its associated events at UNC-CH are outlined in this book. In doing so, the case is made that the education provided in a six-week course offered by the UNC-CH School of Medicine beginning in 1936 represents the first course in DPH for dental professionals offered in the United States by an academic institution. The course, as well as subsequent short courses and post-graduate education, had a visible and important place in the emerging definition and practice of dental public health. Dr. Charles S. Mangum, dean of the UNC-CH School of Medicine in correspondence with a U.S. senator from North Carolina, referred to DPH courses offered in the School of Medicine as the Institute of Public Health Dentistry. This training program, described in detail in the next chapter, would be one of several "firsts" by DPH in North Carolina.

In her background paper prepared for the National Academy of Medicine (then the Institute of Medicine) for its exploration of the question of who will keep the public healthy, Elizabeth Fee (2003) described two primary and slightly overlapping phases of public health education in the United States. The first phase was bounded by the years 1914 and 1939. Private foundations, particularly the Rockefeller Foundation, funded activities in that period. A group commission in 1914 by the Rockefeller Foundation had produced the Welch-Rose Report. Published in 1915, it recommended establishment of a new discipline separate from medicine and proposed a strategy to address growing training needs through university-based research and independent of medical schools. The report was to public health education what the Gies Report was to dentistry and the Flexner Report was to medicine.

The first three schools of public health were opened at Johns Hopkins, Harvard, and the University of Toronto, with Rockefeller Foundation funding. According to Fee, these institutions were "well-endowed private institutions that favored persons with medical degrees, had curricula that leaned heavily toward the laboratory sciences, and emphasized infectious diseases . . . and . . . tended to have an international flavor."

The small capacity for education in public health provided by these first institutions was unable to produce enough graduates of the kind needed to meet the population's health needs. The workforce shortage was further exacerbated by the Great Depression. The Social Security Act of 1935 provides a benchmark for the beginning of the second phase in public health education. For the first time, the federal government provided funds for public health training. By 1936, ten schools offered public health degrees or certificates that required at least one year of residence. Federal funding also provided further incentives to meet the need for public health practitioners through short courses of a few weeks to a few months' duration. Federal funds awarded to California, Michigan, Minnesota, Vanderbilt, and North Carolina supported the short courses, which in the 1930s were very practice-oriented. Although it did not benefit directly from the funds awarded to North Carolina, the Institute of Dental Public Health was established during this same time.

Demand for general training in public health continued during the war years and into the 1950s. Curricula evolved from their emphasis on infectious diseases to chronic diseases. But federal funds for training declined. Consequently, the need for resources drove schools to seek funds through research initiatives. The community-based orientation of the 1930s dissipated, and field training programs virtually ceased to exist. Fee (2003) reports that between 1947 and 1957 the number of students educated in schools of public health fell by fifty percent.

The Federal Health Amendments Act of 1956 authorized grants directly to individuals or to institutions to support training of public health professionals. These funds would contribute to the establishment of dental public health. In the first year of the program, ten dentists and eight dental hygienists were awarded traineeships (Duffy et al. 1998). The first major government investment in public health education came in 1960 with the Hill-Rhodes Bill, which provided funds for training and project grants for public health. This legislation was the beginning of a period of renewed interest in public health. Throughout the 1960s and into the early 1970s, schools of public health thrived with federal funding for teaching and research. Between 1965 and 1972, student enrollments again doubled. Federal programs resulted in dental professionals getting needed training in public health.

The Health Professions Educational Assistance Act of 1976 did not extend targeted support for dentists. Rather, a pool of traineeship dollars was allocated to each school of public health to be distributed among all trainees, essentially ending traineeships for dentists that were large enough to support their long-term training. Federal funding for general purpose traineeship grants, project grants for graduate training in public health, and curriculum development grants were reduced or eliminated.

Academic Foundations for Dental Public Health

The consensus opinion in the literature is that graduate-level courses in dental public health for credit were first offered at the University of Michigan, followed by Harvard and North Carolina. These courses grew out of demand for training from the field. Courses at Harvard and North Carolina were certificate courses, with courses at Michigan offered for degree credit. Demand for training in DPH resulted from the growing number of clinical public health programs funded by federal legislation in the mid-1930s employing a growing number of dentists without public health training. Dentistry was characterized during this period by high oral health treatment needs, low utilization, a limited workforce supply and no effective public health strategies to prevent disease.

The Dental Public Health Program officially began at the University of Michigan in 1941 under the leadership of Kenneth Easlick, known as the “father of dental public health,” when an independent program was established along with five other independent units in the new school of public health. Prior to that, some dentists obtained MPH degrees, but none took formal courses in dental public health. Instead, they participated in DPH seminars organized by Easlick, some available starting in 1938 (Weintraub 1991). Dental courses offered as part of the formal coursework for the MPH degree included not only school of public health courses but also those offered by dental school faculty, like bacteriology of dental caries, infection control, and seminars with pediatric dentistry residents (*Endeavor* 1995).

At the Harvard School of Dental Medicine, a Dental Public Health Unit was established on January 1, 1957, under the leadership of James M. Dunning with a grant from the Massachusetts Department of Public Health (Dunning 1958). The unit provided technical assistance to public health dentists and served as a referral source for complicated clinical cases. A third objective was to “develop teaching methods and materials and to conduct seminars for dentists from the local community programs in the various phases of preventive medicine and public health” (Dunning 1958). The first course in 1957–58 enrolled eleven students who were awarded a certificate at the completion of the seminar. The two-hour seminars were offered at night to accommodate the schedules of public health practitioners in local DPH programs attending the seminars. Topics in the twenty seminar sessions included basic public health disciplines and tools (e.g., biostatistics, epidemiology, health education, program planning, community relationships, organization of medical care) and their application to DPH practice. As a side note, the seminar on “organization of medical care” was conducted by Cecil J. Sheps, at the time Lecturer on Preventive Medicine at Harvard, who later moved to UNC-CH and became the founding director of the Center for Health Services Research and Vice Chancellor for Health Affairs.

Dental Public Health at the University of North Carolina at Chapel Hill

This history of the dental public health education program at the University of North Carolina at Chapel Hill begins with the Institute of Dental Public Health in 1936 and ends with the retirement of Dr. Rozier, its long-standing director, eighty years later. The DPH program at the UNC-CH remains in the Gillings School of Global Public Health with the appointment of B. Alexander White to the faculty. The broad definition of DPH education captures the many federally supported short courses offered over two and a half decades by the university, advanced postgraduate courses leading to masters or doctoral degrees in a public health discipline, and the certificate-granting DPH residency program started in 1965 and continues to the present, making it one of, if not the, longest running residency programs in the country. The DPH residency program is offered by the state health department but is included here to provide a comprehensive history of advanced DPH education opportunities available in North Carolina. Many residents are graduates of the University of North Carolina Gillings School of Global Public Health, so the collaboration between the residency program and School of Public Health provides continuity between the two administratively independent programs.

References Chapter 1

- Duffy RE, Chen DW, and Sampson NH. 1998. "History of Federal Legislation in Health Professions Educational Assistance in Dental Public Health, 1956–97." *Journal of Public Health Dentistry* 58, suppl. 1 (December): 84–89.
- Dunning JM. 1958. "The Harvard Dental Public Health Unit." *Journal of Public Health Dentistry* 18, no. 2 (June): 7–10.
- Endeavor*. 1995. "Fostering Oral Health through Practice, Teaching, and Research: The Evolution of Dental Public Health." Fall/Winter: 2–14, 35–36.
- Fee E. 2003. "Appendix D. The Education of Public Health Professionals." In *Who Will Keep the Public Healthy? Educating Public Health Professionals for the 21st Century*. Washington, D.C.: National Academies Press.
- Weintraub JA. 1991. "The Advantages of Including Dental Public Health in Schools of Public Health in the United States." *Community Dental Health* 8, no. 1 (March): 59–67.

The Beginnings of Dental Public Health Education at UNC-CH

The Institute of Public Health Dentistry

In 1936 Dr. Ernest A. Branch, head of the state dental program (1929–58), asked Dr. Charles S. Mangum, dean of UNC's School of Medicine, to teach a course of several weeks in length for public health dentists working under Branch's supervision. Branch had assumed leadership of the Dental Public Health Program, a school-based program, in 1929, about ten years after it was founded. He found six full-time dentists employed by the state, soon to become four because of the Depression and loss of funding. He quickly devised a plan in which county and city officials provided matching funds, which increased the DPH workforce to about twenty-two dentists by 1936. He also sought to improve the quality of services provided by these dentists through training in public health, child behavior, and instructional methods.

Aided by federal funds from the Social Security Act, states were experimenting with different approaches to implementing school-based dental programs. North Carolina was the first state to employ dentists to provide services statewide, which is the reason North Carolina claims to have had the first state dental program. These dentists provided screenings and referrals to private dentists, some corrective services using portable equipment in the schools, group classroom instruction, and they generally promoted oral health in the community.

In the 1935–36 academic year, dentists working for the state provided dental services for schoolchildren in thirty-eight counties and three city units. During the 1934–36 biennial, 146,106 children were screened, of whom 85,293 (58 percent) were provided one or more dental services and 34,505 (24 percent) were referred to local dentists for follow-up. In all, a total of 344,081 dental procedures were completed, including 69,268 restorations and 64,386 extractions. Community and classroom instruction in oral health was provided for 190,867 people through 3,630 lectures (Twenty-Sixth Biennial Report of NC State Board of Health).

Dentists in the school program faced an overwhelming amount of disease. A 1934 survey of North Carolina schoolchildren conducted by the North Carolina Dental Society revealed that 83 percent of children needed restorations in permanent teeth and 56 percent needed extractions (Herget 2009). A statewide survey to be completed a few years later estimated that about 2,000 children graduated from high school

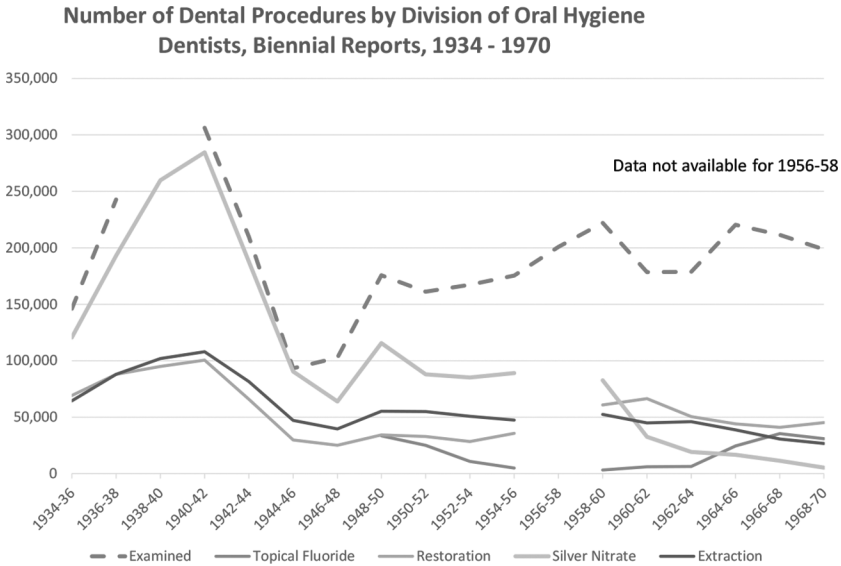


Fig. 1. Procedures by N.C. Public Health Dentists.

every year having had all their permanent teeth extracted (Fulton and Hughes 1965). Reportedly, Dr. Branch had a unique indicator to measure the productivity of the school dentists. He claimed that program success could be measured by the size of the circle of blood at the bottom of the schoolhouse steps put there by children as they left the building after being treated. The larger the circle, the more productive the dentist (Rozier 1997).

The evidence base for prevention of dental disease was not well developed. H. Trendley Dean was just beginning his observational studies to test the hypothesis that fluoride in drinking water could prevent dental caries (Harris 1989). The National Institutes of Health (NIH) Institute for Dental Research that would fund biomedical research did not yet exist. In North Carolina, opening of the doors of the first dental school was fifteen years away. Ironically, public health dentists used silver nitrate frequently (35 percent of procedures).

Silver nitrate was discarded as a treatment in the 1950s in favor of topical fluoride, and it would be more than sixty years before a product became available in the United States that contained both silver nitrate and fluoride (silver diamine fluoride), thus taking advantage of the caries-arresting properties of the silver and caries-preventive properties of the fluoride. Without effective preventive measures, administrators, policy makers, and field dentists necessarily had to place a lot of faith in classroom education, proven in later years to be generally ineffective in achieving sustained behavior change and caries reduction.

Demand exceeded the supply of dentists, so successful referrals from public health program dentists to private dentists were challenging. In 1930 there were only 770 dentists in the state, about one dentist for every 4,000 people. Only five other states had fewer dentists per 100,000. In 1940 only twenty-one dental hygienists were practicing in the entire state, but hygienists were the dental public health professional that the school-based preventive dentistry program would come to depend on so heavily in the 1970s (O'Rourke Report 1948).

Without education programs, professional organizations, or scientific journals dedicated to the practice, public health dentistry could hardly be considered a profession. The workforce was scarce and needed training. There was no educational pathway available to dentists for this kind of work. Recruitment of dentists was described in the NC State Board of Health Biennial report as “hard to get and hard to keep.”

Institute of Public Health Dentistry

It was against this backdrop that Branch made his proposal to the university for an institute of public health dentistry. It was well received by Mangum. The university had a strong tradition of service to the state, with leaders who addressed major social problems. Among them were university president Edward Kidder Graham, who in the early twentieth century (1914–18) linked the campus to campaigns for good roads, city and county planning, and rural economic development; Professor Howard W. Odum, who founded the Department of Sociology and pioneered research on social systems such as tenant farming, mill villages, and sharecropping that held back so many North Carolinians; and university president Frank Porter Graham (1930–34), who sought to deal with the prevailing 60-hour work week and child labor.

Although some professors objected to non-degree programs of only a few weeks' duration, so-called “short courses,” the university was committed to them. They met an immediate need for knowledge and skills among public health practitioners who had neither the time nor the resources to attend a full-length graduate program in public health at Hopkins, Harvard, or Michigan.

Mangum was particularly interested in these courses, because in addition to being aligned closely with the mission of the University, they provided a quick way to increase academic visibility and impact of the new Division of Public Health, which had just been established on December 13, 1935, with Milton Rosenau as dean. An influential academician, Rosenau had been recruited to the position after his retirement from the Harvard School of Public Health. His classic text *Preventive Medicine and Hygiene* was a standard reference for public health practitioners and students. Gary Rozier was a contributing author to one of the chapters in the thirteenth edition (Rozier 1991).

The university had agreed that it would serve as a regional training center for public health workers in the states in the USPHS sanitary district to which North Carolina



Fig. 2. Dentists Attend Short Course at UNC-CH.

belonged. Although Rosenau was not a strong supporter of short courses, he accepted the position as head of the division, and the university agreed to accept students into the certificate program the following January with federal support. Four health officers registered during the winter quarter of 1936, followed by fifty-one health officers, sanitary engineers, and sanitary officers the following spring.

A successful prototype for these short courses had just been offered. A course in public health was first offered at UNC in 1933 by the School of Public Administration to train sanitary engineers to help counter growing health problems in the Southeast (Barr and Berrie 1979). The Schools of Public Administration, Medicine, and Engineering and the State Board of Health had taught a successful twelve-week course in the 1934–35 academic year for government officials, which included physician health officers.

The first dental public health short course was taught at UNC from May 25 to July 3, 1936. Sixteen white dentists employed by the state health department attended the course. Black dentists on staff attended another university, because African American students were prohibited from enrolling at the University of North Carolina graduate school until 1951.

The curriculum for the first course included public health, child psychology, and teaching methods. Lectures in principles of public health administration, commu-

nicable disease control, prevention and vital statistics, and the role of sanitation and public health laboratory sciences were required, but trainees were not tested on the content. They were tested on courses in child psychology, pedagogy, visual education, and public speaking. Dr. Branch was listed as a “special lecturer” in the division catalog and provided general direction for the course.

The course was described in the State Board of Health Biennial Report as “the first school of public health in the United States or abroad to train dentists.” After the first course, Dean Mangum wrote in a letter to a U.S. senator from North Carolina in which he proposed funding on a permanent basis:

If our plans work out we will be able to have here in NC a school giving special instruction in public health to dentists which will draw students from any states in the Union who, having taken our course, can go back to their own states, carry the work on and give to NC the prestige of being not only the pioneer in this field and the originator of this type of instruction, but the school which should, if properly equipped, take the position of leadership and be the headquarters in the U.S. for this work.

The short course was offered every year for the next six years, the last one being in 1942 after seven consecutive years. The fourth course, held in the summer of 1939, included sessions on:

- Principles of Health Education, by Harold W. Brown MD, DrPH, Professor of Public Health
- Health Education in the Public Schools, by Professor Oliver K. Cornwell, Head of the Department of Physical Education
- Audio-Visual Aids, by Charles F. Milner, Head of the Bureau of Visual Instruction, University Extension Division
- Principles of Public Health Administration, by John W. R. Norton MD, professor of Public Health Administration
- Public Speaking, by William A Olsen AM, Associate Professor of English
- Methods of Teaching, and Problems in Child Psychology, by William J McKee CE, PhD, Professor of Education, and Dr. Branch

Funds for dentist trainees were raised from private sources by Dr. Branch, while federal and state funds provided support for university faculty and other resources. The annual short course was discontinued during World War II, because the war depleted the number of public health dentists employed by the state health department. The Sixth Institute of Public Health Dentistry, held in 1942, had twenty-eight students in attendance. The courses set the stage for the short courses that resumed in the early 1960s. They firmly established the importance of a well-trained workforce, the importance of a broad public health perspective among school-based dental professionals, and the commitment of the university to providing that training.

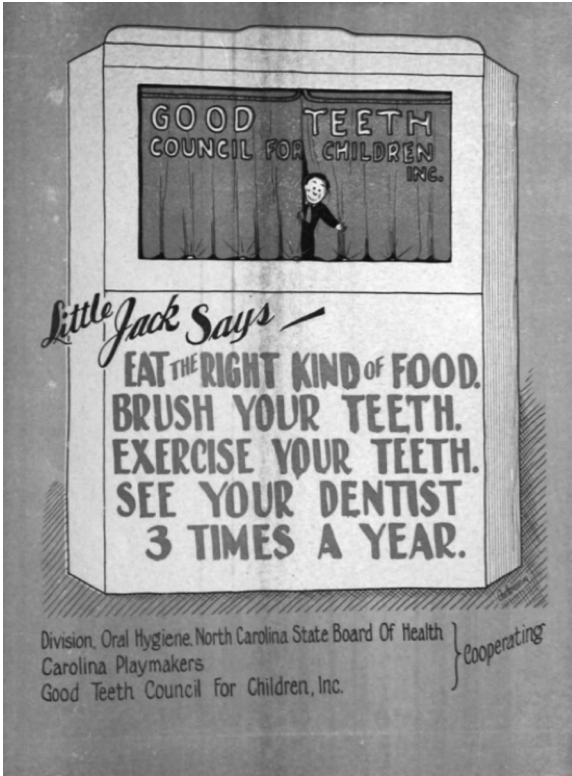


Fig. 3. Puppeteers Tour N.C. Schools.

Little Jack

The famous dental health education program called the Little Jack Puppet Show, which provided oral health education for thousands of elementary school children in North Carolina each year for close to thirty years, originated during the 1930s. Although not “professional” education, it is mentioned in this history because of UNC’s connection to the program, a DPH collaboration mostly lost to the passage of time.

While the university was working with Dr. Branch to establish the Institute for Dental Public Health, another collaborative effort was underway to expand oral health education for elementary school children in the state. The Little Jack Puppet Show was developed by Frederick H. Koch, Professor of Dramatic Arts and founder of the Carolina Playmakers at UNC, in collaboration with the state’s Division of Oral Hygiene; the Good Teeth Council for Children, which was an advertising arm of the Wrigley Chewing Gum Company; and Frances Hooper, a journalist and advertising executive in Chicago whose primary account was the Wrigley Chewing Gum Company and the related Good Teeth Council for Children.

Full-time puppeteers traveled the state presenting the show to elementary schoolchildren. An article in the *Danbury Reporter* (1936) entitled “Puppet Show Coming to Stokes” provides insights into the scheduling and performance of the play. In a front-page story, school nurse Miss Kate Nicholson announced that the Carolina Playmakers from the University of North Carolina would present a puppet play, *Circus or Bust*, to the schools of Stokes County with support from the Division of Oral Hygiene of the North Carolina State Board of Health, the Stokes County Health Department, and the Board of Education. As was typical, the play was presented to two schools in the morning and one in the afternoon.

Circus or Bust emphasized four rules of good health: eat the right kind of food, brush your teeth, see the dentist at least three times a year, and exercise your teeth (which included chewing gum after supper). Little Jack, the show’s main character, invited children to write to him and tell him what they had learned. Each child who wrote to Little Jack received a personally addressed letter emphasizing the rules for good health. The puppet shows and related education activities were popular with schoolchildren.

The primary contribution of each organization to the production of the play, which would run statewide for almost thirty years and reach thousands of schoolchildren with its educational messages, is not well documented. Further, historical records such as scripts and plans for stage shows are spread across archives at the University of Chicago, the UNC-CH, the N.C. state health department, Division of Public Health and state archives. Based on areas of expertise, it is likely that Professor Koch, his staff, and students in the Dramatic Arts department would have worked with the Oral Health Section staff to make the staging, create hand puppets, prepare scripts and recruit and train the original puppeteers (Hooper 2007). Miss Mary Tillery, the artist in the Oral Health Section made the puppets. The Oral Health Section trained the puppeteers, managed the travel itinerary for the puppeteers, and provided classroom educational activities.

Unfortunately, the play initially promoted a harmful practice—the daily use of chewing gum containing sugar, probably because of the involvement of Wrigley and its advertising agency. Members of the partnership likely were aware that scientific evidence did not support the message being disseminated by Little Jack. But the message seems to have been pervasive in educational materials used by the Oral Health Section at the time. The inset is text from a review article by Dr. Branch in the North Carolina *Health Bulletin*, which demonstrably conveys the false message that chewing gum is not harmful to the teeth (Branch 1935).

An image of a school dentist lecturing in front of a class of schoolchildren, pointing to an oral health message that reads “The development of the jaw; exercise the jaw; chew gum,” suggests that the Oral Hygiene Division also disseminated the message independent of Little Jack. As part of one of its direct advertising campaigns, the Wrig-

ley Company mailed letters to millions of toddlers nationwide, suggesting that turning two marks the perfect occasion to start chewing gum. It claimed that gum-chewing is good for children's teeth and that it can help with the pain of teething. A stick of gum was included in each letter for the child to try (*Grewal Levy Marketing News* 2017).

In a review of the school dental program published in the *NC Health Bulletin* in 1935, Branch wrote, "If jaws are to grow normally and develop to a sufficient size to accommodate thirty-two teeth of the permanent set that are to replace the twenty teeth of the first set, his jaws must have exercise. . . . Our present-day living does not require as much chewing of hard foods as formerly. This is why the dentist today will advocate the chewing of gum. Contrary to the notion of many people, chewing gum does not harm the teeth."

(Branch 1935)

Little Jack's message was later changed in the *Fair Show*, produced in the 1960s. The new message was to use fluorides in addition to eating the right foods, visiting the dentist twice a year, and keep your teeth clean.

Little Jack and his fellow puppets met their demise in 1968. Several factors were responsible for the discontinuation of the program. Demands on the public-school curriculum were increasing and requiring more academic accountability, limiting time for extracurricular activities. The Little Jack shows were never rigorously evaluated for oral health outcomes, but it is unlikely that they were effective in promoting behavioral changes and improving oral health, because of their infrequent exposure and mass communication techniques. Later trials of school-based programs by NIH and others proved school-based education programs for elementary classroom education to be mostly ineffective in changing behaviors and improving oral health, particularly dental caries. Recommendations for school-based programs emphasized more extended and intense education than provided by Little Jack visits. The North Carolina Preventive Dentistry Program, implemented in the early 1970s, emphasized continuous involvement of teachers and fluoride programs.

References Chapter 2

- Barr HH, and Barrie FH. 1979. *Edward G. McGavran: Guardian of the Body Politic*. Chapel Hill: School of Public Health, University of North Carolina.
- Branch EA. 1935. "The Dental Approach to the Child." *Health Bulletin* 50, no. 10: 19–20.

- Danbury Reporter*. 1936. "Puppet Show Coming to Stokes." November 19. Available at: <https://newspapers.digitalinc.org/lccn/sn91068291/1936-11-19/ed-1/seq-1.pdf>.
- Endeavor*. 1995. "Fostering Oral Health through Practice, Teaching, and Research: The Evolution of Dental Public Health." Fall/Winter: 2-14, 35-36.
- Fulton JT, and Hughes JT. 1965. *The Natural History of Dental Diseases*. Chapel Hill, N.C.: School of Public Health, UNC-CH, 1965.
- Grewal Levy Marketing News*. 2017. "It's Both Cute and Horrifying: A Historical Ad that Tries to Get Babies to Chew More Gum." June 21, 2017, <https://grewallevymarketing.com/2017/06/21/its-both-cute-and-horrifying-a-historical-ad-that-tries-to-get-babies-to-chew-more-gum/>.
- Harris RR. 1989. *Dental Science in a New Age: A History of the National Institute of Dental Research*. Rockville, Md.: Montrose Press.
- Herget JB. 2009. *The North Carolina Dental Society, 1856-2006: A History*. Cary, N.C.: North Carolina Dental Society.
- Hooper F. 2007. Guide to Francis Hooper Papers. University of Chicago Library. 18 pages. Available at: <https://www.lib.uchicago.edu/ead/rlg/ICU.SPCL.HOOPERF.pdf>.
- Mangum CS, Dean, to Hon. Josiah William Bailey. June 1937. In Rozier archives.
- McGavran EG. 1953. "What Is Public Health?" *Canadian Journal of Public Health* 44, no. 12: 441-51.
- O'Rourke JT. 1948. *A Report of a Study of the Dental Needs and Facilities of North Carolina*. Dental College Committee, N.C. Dental Society.
- Pearson EA, Jr. 1958. "A History of the Origin, Development and Progress of the Division of Oral Hygiene. North Carolina State Board of Health." Chapel Hill: University of North Carolina.
- Rozier RG. 1991. "Dental Public Health." In *Maxcy-Rosenau-Last Public Health and Preventive Medicine*, 13th ed., edited by JM Last and RG Wallace, 1005-20. East Norwalk, Conn.: Appleton & Lang.
- . 1997. "AAPHD Turns 60—Back to the Future: Whatever Became of Dental Public Health?" *Journal of Public Health Dentistry* 57, no. 1: 3-4.
- Twenty-Sixth Biennial Report of the North Carolina State Board of Health. July 1, 1934-June 30, 1936. Raleigh: NC State Board of Health.

Laying the Foundation for a Resurgence of Training in Dental Public Health

1942–60

Events in the one to two decades after the demise of the Institute of Public Health Dentistry laid a foundation for the dental public health program in the School of Public Health (SPH) and for the specialty itself. Both inside and outside the university, scientific and programmatic developments contributed to public health dentistry's status as a new discipline. Some of the major activities that occurred between the last short course in 1942 and the next course in 1960 are reviewed in this chapter.

Establishment of Public Health Training at UNC-CH

While the dental public health short courses were being offered by the Institute of Dental Public Health, the Division of Public Health continued to offer short courses for local public health workers. Seven courses for 300 public health workers were offered between 1936 and 1940. Concurrently, Rosenau was implementing changes in the Division so that it could function as an academic unit offering degree credit for graduate courses independent of the School of Medicine.

The end of the 1930s was an important period for the development of public health education at UNC. The Board of Trustees approved formation of the School of Public Health in 1940, the first school of public health in a state-supported university. The Division moved from Caldwell Hall on the main undergraduate campus into the new Medical and Public Health Building in 1941, the only building on the medical side of campus when Walter Berryhill became dean. The name later was changed to MacNider Hall. The first departments for the Division were organized (Public Health Administration, Epidemiology, Sanitary Engineering, and Parasitology), initially with only one to two faculty for each. The Division also offered its last short course. In time, the teaching increased, a number of graduate students were admitted to the school, and its first graduate degrees were awarded.

World War II was hard on the School of Public Health. It lost students and faculty but bounced back quickly with federal funds. The war also was hard on DPH

Number of dental professionals enrolled in masters degree programs in Gillings School of Global Public Health by year, 1952-2016

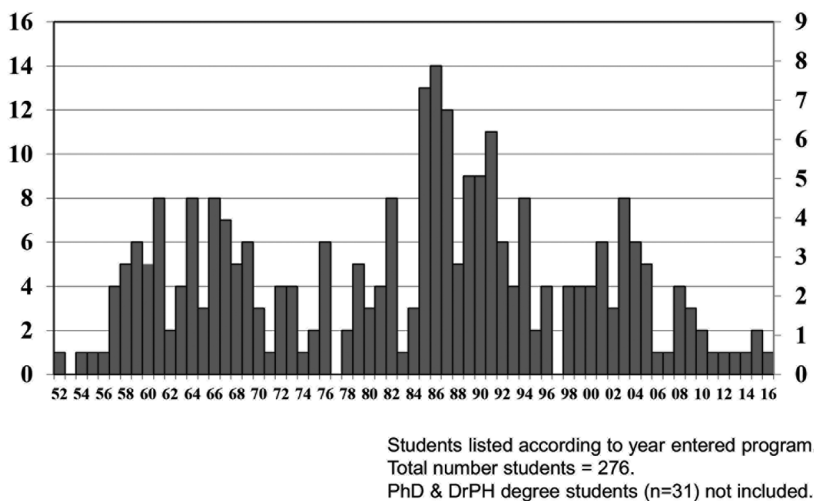


Fig. 4. Enrollment in Masters Degree Programs.

programs elsewhere in the country. As an example, Dr. Branch, state dental director in North Carolina, recounted optimistically in the 1957–59 biennial report

a slight upward trend in the number of children receiving the services. Indeed, it appears that 1954 marked a turning point after the difficult and discouraging decade between 1942 and 1952. Since 1942 it has been impossible to maintain a staff of dentists adequate in number s to meet the demands for the service. However, during the past two years our efforts in the area of recruitment have been more fruitful. (Pearson 1958, 65)

Edward G. McGavran was dean of the School of Public Health from 1947 to 1963, during most of the eighteen-year gap between the 1942 DPH short course and the next one in 1960. He energetically led the newly formed school in an expansion of its academic, research, and service missions. By 1951, a departmental structure with eleven departments was in place. Although small, the addition of faculty resources in some departments were allowed to grant graduate degrees at the department level rather than the school level. Under McGavran's administration, the number of faculty grew to sixty-two in the 1950s and the number of research papers increased from thirty papers in 1948 to eighty-two (Barr and Berrie 1979). Student enrollment had increased to 162 by the end of the 1950s. Among the master's degree students during the 1950s were nineteen dentists, the first one having enrolled in 1952–53.

Defining Dental Public Health and Assembling Faculty Resources

Among the first four faculty hired in Epidemiology was John T. Fulton, a dental epidemiologist (1958). His hiring followed that of John Cassel (physician, 1954). In 1958, Sidney Kark (physician) and Ralph Patrick (cultural anthropologist) were also hired. Kark left the university after one year, but the others comprised the core faculty for the next two years when C. David Jenkins, Herman A. Tyroler, and Hubert Campbell were hired. Epidemiology was authorized to offer graduate degrees (Master of Public Health and Doctorate in Public Health). John Hughes, a dentist, became the first doctoral student in epidemiology, in 1958. The statewide oral health survey organized by Fulton when he joined the faculty provided a dataset for the new department and the experimentation with new IBM computers. Graduate students and faculty published several research papers on oral health in the initial years of the Department of Epidemiology.

Dr. Harry Bruce, who taught the first graduate level course in DPH in the UNC-CH School of Public Health, was appointed to the Department of Public Health Administration as an adjunct faculty member in 1958. Later, Frank Law would be added, followed in succession by Dr. Carl Holmes and Dr. John Hughes. With the retirement of Fulton in 1970, the DPH faculty resources shifted almost entirely to the Department of Administration.

McGavran defined the practice of public health as the “scientific diagnosis and treatment of the community” or as he often referred to the community, the “body politic.” The definition requires that the public health professional have knowledge and skills that are unique to public health practice, making public health a discipline unto itself, separate from disciplines where the individual is the patient. He promoted this concept far and wide, including among dental groups. This articulation of public health practice was needed, because constituencies within and outside the university did not understand the practice of public health, often misconstruing it as the “treatment of poor people.” In the 1950s and 1960s, the “Body Politic” became the rallying cry of a campaign to win respectability for public health (Korstad 1990, 77).

McGavran’s activities as dean influenced DPH in several ways. He supported water fluoridation, particularly in Chapel Hill; he took his message and philosophy about the body politic to dental workshops when DPH was defining itself as a specialty; and as already mentioned, he hired a dental epidemiologist and a dental administrator to the School of Public Health faculty.

While dean, McGavran regularly gave his lecture “What Is Public Health?” in many venues, including dental ones (McGavran 1953). He presented at the 1954 Conference on Field Training for Public Health Dentists held in New York City, which helped set standards for residency programs. He also delivered the keynote address at the Fourth Workshop on Dental Public Health, whose title and theme were “Objectives

and Evaluation of a State's Dental Program," at the University of Michigan, April 2–6, 1956. In his address, McGavran outlined his working definition of public health. This message was an important one for the audience to hear, as DPH was developing as a specialty. It was important for both public health practitioners and faculty to hear it, as decisions were being made about where to place public health faculty in the university and whether a formal "program" in DPH was needed. He said at the conference:

Public health dentistry must prepare to function second to none upon the democratic interdisciplinary team of professional equals to provide the most scientific diagnosis and treatment for the health-needs and status of the community of its jurisdiction.

If public health dentistry is only one of the specialties of dentistry, then let us face the facts honestly. Public health dentists will not and cannot determine what public health dentistry is or where it is going. The direction will be determined by organized dentistry and ultimately by organized medicine. Organized medicine will also determine what subordinate position public health dentistry must have to public health medicine. (McGavran, 1956)

It can be assumed, based on his writings and presentations, that McGavran believed that public health disciplines and programs generally belonged in schools of public health, institutions devoted entirely to public health and independent of the effects of the heavy hand often present in academic medicine.

His "body politic" philosophy lived on for years. His classic manuscript outlining his definition of public health practice was required reading in the introductory course in dental public health well into the 1960s and 1970s.

At UNC-CH, Dr. Bruce presented the concept in DPH short courses that started up again in 1960. In printed materials he distributed to participants in the 1960 short course, he wrote,

Public health practice . . . requires the distinctive competencies, skills, knowledges, and techniques that relate to the focus upon the community as distinguished from the individual. The practice of dental public health is that specialty of dentistry requiring distinctive competence in community health and as such is an integral part of the practice of public health. The distinctive competence required in dental public health relates to responsibility of the community as a patient as distinguished from the individual, rather than a difference in functions, activities, or programs. Dental public health is the sum total of the research, education, prevention, diagnosis, prescription, treatment and evaluation in community dental health care. (Hughes notes, Dental Public Health Programs)

Bruce put this concept much more directly, at least in the words of the rapporteur, at the third annual DPH short course. It reads as follows: "Public health is a distinct

profession using a variety of disciplines and should not be a subordinate specialty of the various professions.” He went on to say that no “disease has ever been controlled by early diagnosis and treatment. This method is successful in the individual patient but not in the community patient. In this community, control has never been accomplished until efforts were directed toward changing the environment or man’s reaction to the environment” (Bruce, 3rd annual short course, p. 1).

McGavran was a strong advocate for water fluoridation, particularly during the protracted battle to fluoridate the Chapel Hill water supply. First recommended for Chapel Hill in November 1951 by UNC physician Sydenham B. Alexander at a city council meeting, fluoridation was a struggle that lasted more than a dozen years. Twice, the SPH faculty passed resolutions in support of water fluoridation. Dr. John Fulton, who had just joined the faculty of epidemiology in 1958, provided a well-documented review of the evidence on the safety and effectiveness of water fluoridation to support the resolutions. To help disseminate the action by faculty in the first resolution, McGavran published a lengthy and supportive editorial about fluoridation in the *Daily Tar Heel*, the student newspaper, in May 1960.

As inaction dragged on, in March 1962 School of Public Health faculty updated the evidence review of fluoridation and developed a stronger policy statement for consideration by the university administration (Fulton 1962). The resolution read as follows:

The faculty of the School of Public Health, University of North Carolina have reviewed this evidence and are satisfied that fluoridation of public water supplies is an effective and safe procedure and should be established as an integral part of any community health program. The faculty of the School strongly recommend that every community having a central water supply deficient in fluoride take steps to restore the fluoride concentration to the optimal level.

Dean McGavran submitted the resolution in a letter to Chancellor Aycock dated April 19, 1962. He outlined some of the reasons for the resolution. He wrote that faculty are addressing “frequent criticisms of the press, which impugns the interests of the University Health Sciences toward water fluoridation, has [have] disturbed the faculty of the School. The Executive Faculty voted unanimously to present this material to the news bureau so that no doubt can be harbored about its support for this important health measure.” Chapel Hill was finally fluoridated on February 28, 1964.

Except for the ban of tobacco use on the UNC-CH campus and the infectious disease pandemics in 1918 and 2020, water fluoridation might be the only health issue that the entire faculty of a school considered taking a position on. The story highlights the advantages of dental expertise on the School of Public Health faculty. A detailed timeline for the twelve-year battle to fluoride the drinking water in Chapel Hill is included as Appendix 3.1.



Fig. 5. UNC-CH School of Dentistry, 1950.

Early Collaborations between the UNC-CH Schools of Public Health and Dentistry

Another factor contributing to an increase in demand for dentists trained in public health dentistry, particularly for the UNC-CH campus, was the opening of the UNC-CH School of Dentistry and its reliance on School of Public Health faculty to teach public health courses required of dental students. The UNC dental school enrolled its first class of dental students in 1950 and occupied its new building adjacent to and south of the School of Medicine and Public Health Building in 1953. The Department of Public Health and Dental Science was one of the first departments at the School of Dentistry. The department was administered by the dean's office until 1953, when Dr. Kermit Knudtson was appointed chair. Dr. John Brauer continued to lecture in the DPH courses until he retired in 1966 (Knudtson and Crandell 1982). The department underwent various name changes, first Practice Administration and Dental Science (date unknown, but probably about 1953), then Preventive Dentistry and Dental Science (1965), and finally, Dental Ecology (1969), a name that was retained until revision of the curriculum in the late 2010s.

The different departmental names reflected the changing emphasis in the profession. The department and school philosophy placed value on proximal and distal determinants of dentists' behaviors and oral health. Faculty appeared to have an appreciation for population-based science. The department included courses on Dental History, Health and Society, Statistics, Natural History of Disease and its Control, Public Health, Community Health Organization, Geriatrics and Preventive Dentistry.

Evidence is unclear as to when a substantial amount of dental public health was first taught in the School of Dentistry, but it likely was in the mid-1950s. The 1954 Annual Report for the Department of Epidemiology states that the Department assumed responsibility for the course Public Health and Dental Science 170 in 1953 (Winkler and Schoenbach 2018). A grant application from the School of Public Health prepared in 1960 stated that medical staff of the Department of Public Health Administration

had taught public health, epidemiology, and medical care administration in the dental school since 1956. Faculty in the Department of Biostatistics also provided some guest lectures. But no information was found about specific courses for these early years of the School of Dentistry.

Nevertheless, it is apparent that in its initial years of operation, the School of Dentistry relied heavily on faculty outside the school to complete the curriculum with public health and prevention topics considered important. Public health and some of its specialized areas, such as statistics, epidemiology, and disease control, were among these topics. In the mid-1950s, dentists were yet to be added to the faculty in the School of Public Health, so teaching these subjects fell to School of Public Health non-dental faculty, mostly in the Department of Public Health Administration.

Course syllabi for the late 1950s and early 1960s show that public health courses in the dental curriculum were jointly listed with the School of Public Health. Non-dental faculty were listed as faculty lead for at least one course. For example, Charles Cameron, a physician and chair of Public Health Administration taught more than half of the sessions in Dental Public Health 192, one of two courses required of dental students.

By the end of the decade, Dr. John Fulton had been added to the faculty in the Department of Epidemiology. Records show that he was lecturing in the epidemiology course for dental students (Dentistry 173: Natural History of Disease and Its Control) soon after he joined the faculty in 1958. Topics in the 1960 syllabus included the following: biological concepts of living systems; the epidemiological method; etiological evidence for biological determinants (genetics, age, sex and race) and social class. Running through Fulton's lecture notes was a strain of advice on life outside of dentistry, reflecting his many years of experience. In defining epidemiology for dental students, he wrote in his lecture notes, "It is, and always has been, trying to identify and understand the forces which determine or influence disease in populations. The forces are not just physical—but psychological, social, and cultural as well." Documents show that Fulton also lectured on the natural history of dental disease in the course Preventive Dentistry 112 in 1967.

The dental hygiene degree program was started a few years after the school was founded. School of Public Health faculty lectured in these courses and in a few instances, were responsible for an entire course. For example, in the late 1960s and early 1970s, John Hughes was listed as the professor of record of a course (Dental Health 48) that included the following topics: philosophy of public health; fluoridation; dental economics, topical fluorides, dental epidemiology; OHI and PI Indexes; DPH programs; and health manpower.

In another of Hughes's courses, dental hygiene students conducted independent investigations into one of four topics: Head Start programs, political aspects of water fluoridation, the role of sealants in public health programs, and continuing education as a licensure requirement. Four dentists enrolled in the Master's of Public

Health (MPH) degree program provided consultation to the students throughout the semester.

In the 1960s as the result of a national “preventive dentistry movement” faculty trained in preventive dentistry and public health joined the dental school faculty. Dr. Ben Barker was responsible for the preventive dentistry curriculum, and dental school faculty assumed a greater role in these courses than outside faculty. It is likely that the School of Dentistry relied on the School of Public Health and the state health department to teach public health while they assumed responsibility for individual clinical services.

The advent of public health dentists in the School of Dentistry freed up important time for public health faculty. It also strengthened the dental school’s curriculum, because public health concepts such as epidemiology and public health practice could be taught in more meaningful dental terms. Two courses were required for all dental students: Dentistry 173: Natural History of Disease and Its Control; and Dentistry 192: Dental Public Health (See Training Plan for public health training grant number PHT 6-36A, 1966).

Professionalization of Public Health Dentistry: Creating a Demand for Graduate Education

Forces external to the university were contributing to the demand for graduate education in dental public health. In the 1940s, nearly a third of Americans lived in poverty. A third of the country’s homes had no running water. Most African Americans still lived in the South, where racial segregation in schools and public accommodations still prevailed (Mintz and McNeil 2018). Following World War II, the United States began an economic boom that created opportunities to address some of the long-standing public health problems. Public health workers with knowledge and skills in addressing these problems were needed.

The oral health status of the public was considered one of the more formidable chronic disease problems in society. The situation in oral health was described well in a publication edited by Walter Pelton and Jacob Wisan (1949), the first book devoted to dental public health and one that would survive into several editions:

The problem is tremendous because of the almost universal prevalence of the diseases, the time necessary for dental treatment, the fact that treatment needs to be started early in life and repeated periodically, the fact that there is not sufficient dental personnel to render adequate dental care to all the population and the fact that there has not yet been developed any practical means of prevention (Pelton and Wisan 1949, 21).

The 1940s and 1950s, the time between the last short course offered by the Institute of Public Health Dentistry and when they started back up again in the 1960s saw the pieces that are the foundation of a discipline come together for dental public health. The gap between short courses was a remarkable time in the development of dental public health, preventive dentistry, the public health infrastructure and policies in support of oral health. An academic knowledge base was emerging as DPH programs continued to develop. Specialties were being approved by the American Dental Association—all creating a demand for training in the new public health knowledge and skills.

A discipline like public health dentistry requires at least four major pillars of support—a professional organization (1937), a journal to disseminate scientific discoveries (1941), credentialing bodies for practice and education (1950), and research to provide evidence and generate new approaches to maintaining oral health. These institutions developed for public health dentistry during the 1940s and 1950s.

The American Association of Public Health Dentistry, the first professional organization devoted entirely to public health dentistry, began in 1937, followed by the Oral Health Section of the American Public Health Association (1943) and the Association of State and Territorial Dental Directors (1948). These organizations promoted policies and strategies to improve the oral health of the public and the needs of their respective constituencies.

The *Bulletin*, published by the American Association of Public Health Dentistry, later to become the *Journal of Public Health Dentistry*, was first published in 1941 with Vern D. Erwin, state dental director from Minnesota, as editor. It was the first publication in the world devoted entirely to public health dentistry and remains a primary component of the discipline.

Individual certification in DPH is conferred by the American Board of Dental Public Health. It was organized and recognized formally as a dental specialty by the American Dental Association in October 1950. Subsequently, the House of Delegates of the American Dental Association officially designated the American Board of Dental Public Health as the national examining and certifying agency for the specialty in October 1951. The principal purposes of the board, as defined in its Articles of Incorporation, are: (1) to protect and improve the public's health by the study and creation of standards for the practice of DPH in all of its aspects and relationships; (2) to grant and issue DPH certificates to dentists who have successfully completed the prescribed training and experience requisite for acquiring the special knowledge and ability needed for the practice of dental public health; and (3) to ensure continuing competency of diplomates. The quality of academic programs in DPH are ensured by the National Commission on Recognition of Dental Specialties and Certifying Boards. As of 2021, the commission recognizes twelve dental specialties.

The UNC School of Public Health values service to the profession and public. Faculty devote countless hours to teaching in continuing education courses, testifying before state and federal legislative bodies, boards and committees, reviewing scientific articles submitted for publication and serving on review panels among many other activities. Gary Rozier might be the first person who has served as president of the American Association of Public Health Dentistry, president of the American Board of Dental Public Health, editor of the *Journal of Public Health Dentistry*, a member of the American Dental Association Commission of Dental Accreditation, and member of the primary “study section” that reviewed grant applications submitted to NIH to fund population-based dental research. He therefore contributed to all four of the pillars defining a profession and helped support dental public health.

An important part of the professionalization of public health dentistry was the development of safe and effective strategies to prevent dental caries. The time from the late 1940s into the 1970s was a miraculous period for the advancement of these methods. No public health interventions had been developed for use by DPH practitioners when World War II ended. A large national effort focused on the prevention and control of dental caries after the war. Most of this effort focused on the use of fluoride in some form. In 1945 experimental trials of fluoridation of public water supplies designed to determine caries prevention effects were initiated in three U.S. cities (Grand Rapids, Michigan; Newburgh, New York; and Evanston, Illinois) and one Canadian City (Brantford, Ontario) on an experimental basis, but it soon was accepted as best practice by state and local government authorities.

For example, Charlotte, North Carolina fluoridated its water supply in 1948, almost ten years before the results of the initial experimental trials were published. The 1950s were devoted to continued research on the safety and effectiveness of fluoridation as well as its implementation. Dozens of baseline and follow-up surveys were conducted among North Carolina schoolchildren to provide first-hand, local data on its effectiveness in preventing dental caries, considered to be necessary to address the initial concerns among the public. By 1960, about ten years after the North Carolina State Board of Health had approved its policy on water fluoridation, thirty-two towns in North Carolina had fluoridated their drinking water supplies, reaching 1,004,396 people.

Other approaches to caries prevention were used to simulate the systemic effects of fluoride. By the end of the 1940s, dietary fluoride supplements were used to provide the systemic benefits of fluoride to children living in areas without fluoridated water. School water fluoridation was started in the U.S. Virgin Islands, Pike County, Kentucky, and Elk Lake, Pennsylvania, in the late 1950s. Seagrove, North Carolina, was added in 1968; and the four sites provide evidence for effectiveness. Although

the trials had a weak pre/post design, collective evidence seemed strong enough after twelve years that this strategy was recommended by NIH for rural areas of the country without a central water supply for much of the 1960s and part of the 1970s. At one time, North Carolina maintained the largest number of rural schools with water fluoridation of any state in the nation.

Fluoridated toothpaste (Crest) was unveiled at the start of 1956 with a memorable ad campaign slogan (“Look, Mom! No Cavities!”) and was approved by the American Dental Association in 1960.

Experimentation with professionally applied topical fluoride began even before water fluoridation studies (Knutson 1948). A 2 percent solution of sodium fluoride (NaF) applied four times over a span of a few days was recommended. By the mid-1950s, topical fluoride (NaF) was distributed free to private dentists by the North Carolina state dental public health program to promote its use (1954–56 Biennium Report). The plan for the 1961–62 biennium reports that upon request, 150 private dentists were provided sodium and stannous fluoride in 1959–60.

In 1955, Michael Buonocore described the acid etch technique, a simple method of increasing the adhesion of acrylic fillings to enamel, but it would be several years before the technique was acceptable enough that it could be used in school-based programs that came into favor in the 1960s and 1970s.

Summary of Gap Contributors to Foundation of Dental Public Health at UNC-CH

This chapter has reviewed some historical events from the early 1940s to the late 1950s that are presented as important factors related to the establishment of a DPH focus at UNC-CH. They occurred during the period after the Institute of Dental Public Health closed and before academic courses were offered in the university. On the surface, these events might not seem to be major parts of the history of DPH at UNC-CH. Yet, factors both internal and external to the university provided a foundation for the development of a program in dental public health.

Although perhaps not a direct determinant of the program, they contributed to the recognition that a program in public health dentistry was needed at the University of North Carolina, and thus a demand was created. Leadership in the School of Public Health appeared to recognize that need. Non-dental faculty were asked to teach in the dental school. They spoke at annual workshops helping to define the discipline. Demand on the School of Public Health faculty to teach courses for dental students and dental hygienists was acknowledgment that public health was an important part of the curriculum and the School of Public Health should be a source of that expertise.

The professionalization of DPH in the 1940 and 1950s created a pronounced need for training in new oral health preventive strategies. State dental programs including the one in North Carolina were seeking up-to-date information on DPH practice.

The first concrete action in response to these factors was the initial offering and continuation of a course in the School of Public Health devoted entirely to dentistry taught by Harry Bruce. Quickly following that was the appointment of John Fulton to the faculty as one of the first four faculty members in the Department of Epidemiology and, then, doctoral level training for the first student who was a dentist.

References Chapter 3

- Barr HH, and Barrie FH. 1979. *Edward G. McGavran: Guardian of the Body Politic*. Chapel Hill: School of Public Health, University of North Carolina.
- Fulton JT. *Controlled Fluoridation of Public Water Supplies as a Means of Prevention of Dental Caries*. UNC-CH School of Public Health Report. March 13, 1962.
- Knutzton K, and Crandell C. 1982. *From Quonset Hut to Number One and Beyond. A History of the School of Dentistry of the University of North Carolina*. [Chapel Hill, N.C.]: University of North Carolina Dental Alumni Association.
- Knutson JW. 1948. "An Evaluation of the Effectiveness as a Caries Control Measure of the Topical Application of Solutions of Fluorides." *Journal of Dental Research* 27, no. 3: 340–57.
- Korstad RR. 1990. *Dreaming of a Time: The School of Public Health, the University of North Carolina at Chapel Hill, 1939–1989*. Chapel Hill, N.C.: University of North Carolina.
- McGavran EG. 1953. "What Is Public Health?" *Canadian Journal of Public Health* 44, no. 12: 441–51.
- . 1954. "Objectives of Field Training in Public Health." American Public Health Association, Dental Health Section and Committee on Professional Education. Conference on Field Training for Public Health Dentists. New York City, June 28–29, 1954.
- . 1956. "What Is Public Health Dentistry?" In *Proceedings of the Fourth Workshop on Dental Public Health. "Objectives and Evaluation of a State's Dental Program."* April 2–6, 1956. Ann Arbor: University of Michigan.
- Mintz S, and McNeil S. 2018. "Overview of the Post-war Era." *Digital History*. Available at: <http://www.digitalhistory.uh.edu/era.cfm?eraid=16&smtid=1>.
- North Carolina State Board of Health, Biennium Report. Volume 36, 1954–56. Number NCHH-02-036.
- Pearson EA, Jr. 1958. "A History of the Origin, Development and Progress of the Division of Oral Hygiene. North Carolina State Board of Health." Chapel Hill: University of North Carolina.
- Pelton WJ, and Wisan JM, eds. 1949. *Dentistry in Public Health*. Philadelphia: W.B. Saunders.
- USPH Service, Health Resources and Services Administration (HRSA), Division of Dentistry. 1966. Training plan for public health training, grant PHT 6-36A.

Winkler J, and Schoenbach VJ. 2018. *The UNC Department of Epidemiology: Our First 40 Years, 1936-1976*. Chapel Hill: UNC Gillings School of Global Public Health, University of North Carolina. Available at: sph.unc.edu/files/2018/02/UNC_EPID_History_2018.pdf.

EXHIBIT X: Early Course for Dental Students

Department of Practice Administration and Dental Science
 School of Dentistry in Cooperation with
 Department of Public Health Administration
 School of Public Health
 University of North Carolina
 Dental Public Health (192) - Spring Quarter 1959-60

Friday 9:00 to 9:50 a.m.

Lecture Hall A – School of Dentistry

Session 1 – Introduction to Public Health Dr. Cameron

Session 2 – Review of Community Health

Agencies at the Federal, State and Local Levels Dr. Cameron

Session 3 – Holiday

Session 4 – Community Health Agencies (con't) Dr. Cameron

Session 5 – Dental Public Health Practice Dr. Cameron

Session 6 – Movie

Session 7 – Dental Public Health in

North Carolina Dr. Pearson

Session 8 – Dental Public Health in

North Carolina (con't) Dr. Pearson

Session 9 – Dental Indexes and Survey Methods Dr. Hughes

Session 10 – Public Reaction to Fluoridation Dr. Demeritt

Session 11 – Dental Health Education Dr. Cameron

Session 12 – New Developments in Dental

Care Plans Dr. Cameron

Faculty

C. M. Cameron, Jr., MD, Professor, Public Health Administration,
 UNC School of Public Health

W. W. Demeritt, DDS, Assistant Dean, UNC School of Dentistry

John T. Hughes, DDS, Department of Epidemiology, UNC School of
Public Health

E. A. Pearson, Jr., DDS, Director, Division of Oral Hygiene, NC
State Board of Health

Textbook:

Pelton & Wisan: Dentistry in Public Health, 2nd Edition, W.B.
Saunders, Philadelphia, Pa., 1955.

An MPH Degree in Two Weeks

Short Courses in Dental Public Health

By 1960, trends in dental innovations had once again created a demand for training among dental public health-care workers. Concurrently, expertise was developing among the faculty at the UNC School of Public Health (SPH) that could help meet that demand. As with the Institute of Dental Public Health more than two decades before, the state dental directors in North Carolina and Virginia requested a training course for their staff dentists. Key faculty at the SPH were able to organize what was to become the first of a series of annual dental public health certificate courses. These courses generally were referred to as “short courses” because they lasted longer than the typical few hours of continuing education but not as long as a full-time graduate MPH degree program. The content of the short courses provided an overview of the core curriculum required in the MPH degree program. Because of their scope and intensity, these courses were often characterized by some as “an MPH degree in 2 weeks.” Because of its content, the initial offering of courses is referred to as the “basic principles” course. As described in this section, the SPH in the mid-1960s expanded course offerings into two specialized areas—prevention and research.

The first basic-principles course, referred to at the time as a seminar, was held in Raleigh in the summer of 1960, with thirty-one dentists employed full-time by the two state DPH programs in attendance. It met in the Oral Hygiene Building, dedicated in 1941.

Dr. Alex Pearson described the motivation for their request in comments at the two-week short course:

During the last two years, the state dental director of Virginia and I have discussed many of the problems public health dentists were confronted with in our respective states. We realized that many dentists would enter public health for a short period of time and then enter private practice and that a year or more in special study in public health was out of the question. We felt strongly that a means should be provided by which the dentists on the staffs of Virginia and North Carolina could meet together for short periods of time for the purpose of getting a better understanding and appreciation of the role of a public health dentist in a generalized public health program... I am very happy that we have had this opportunity to study and work together. (Summary of Courses, 21)

Dr. Law described the goals of the course as follows: “The first conference was designed to present basic elements of public health to dentists assigned in state and local health departments and developed on request of some 30 dentists employed by the state health departments in North Carolina and Virginia” (Law 1962).

Several key features were evident in the design and content of the 1960 course. The faculty was small but consisted of full-time university faculty and experienced practitioners who would become important not only in the successful offering of this and subsequent short courses, but in the development of DPH within the university. Drs. John Hughes, Alex Pearson (1959–78), and George Dudney (1979–88) were to be at the heart of a successful practice-academic partnership in North Carolina for the next three decades. Harry Bruce provided an important connection to the Federal policies and services.

John Fulton and Hughes presented lectures on epidemiology. In his presentation at the 1960 short course, Fulton discussed epidemiology of dental diseases with the intent, in his own words, to “broaden your concept of dental disease by extending the picture of its prevalence into population groups; some of the circumstances in which it occurs, and some of the biological and social variables that are associated with dental disease and seen to affect it. Then I tried to give you an idea of the theoretical framework in which, at the University of North Carolina, dental diseases were being looked at as group phenomena” (Summary of Seminar 1960, 28).

Dr. Charles Cameron taught health administration and public health practice. He received his MD degree from Vanderbilt and an MPH degree from UNC and joined the UNC faculty in 1955. He was now chair of the Department of Health Administration, and from that position he played a leadership role in promoting DPH, teaching in the School of Dentistry in addition to short courses. He had served as a health officer in Tennessee, as a commissioned officer in the Public Health Service, and with the N.C. State Board of Health.

Dr. Ralph Patrick, associate professor, like Fulton was part of the small cadre of faculty who had joined the Department of Epidemiology in the late 1950s (1958). He was a social scientist with a PhD in anthropology from Harvard. Along with Cassel and Jenkins, he coauthored the department’s conceptual model for social epidemiology (Winkler and Schoenbach 2018). Along with Fulton, Patrick brought to the course the important perspective in the department on the importance of social determinants in disease causation and measurement of social class. He played an important role in the design of the statewide survey of oral health, contributing his expertise to the measurement of social class, one of the initial dental studies to consider the role of social class in oral health.

Aspects of health education and community organization were taught by Elizabeth McMahan, MSPH, EdD, associate professor of public health education at the University of North Carolina. She later resigned from her position at UNC along with several other faculty when Ralph Boatman was appointed chair. Effective September 1, 1971,



Fig. 6. Public Health Dentists Attend First Short Course, 1950.

she moved to the Department of Health Education in the College of Health at East Tennessee State University. She would return to North Carolina to participate in the last DPH short course in 1983 in Brown Summit.

A second important characteristic of the 1960 short course is that it was very interactive with daily discussion groups for a big portion of the day and individual conferences in the evening. Finally, the evaluation was extensive. Group and individual feedback, well documented in the final report and in Hughes' notes from the course, were part of an extensive evaluation.

Attending this first course was Joseph Doherty, a young dentist in Virginia who would later become a national leader in dental public health. In reporting out for a group exercise, he said, "This is our first real experience, at least for most of us, with public health. . . . The question we had when we came here is 'Where do we fit into this picture as dentists?'" (Summary of Seminar 1960, 7).

A careful evaluation of this initial course in 1960 provided a strong foundation for future courses. They were held in Chapel Hill every year for twelve consecutive years as intense ten-day, sixty-hour courses. (The second course in Chapel Hill was held in Avery Hall.) The basic-principles courses averaged about a dozen faculty, drawn from several departments in the SPH, the School of Dentistry, and state, federal, and local programs.

Courses averaged about thirty-five students each. Financial assistance was available to students for most of the short courses. Project grants or short-term traineeship grants of \$12 per day per trainee provided federal support for students in the basic principles course each course with students' agencies providing financial support for others.

Course content was recorded in abstract form for most years by Frank Law, and it provides insights into the content of sessions. The regularity of courses was ideal for addressing current issues in public health practice and health policy. The third annual short course, held in 1962, included a presentation by Elizabeth M. Warner, a dental hygiene consultant with the USPHS, stationed in Washington, D.C. She gave a presentation titled the "Dental Hygienist in Dental Public Health" on expansion of functions for auxiliary personnel. Notes for the session by Law recounted that "an animated and heated discussion followed this presentation."

Ms. Warner presented once again at the fourth annual short course on the same topic: "The ADA has gone on record as encouraging experimentation in the expansion of the duties of dental hygienists, dental assistants, and laboratory technicians. However, no experimental programs have been started in the US. This is probably due to opposition by the dental profession despite ADA action" (Law 1963, 14).

The theme of the keynote address by Dr. Donald Galagan, Chief Division of Dental Public Health and Recourses, Public Health Service, at the third course, titled "The Emerging Role of Dental Public Health," was that DPH faces the same problems over and over. He said, "Growing manpower shortages, the organization of programs to provide dental care for special population groups, and the more effective use of auxiliary dental personnel are additional problems facing the dental profession and dental public health" (Law 1962, 19).

A similar theme was evident in a presentation by Galagan at the 1962 Georgia Public Health Association Meeting under the provocative title "Whatever Became of Dental Public Health?" (Galagan 1962). In this address, he reviewed the growing challenges in dentistry—the increasing amount of dental disease with severe workforce shortages. In his words, "the pattern of disease and neglect and deprivation represents a serious threat to the welfare of the American people." Dental public health was at a critical point, in his opinion. Public health agencies held the responsibility of providing guidance for addressing these problems but had insufficient resources to do so. Available interventions included an increased supply of dentists, expanded duties of auxiliaries, dental insurance, and water fluoridation. Yet they were undeveloped and underfunded. At the time, they received only one cent out of every public health dollar.

By the fourth course in 1963, the number of faculty had increased to seventeen, including three from the USPHS. The basic principles course was on firm ground, with two to three dozen participants in each course, coming from more than a dozen

states, with a diverse and experienced faculty, and a growing national reputation and one component of a comprehensive DPH program.

The curriculum was a mini version of the School of Public Health MPH degree in Public Health Administration. It consisted of three basic components: (1) SPH core subjects—epidemiology, biostatistics, health education and administration, most of which continued to be taught by the regular course instructors; (2) their application to DPH; and (3) current topics of interest and importance to DPH.

Only two short courses on basic public health principles were offered in the 1970s—in 1973 and 1978. Federal funding ended 1978 with the fourteenth offering of the basic-principles course over almost two decades.

The last short course was spread over the three consecutive annual staff conferences held by the Oral Health Section from 1982 to 1984. The 1982 course included biostatistics, dental epidemiology and statistics taught over one and a half days by John Hughes and Gary Rozier. The 1983 course featured several hours of health education and community organization in public health. The last course in 1984 had a major commitment to prevention with two international experts in dental public health—Drs. Alice Horowitz and Herschel Horowitz—sharing the two-day course. Herschel provided a comprehensive review and update of fluorides, including community and school water fluoridation, self-applied fluorides, combined fluoride therapies and the future for fluorides. The topics listed in the program for Alice Horowitz were education as the cornerstone of successful preventive regimens, planning and evaluating effective community-based programs, and plaque control in community-based programs.

Short Courses in Preventive Dentistry

The late 1960s can be thought of as the golden era of preventive dentistry in the United States. Prevention was one hope to balance excess need and demand for dental care with the workforce shortage. Robert Kesel wrote in the *Survey of Dentistry*, published by the Commission on the Survey of Dentistry, Council on Education, that “preventive dentistry offers the most promising solution to the dental health problems of the nation.” The Commission recommended that “Dentists recognize increasingly the pre-eminent importance of preventive dentistry by utilizing all available preventive measures in their practices and by educating their patients in the value of prevention” (Kesel 1962, 112).

The need for preventive strategies in North Carolina was highlighted in dramatic fashion by Frank Law in his presentation at the 1968 Prevention of Caries short course. He reported that the statewide survey of North Carolina conducted in 1960–62, the Natural History of Dental Diseases Study, indicated that “about 7,000 white females under age 18 are edentulous and about 40% of men and women age 50 are edentulous” (Law 1968, 11).

At the same short course, John Fulton compared DMFT and component scores for North Carolina, New Jersey, and New Zealand. He had first-hand knowledge of the New Zealand school dental nurse program, having studied the program on behalf of the World Health Organization in the early 1950s and concluded that it provided access to quality dental care (Fulton and WHO 1951). He pointed out that caries attack rates were similar for the three areas but filled tooth rates were much higher and lost tooth rates considerably lower in New Zealand than in North Carolina and New Jersey, again emphasizing the need for caries prevention services.

A national movement swept up private practice, public health, and dental education in the 1960s and 1970s. Robert Barkley, a general dentist from Macomb, Illinois, was the face of the movement for clinical dentistry. He assembled information from some of the pioneers in preventive dentistry—Levi Parmly, Charles Bass, and Sumter Arnim—from sources generally inaccessible to practicing dentists and packaged it in a way that captured the attention of dentistry.

In developing his five-day plaque control program, Barkley drew indirectly for a historical foundation on the writings of Levi Spear Parmly, referred to by some as the “Father of Floss.” In “A Practical Guide to the Management of the Teeth,” published in 1819, Parmly had touted the importance of daily oral hygiene and recommended the use of silk thread to clean between the teeth.

Barkley also drew on the work of Charles C. Bass, a pathologist and expert in tropical medicine, who after his retirement as dean from the Tulane University School of Dental Medicine conducted extensive research into the best methods for plaque control. Publications in the *Louisiana State Medical Journal* in the 1940s promoted what is known as the “Bass Technique of Toothbrushing” and the use of nylon thread to clean between the teeth rather than silk thread recommended by Parmly. For his work, some refer to Bass as “The Father of Preventive Dentistry.”

Finally, Barkley drew on the research in periodontal disease control conducted by Sumter Arnim, who expanded on the work of Bass and published it in the periodontal literature in 1958. He used phase-contrast microscopy to study plaque and developed an early form of the disclosing tablet, both used as educational tools in Barkley’s approach to plaque control.

The populist movement created by Barkley was widespread and spilled over into public health (N.C. Department of Health and Human Resources 2020). Implementation in public health got caught up in the technique of plaque control rather than a comprehensive approach to patient disease management. A timeline for the history of DPH in North Carolina states that in 1971 “research identified a new, previously unknown enemy of dental health, plaque, and produced methods for combating the problem” (NCDHHS 2020). This timeline is hardly accurate, because plaque control methods being promoted were based on research conducted years before.

The history timeline provides further details about activities in North Carolina:

In North Carolina the Dental Society passed resolutions at its meeting in 1971 advocating for a strong preventive dental program and formed a Task Force for Community Preventive Dental Health Education. All dental public health personnel were trained in plaque control and directed to initiate plaque control programs in local health departments. Private practice dentistry and dental public health worked together to teach new plaque control techniques. Plaque control workshops were held across the state by the task force for North Carolina dentists, dental hygienists and dental assistants. In the same year dental public health employed its first four dental hygienists to teach preventive dental health in counties. (NCDHHS 2020)

The response to the plaque control movement in public health was to develop school-based brushing programs. These later proved to be ineffective in preventing dental caries, of modest effect on periodontal conditions and difficult to implement in the classroom because of logistic concerns. But school-based dental programs were slow to abandon these ineffective techniques in favor of their commitment to school-based health education about oral health.

Many dental schools, including the UNC School of Dentistry, formed departments of preventive dentistry in the 1960s. They were encouraged to do so by the increasing emphasis on preventive dentistry and, in the case of UNC, influence from the initial success of a program started by the U.S. Army in 1961. The Army's plan called for the "creation of a philosophy of dental practice in which preventive concepts are accepted and placed in proper perspective with other procedures as an essential consideration in planning dental care for all patients". A major symposium on the subject of Applied Preventive Dentistry (Washington D.C., 1964), led to curriculum changes in the dental school. Plans for the UNC School of Dentistry called for formal instruction in the preventive dentistry to begin at UNC in September 1966. The plans were to involve dental students for 40 hours of didactic lectures and some 300 hours of clinical instruction.

The implementation of these curriculum changes was described by Ben Barker at the Second Conference on the Teaching of Preventive Dentistry and Community Health, held in Baltimore, Maryland, in 1968. Rozier was a member of the class enrolling in 1966 and recalls firsthand the School of Dentistry "experimenting" with the clinical preventive dentistry curriculum. The importance of oral hygiene was well known but not widely promoted in dental practice or dental education (Garcia and Sohn 2012). The emphasis was more on dental caries. Periodontal probes were rarely part of the dental examination, even generally unavailable in dental practices. Rozier and his classmates were randomly assigned to different educational strategies for periodontal probing to determine if dental students could be taught to use periodontal probes.

Federal legislation in 1964 authorized funding for grants to improve the teaching of preventive medicine and community dentistry in the Nation's health professional schools (Duffy et al. 1998). The UNC Department of Public Health Administration was the recipient of a Special Purpose Traineeship Grant, "Teachers of Preventive Dentistry," in 1966 (July 1, 1966–June 30, 1971), which continued the special projects training grant for another five years. This grant was specifically designed to establish a graduate training program in the UNC-CH School of Public Health "to prepare dentists for careers as teachers of preventive dentistry." The National Advisory Committee in approving the grant, however, indicated that the dental program did not need to change in any substantial way.

With the departure of Carl Holmes, John Hughes was hired by the Department of Public Health Administration in June 1966 to direct the dental program. The department chair (Robert E. Coker Jr.) died suddenly, and Morris Schaefer was appointed chair in 1967 after an interim chair. The ensuing three years were a period of developmental change and growth in the department. Schaefer helped consolidate autonomous programs, led the development and approval of a research-oriented PhD program and recruited research-oriented faculty in policy analysis and related disciplines.

In the summer of 1966, the Department of Public Health Administration began offering two other short courses in addition to the basic course. A week-long course in prevention and a similar length course in research design were offered each year for five consecutive years. The preventive course focused on dental caries the first year and on periodontal diseases in alternate years during the five years. They averaged about twenty-five participants per course over the five years.

The prevention short courses were designed primarily for full-time dentists and dental hygienists who were employed by state and local dental health programs. This type of course was requested by representatives from the state dental health programs in North Carolina, Virginia, and Tennessee. A planning committee believed that there was a need for such a course because of the continuing advances in preventive dentistry and challenges faced by public health in keep abreast of these advances. Important research findings for public-health dentists and hygienists were results of the continuing studies of water fluoridation, the effectiveness of alternative fluoride procedures, and increased understanding of the etiology of dental caries.

The overall purpose of the prevention short course was to acquaint the participants with recent developments in the field of preventive dentistry in order that they might apply this knowledge in their dental health practices. The specific objectives of the course were to: (1) review the state of knowledge about the effectiveness, limitations, and proper techniques for applying three topical fluoride agents (sodium fluoride, stannous fluoride, and acidulated phosphate fluoride); (2) familiarize the participants with recently developed information on the etiology of dental caries; (3) familiarize

the participants with existing knowledge on the epidemiology of dental caries; (4) review the existing information on specific methods and techniques for prevention of dental caries (including water fluoridation, diet control, and the use of systemic fluorides—tablets, drops, etc.); and (5) familiarize the students with recent knowledge and techniques of secondary prevention of dental caries.

Topics for the caries courses included presentations on the etiology of dental caries and its prevention and control. The intervention focus was on updates on fluorides, the most effective strategy available at the time. Because of the state of the art on the prevention and control, the periodontal diseases courses were not as well-grounded in science as the dental caries ones. Both the caries and periodontal courses included the epidemiology of diseases and their measurement. An example of the content of these courses is displayed in Exhibit X.

Short Courses in Research Methods and Their Application in Dental Public Health

Five courses in research methods and their application in dental public health were offered by the Department of Public Health Administration between 1966 and 1970. Enrollment targeted dentists and dental hygienists employed by state and local health departments. Courses averaged about thirteen select participants per course and the faculty were Fulton, Hughes, Law, and Earl Williams from Tennessee. The need for training in research methods was expressed by state dental directors and other consultants in the field of dental public health. That need was considered particularly great concerning the application of research principles and methods to the field of dental public health practice.

The research courses were presented in two parts. First, participants completed four programmed teaching units on research design prepared by the USPHS Dental Health Center in San Francisco. The programmed materials consisted of slides and audio tapes. Second, they participated in small group work applying the principles taught in the instruction materials by developing a research approach to specific problems in dental public health practice. The product was a research plan or program plan demonstrating scientific approaches to designing public health programs. The instructional materials were designed initially for use with dental school faculty and similar groups and had not been applied to a dental public health setting before use in these courses. The short course thus tested the application of the instructional units and the scientific method to operational problems in the field of dental health.

The course purpose was to acquaint the participants with the basic principles of research planning and design as related to dental public-health practice. The specific objectives of the course were to: (1) present basic information on research design

Decision Making Processes on Health Care Matters: A Structure for Comparison

Generic Activity Stages	Patient Care	Community Health Planning	Biomedical Research	Public Policy Process*
Identify Issues	Take history Examine patient	Recognize problem Collect data	Review literature State research problem	Perceive problem Socially redefine through representation
Generate Solutions	Make diagnosis Formulate treatment plan	Set objectives Compare alternatives	Develop hypothesis Develop research design	Legitimate acceptable alternatives
Take Action	Delivery health care services	Adopt program Implement program	Collect data Analyze data	Government decides policy Implement policy
Evaluate	Follow up patient	Evaluate program	Study and discuss findings	Public reacts Evaluate

*This column is adapted from Jones, CO. *An Introduction to the Study of Public Policy* (New York: Milbank Memorial Fund, 1973). See table in Douglass CW. 1980. Influencing federal, state and local oral health policies. *Family Community Health* 3:81-90.

Fig. 7. Parallel Decision-Making Processes (Douglass 1980).

and planning to public health dentists; (2) assist the students in understanding the basic elements of research design and methodology; (3) identify areas in dental public health where the elements of research are needed and applicable; (4) relate research methodology and planning to elements of dental public health practice, e.g., determination of need, program planning and program evaluation; and (5) provide the faculty with experience in and an opportunity to evaluate the effectiveness of programmed instruction for continuing education in dental public health.

Both research and program planning are based on the scientific method and the steps for both have some methods in common. For example, evaluation of a public-health program and measurement of an outcome in a research project might use the same index for measuring disease status. Groups identified a public health problem and developed a plan to address it. Materials from the course list close to twenty questions/problem areas considered by the three small workgroups in the first course. Problem areas selected for development in the first course in 1966 were: pre-service and/or in-service training programs for teachers; survey of dentists to determine the preventive practices and agents used in their practices; and determining the value of topical fluoride application in areas where community water supplies are fluoridated. These questions could be framed in different ways, and they demonstrate some difficulty that could be encountered in translating research methods into public-health

practice. It appears that courses emphasized program planning methods more heavily as experience was gained with these modules. Faculty agreed that the draft document produced in the course was an acceptable first draft. They provided evidence of insights and knowledge about problems in public health and how to address them with research or program planning.

Summary of Short Courses

Over a twenty-four-year period, thirty-one short courses, mostly of two weeks' duration, were taught for about 900 dentists and dental hygienists. Most of the courses were the basic public health course. Six were the research course and five, prevention (three dental caries and two periodontal diseases). Detailed documentation is not available for later years, but initial grant reports recounted high demand for the courses, creating interest in long-term training and subjective opinions about improvement in the quality of the dental public health workforce.

Federal funding for the courses ended in 1978. Even though popular, they were not continued for several reasons. The School of Public Health placed less emphasis on faculty providing continuing education as part of the criteria for promotion and tenure. By the mid-1960s, a divide between the more research-oriented departments and community-oriented departments had developed. Faculty knew that one effective strategy to expand programs was to obtain (external) federal or foundation funding and then replace it with state appropriated funds. Many faculty took a more entrepreneurial approach to their faculty roles, developing large research programs rather than community service programs (Korstad 1990, 120).

Continuing education also became more available at the national level. For example, the annual meeting of the American Association of Public Health Dentists (AAPHD) moved from a one-day meeting, much of which was devoted to the association's business affairs, to a two-and-a-half-day meeting (and longer) in the 1970s.

Another reason for deemphasis of short courses was the more sophisticated and well-planned continuing education provided at the annual staff conferences of the state dental program. The dental program had a long tradition of instruction. It was at the heart of founding of the Institute of Dental Public Health and the short courses. Ernest Branch, director of the state dental program from 1929 to 1959, was known to invite staff dentists into the Raleigh central office on Saturday mornings for staff conferences. While records are not complete before the 1970s, the tradition continued, and continuing education was held every year. They were a combination of personnel items and professional continuing education. When funds were available, these two functions were separated.

Since the early 1970s, the Oral Health Section also provided an orientation to dental public health for newly employed state and local dental public health staff as agreed

to with the North Carolina state dental board. These arrangements were made to accommodate direct supervision requirements when the state preventive dentistry program was implemented. According to state statute §90–233:

A dental hygienist may practice only under the supervision of one or more licensed dentists. This subsection shall be deemed to be complied with in the case of dental hygienists employed by or under contract with a local health department or State government dental public health program and especially trained by the Dental Health Section of the Department of Health and Human Services as public health hygienists, while performing their duties for the persons officially served by the local health department or State government program under the direction of a duly licensed dentist employed by that program or by the Dental Health Section of the Department of Health and Human Services. (NC statute §90–233).

To meet the requirements, the Dental Health Section provides several days of didactic training and field experience. Topics for the course are similar to the basic public health short course, and can be thought of as a “short course lite.” Faculty included a larger number of instructional staff from the Dental Health Section, but also some from other branches of government and the UNC-CH School of Public Health.

The course satisfied the Board requirement on dental hygiene supervision and provided an orientation of new staff to their roles and responsibilities. Included in the orientation was an overview of the organization and policies of the statewide dental health program, an introduction to techniques of working in a community and with community agencies.

Topics from the 1973 course entitled “Introduction to Dental Public Health” reflect the state of the art of dental public health interventions and strategies: history of the N.C. Dental program; epidemiology of dental diseases; epidemiology and research; the dental hygiene practice act; roles of dentists, hygienists, and health educators in DPH programs; principles and philosophy of preventive dentistry (plaque control programs, brush-ins, teacher seminars and educational materials, fluoridation, fluoride tablets, nutritional aspects of dental caries), school-based screening and referral, communicating primary dental messages, community diagnosis and organization and program evaluation. Additional topics from other courses included elements of a comprehensive health education program; fluoride mouthrinse programs; dental sealants; Head Start; adult dental screening; preschool programs; access to care issues; and infection control guidelines.

The Golden Era of Short Courses Comes to an End

At the 1982 course at the Episcopal Education Center near Brown Summit, North Carolina, a celebration was held to recognize the retirement of Dr. John Hughes.

The event was appropriate for the occasion, given Hughes's dedication to continuing education throughout his career, having served as director of continuing education for the School of Public Health. He had participated in all thirty-one short courses since the first one in 1960, leading many to refer affectionately to the courses offered over almost two and a half decades as "John Hughes' Short Courses." In addition to administrative responsibilities, Hughes presented at nearly all the courses, usually on the same topic—some aspect of epidemiology, usually measurement issues and methods. In presenting the epidemiology of oral diseases, he used cardboard figures. The retirement celebration was held at the 1982 annual staff conference so that the many dental public-health practitioners who had participated in his courses could show their appreciation for his long and dedicated career.

References Chapter 4

- Bernier JL, and McFall TA. 1961. "Role of Prevention in Military Dentistry." *Journal of the American Dental Association*, no. 62: 717–22.
- Douglass CW. 1980. Influencing federal, state and local oral health policies. *Family Community Health* 3: 81–90.
- Duffy RE, Chen DW, and Sampson NH. 1998. "History of Federal Legislation in Health Professions Educational Assistance in Dental Public Health, 1956–97." *Journal of Public Health Dentistry* 58, suppl. 1 (December): 84–89.
- Fulton JT, and World Health Organization. 1951. *Experiment in Dental Care: Results of New Zealand's Use of School Dental Nurses*. Geneva: World Health Organization.
- Galagan DJ. 1962. "Whatever Became of Dental Public Health?" *Journal of Public Health Dentistry* 22: 82–90.
- Garcia RI, and Sohn W. 2012. "The Paradigm Shift to Prevention and Its Relationship to Dental Education." *Journal of Dental Education* 76, no. 1: 36–45.
- Kesel RG. 1962. "Dental Practice." In *The Survey of Dentistry. Final Report*, B. S. Hollinshead, dir; Commission on the Survey of Dentistry in the United States. Washington, D.C.: American Council on Education.
- Korstad RR. 1990. *Dreaming of a Time: The School of Public Health, the University of North Carolina at Chapel Hill, 1939–1989*. Chapel Hill, N.C.: University of North Carolina.
- Law FE. 1962. *Final Report. The Third Annual Summer Course on Principles of Public Health for Dentists and Dental Hygienists*. July 23–August 3, 1962. School of Public Health, University of North Carolina, Chapel Hill.
- . 1963. *Final Report. The Fourth Annual Summer Course on Principles of Public Health for Dentists and Dental Hygienists*. July 22–August 2, 1963. School of Public Health, University of North Carolina, Chapel Hill.
- . 1968. *Final Report. The Prevention and Control of Dental Caries*. July 15–19, 1968. School of Public Health, University of North Carolina, Chapel Hill.
- N.C. Department of Health and Human Resources. 2020. "History of Dental Public Health in North Carolina / 1856–2010." Oral Health Section, NCDHHS. <https://publichealth.nc.gov/oralhealth/aboutUs/history.htm>.

N.C. State Statute §90-233. Practice of Dental Hygiene. Supervision Requirements. https://www.ncleg.net/enactedlegislation/statutes/html/bysection/chapter_90/gs_90-233.html#:~:text=%C2%A7%2090%D233,one%20or%20more%20licensed%20dentists.

Summary of Seminar in Dental Public Health. 1960. Raleigh, North Carolina. May 30–June 10, 1960. School of Public Health, University of North Carolina, Chapel Hill.

Winkler J, and Schoenbach VJ. 2018. *The UNC Department of Epidemiology: Our First 40 Years, 1936–1976*. Chapel Hill: UNC Gillings School of Global Public Health, University of North Carolina. Available at: sph.unc.edu/files/2018/02/UNC_EPID_History_2018.pdf.

UNC SPH, 1960

University of North Carolina
School of Public Health

Seminar in Dental Health
Raleigh, North Carolina
May 30 – June 10, 1960

A training conference for dentists employed by the State Department of Health of North Carolina and Virginia. Each day will be divided into three sessions:

9 a.m. – 12 noon – Subject presentations

2 p.m. – 5 p.m. – Three discussion groups

7 p.m. – 9 p.m. – Readings and individual conferences

Faculty

Harry W. Bruce, Jr. DDS, MPH Visiting Professor of Dental Public Health Administration

Charles C. Cameron, Jr., MD, MPH Professor of Public Health Administration

John T. Fulton, DDS Professor of Dental Epidemiology

John T. Hughes, DDS, MPH Research Fellow in Dental Epidemiology

Elizabeth L. McMahan, BS, MSPH, Associate Professor of Public Health Education

Ralph C. Patrick, Jr., AB, PhD Associate Professor of Epidemiology (Cultural Anthropology)

Agenda

- Session 1: Introduction to Dental Health Problems – Fulton
 Elements of Human Behavior – Patrick
- Session 2: Community Structure – Patrick
- Session 3: Public Health Administration – Cameron
- Session 4: Local Health Departments – Cameron
 School Administration for Health - McMahan
- Session 5: Community Health Education – McMahan
- Session 6: Epidemiology of Dental Diseases – Fulton
- Session 7: Epidemiology of Dental Diseases (con'd) – Fulton
 Dental Survey Methods – Hughes
- Session 8: Statistics in Dental Public Health – Hughes
- Session 9: Dental Public Health Programs – Bruce
- Session 10: Summary - Staff

Curriculum for Prevention and Control of Dental Caries Short Course, 1968

University of North Carolina
 School of Public Health

July 15–July 19, 1968

Monday a.m.

Registration and Greetings
 Mr. Harper, UNC
 Dr. Ben Barker, UNC

Epidemiology of Dental Caries:
 Dr. John T. Fulton, UNC

Measuring Dental Caries:
 Dr. John T. Hughes, UNC

Monday p.m.

Water Fluoridation: Community,
 School, Home
 Dr. Frank Law, UNC

Water Fluoridation: Engineering
 Mr. Franz J. Maier, USPHS

Tuesday a.m.

Diet and Dental Caries

Dr. Robert M. Stephan, NIH

Topical Fluorides:

Dr. John K. Peterson,
Health Dept, SD

Wednesday a.m.

Panel: Course Faculty

Thursday a.m.

Application of Indices

Dr John T. Hughes, UNC

Friday a.m.

Course Summary and Evaluation

Drs. Fulton, Hughes, Law

Tuesday p.m.

Fluoride Uptake by Enamel

Dr. Harold R. Englander, NIH

Newer Concepts in the Etiology of
Dental Caries

Dr. Paul H. Keyes, NIH

Wednesday p.m.

Motivation in Preventive Dentistry

Mr. Richard J. Cassidy, Decision
Research Corp

Thursday p.m.

Control of Dental Caries

Dr. Theodore R. Oldenburg, UNC

North Carolina Dental Public Health Residency Program

A Long-Standing Collaboration

This chapter reviews the development of dental specialties with a focus on dental public health. The development of DPH as a specialty of dentistry was never straightforward or easy, especially the events that led to accredited residency programs in DPH and North Carolina's position as one of the first training programs in the nation. Key milestones in the development of DPH are the formulation of a formal definition, establishment of guidelines for training programs, and the development of a structure for their accreditation. Finally, the initial development and evolution of the North Carolina DPH residency program is reviewed in the context of national developments. Residents in the North Carolina program have made important contributions to the advancement of DPH. This chapter emphasizes some of those contributions made during their training, primarily through the major project required of all residents. A timeline for major national and local events related to the development of the dental public health specialty is presented in Appendix 5.1.

Development of Dental Specialties

Several pathways were available to dentists to become specialists during the first half of the twentieth century. They could complete graduate training in an area of dentistry or complete some other form of training like a preceptorship or continuing education. Self-study and skill-development activities were another pathway that could be taken. Specialty licensure became available in a few states. Specialty boards also came into existence and provided some oversight. Two specialty boards (orthodontics and periodontics) were incorporated before a means for official recognition of specialties became available. By the 1940s, some oversight of specialty recognition was desired by dentistry.

In 1948, the American Board of Oral Surgery requested that the ADA approve requirements for specialty activities and boards. With no established policies applicable to recognition of any board, the Association in turn requested that the Council on Dental Education of the ADA develop a set of basic requirements. In 1947, the House of Delegates approved a set of requirements prepared by the council. The American Board of Oral Surgery met these requirements and was approved by the house at that

meeting as the first specialty in dentistry. Other groups applied and by the close of the ADA annual session in 1951, approval had been granted to seven specialties. Dental Public Health was the last of the first seven specialties, being approved in 1951. In the short span of about five years, seven specialty groups and their certifying boards had obtained specialty status recognition (Hollingshead 1961). Only three additional specialties would be approved in the next six decades. Endodontics was approved by the ADA House of Delegates in 1963, radiology in 1979, and anesthesiology in 2019, making it the tenth ADA-recognized specialty.

In 1959, the ADA House of Delegates passed a resolution requiring specialists to have completed two or more years of advanced education beyond the dental degree to be eligible for certification. An amendment passed in November 1965 was more specific and added urgency to the need for accredited residency programs in dental public health. This requirement proved to be a challenge for dental public-health educators to meet for the next several years, because the most common academic program for dentists wishing to acquire specialty status in dental public health was an MPH degree from a school of public health. These degrees were only one year in length and were accredited by the Council on Education in Public Health (Committee of Professional Development of the American Public Health Association at the time), not the American Dental Association. No mechanism was in place to accredit residency programs, which were mostly located in local, state, or federal public-health agencies with informal supervision, structure, and oversight.

Emerging Definition of Dental Public Health

A specialty requires clear boundaries to guide education, workforce development, and practice. The definition of dental public health evolved to meet practical needs and has never been given a great deal of conceptual thought or scholarly discussion. Rather, the boundaries have been defined more by experiences gained through the practice of dental public health, which was slowly developing as a discipline in the 1930s and 1940s. Observations about how the practice of dental public health differed from other areas of dental practice were key to the distinction of dental public health as a specialty. The definition describes the functions of a public health dentist in the broadest of terms. Dentists found themselves in positions that required new knowledge, skills, and competencies not learned in dental school to provide services that would address public-health needs. Federal legislation and related dental policies and programs, and some forward-thinking dentists, particularly at the federal level, led the way in the development of services and programs now considered to be under the dental public health umbrella. These events molded the definition of dental public health.

Because dental public health is part of public health, it is understandable that early attempts to define dental public health relied heavily on the definitions of public health in general. Perhaps the most often quoted definition is the one by Winslow (1920): "the science and art of preventing disease, prolonging life and promoting human health through organized efforts and informed choices of society, organizations, public and private, communities and individuals." In an early version of his book, James Dunning similarly defined public health as "the art and science of preventing disease, prolonging life, and promoting physical and mental efficiency through organized community effort" (Dunning 1970, 4).

At the fifth meeting of the American Board of Dental Public Health held on February 4–5, 1952, the board approved the following definition to be included in its Bulletin: "Dental public health is defined as the science and art of preventing and controlling dental health through organized community efforts. This definition is based on three basic areas of careers in dentistry; Dental Public Health, Research, and clinical Dentistry. Each of these areas of careers may include practice, teaching, or administration. For the purposes of the Board, the term community is used in a constricted sense and relates to the people at a particular region who have a common organization of interests and live in the same place under the same laws" (Easlick 1974, 19).

This definition can be attributed generally to the original members the board: Philip E. Blackerby, William A. Jordan, Walter J. Pelton, Robert A. Downs and John W. Knutson. But the original draft was likely provided by Drs. Knutson and Pelton, who were assigned the task of drafting a definition at the fourth meeting of the board, in October 1951. Dr. Knutson is also credited with drafting the definition of "dental public health" that appeared in the second edition of *Dentistry in Public Health*, published in 1955, in which the steps of clinical practice are compared to the steps in public health practice (Knutson 1955). He summarized the analogy between patient care and community care as follows:

<u>Patient</u>	<u>Community</u>
1. Examination	1. Survey
2. Diagnosis	2. Analysis
3. Treatment planning	3. Program planning
4. Treatment	4. Program operations
5. Payment for services	5. Finance
6. Evaluation	6. Appraisal

This analogy would remain an enduring one that would be used for years in its original form or as modified to provide an answer to the difficult-to-answer question "What is dental public health?" Figure 9 provides one modification used in DPH

courses at UNC that broadens the comparison beyond patient and community care to include research and formation of public policy. The underlying structure for these decision-making processes are the generic activities in the scientific method: identify issues; generate solutions; act and evaluate.

The ABDPH used the definition approved in 1952 with only one change for more than sixty-five years. The initial definition focused on types of career roles for specialists and used a narrow definition of the community. A revision with minor word changes and a clarifying paragraph on roles was approved by the ADA House of Delegates in 1976 and remains the official definition some four decades later. It reads:

Dental Public Health is the science and art of preventing and controlling dental diseases and promoting dental health through organized community efforts. It is that form of dental practice which serves the community as a patient rather than the individual.

The added clarifying paragraph reads:

It is concerned with the dental health education of the public, with applied dental research, and with the administration of group dental care programs as well as the prevention and control of dental diseases on a community basis. (Weintraub and Rozier 2016)

The definition was approved by the American Academy of Pediatric Dentistry (AAPD), the Oral Health Section of the American Public Health Association (APHA), and the ADA. It appears to have been accepted by the early 1960s. A definition proposed by attendees at the fifth workshop at the University of Michigan held in 1961 reads as follows:

Dental public health is that form of dental practice which serves the community as a patient, rather than the individual, by preventing and controlling dental diseases and promoting dental health through communal effort. The practice of dental public health is concerned primarily with the dental-health education of the public, with applied dental research, and the prevention and control of dental diseases on a community-wide basis. (As defined by the ABDPH) (Weintraub and Rozier 2016)

A major step in defining the specialty was the development of competencies, initially referred to as “behavioral objectives.” These competencies, first articulated at the Boone workshop in 1974, evolved over time.

Development of the American Board of Dental Public Health (ABDPH)

The American Board of Dental Public Health (ABDPH) was central to the development of the dental public health specialty. It was founded in July 1950 at the request of

the American Association of Public Health Dentistry (AAPHD) and Dental Health Section of the APHA after the results of a survey of the membership of the two organizations supported such action. Both organizations were sponsors of the board. Members of the Dental Health Section were very visible and active in dental public health in the 1940s and 1950s. Dentistry was encouraged to peruse formation of a formal specialty in dental public health when the American Medical Association responded positively to the recommendation of physicians in the APHA to establish a Board of Preventive Medicine and Public Health.

The ABDPH was incorporated under the laws of the State of Colorado as a not-for-profit corporation with diplomates as corporate members. The articles of incorporation stated that the purpose of the board was “To protect and improve the public health, by the study and creation of standards for the practice of dental public health in all the aspects and relationships and to grant and issue to dully licensed dentist certificates of special knowledge and ability in preventive dentistry and dental public health” (Easlick 1974, 5).

The ABDPH was organized in accordance with the *Requirements for Approval of Examining Boards in Dental Specialties* of the American Dental Association’s Council on Dental Education and Licensure. Dental public health was recognized formally as a dental specialty by the American Dental Association in October 1950. Subsequently, the ABDPH was officially designated as the national examining and certifying agency for the specialty by the House of Delegates of the ADA in October 1951. It was recertified in 1986, 2001, and 2012. The first examination administered by the Board was in 1952, with twelve candidates of whom nine successfully passed and became diplomates.

Dual sponsorship of the specialty by the AAPHD and the APHA ended in 1972, primarily because this structure became cumbersome. Sponsorship continued with the AAPHD. The working relationship with the American Dental Association was stronger for the AAPHD than for the Dental Health Section of the APHA, and unfortunately, dental public health was considered by many to be primarily a specialty of dentistry, not public health.

Differences between Dental Public Health and the Other Specialties

From the beginning, the DPH specialty differed from the other seven specialties in several major ways. It was and continues to be primarily a nonclinical specialty, with public health dentists holding a variety of positions in which dental programs are developed and administered. Dental public health specialists generally do not provide individual patient care, rather they work to improve oral health through public policy and the design, implementation, and evaluation of oral health programs.

Other specialties had single sponsorship. Further, the Dental Health Section of the APHA, a major public health organization in the United States, had an increasing

number of members at this time who were dental hygienists. Leadership in dentistry feared that this arrangement could lead to unfavorable external influences on ADA policy and dental practice.

As already mentioned, and most importantly, the requirements to become educationally qualified to take the ABDPH examination differed from other specialties and in practice did not adhere entirely to specialty guidelines formulated by the ADA. The requirement for certification filed with the initial application for incorporation of the board listed among its requirements the following:

Successful completion of at least one academic year of graduate study leading to the degree of Master of Public Health or an equivalent degree or diploma from an institution accredited for this purpose by the American Public Health Association. . . .

Accredited field training of at least one year in public health practice under competent direction which included planned instruction, observation, and active participation in a comprehensive, organized public health program placing emphasis on dental health, or equivalent training and experience. (ABDPH 1951)

Approved residency programs were not available in the 1950s and most of the 1960s, nor was there a mechanism to obtain accreditation by any organization. Dentists typically would get an MPH degree from a school of public health and then go to work in a non-accredited public health position. An example, perhaps atypical, is the experience of Viron L. Diefenbach (1997), retired Assistance Surgeon General (USPHS) and Dean Emeritus of the School of Public Health at the University of Illinois at Chicago. He described his two-year experience after one year of academic training as a PHS officer assigned to the Regional Office of the Federal Security Agency in Kansas City in 1951 under Dr. George A. Nevitt, later to become well-known for his skills as a mentor in the USPHS. Diefenbach learned about the organization of the health department at the state and local levels, program planning, administration and evaluation of programs and personnel performance. According to Diefenbach, field studies on the association of fluoride and dental caries

required extensive reading of the literature, comprehension of previous dental research; conceptualization of research design; learning dental public health indices and examination techniques; planning and organization of resources; and public relations with news media, state and local health departments, dental societies, and public-school authorities. Processing the data, applying statistics and preparing the reports for publication followed along with presenting the findings at public and professional meetings. . . . All these activities contributed to my learning specialized skills for the practice of dental public health. Along the way I learned many lessons about protocol, health policies, legal constraints, and the politics of health affairs. (Diefenbach 1997)

The ABDPH looked for this type of training in applications for the board examination, but often found it necessary to waive the second year of required training because so few candidates had this type of experience. Making approved field experiences available and improving residents' practical experiences were constant themes for the board over its first two decades of existence. In the fourth meeting in the second year of the board, in 1951, the need for accredited centers to provide practical experiences for personnel in dental public health was discussed. It was agreed that among the board's first activities should be those directed toward the solution of this problem.

The lack of approved residency programs became particularly acute in 1961, when the ADA House of Delegates established that the basic educational preparation for all specialties required a minimum of two academic years of graduate study beyond the dental degree.

In the fall of 1964, the ADA invited all dental schools and directors of postgraduate training facilities to list any postgraduate certificate programs designed primarily for the educational preparation of dental specialists. This represented an initial effort by the Council on Dental Education to recognize and accredit postgraduate, specialty-oriented educational programs in dentistry. It provided a more focused list than the list of graduate-degree-granting programs maintained by the ADA at the time. This preliminary accreditation was to be based on a "paper review" followed by a site visit by appropriate representatives of the Council on Dental Education as soon as possible.

In a letter from Polly Ayers, president of the ABDPH, to Dr. Kenneth E. Wessels, Secretary, Council on Dental education, ADA, on Dec 3, 1964, the board in an urgent request asked the Counsel of Dental Education to develop a mechanism for accrediting dental public health residencies. The letter listed residencies that likely met the board's criteria: PHS Dental Health Center; Kentucky State Health Department; California State Health Department; Colorado Department of Public Health; State of New Jersey Department of Public Health; Tennessee State Department of Public Health; University of Michigan; and the University of North Carolina/State Health Department.

The 1960 American Dental Directory, published by the ADA, reported that there were 3,916 dental specialists in the United States or 3.8 percent of the 103,581 dentists listed. It listed 30 public health dentists.

Public Health Service's Dental Health Center Leads Development of a National Program

For the first decade or so after the ABDPH was established (from 1952, when the first examination, was given to 1961), there was no formal approval process for field experiences external to the specialty as we know it today. At the same time, there was

increasing pressure to develop training programs that could meet the national needs for training in dental public health. Toward the early 1960s, the most pressing issue was that dentists who completed a one-year MPH degree were not able to meet the educational requirements of the ABDPH because of the lack of residency programs. Federal leadership stepped in to help address the problem through the development of a national DPH residency program.

In 1960, Assistant Surgeon General Donald Galagan had become the first chief of the Division of Dental Public Health and Resources, a new federal agency created from the merger of divisions not under the purview of the National Institute of Dental Research (Snyder 1994). He was a member of the ABDPH at the time and became board president in 1962. In 1961 the division opened an applied research facility in San Francisco, the Dental Health Center, under the direction of another key decision-maker in the establishment of a national dental-public-health residency program, Dr. George Nevitt, widely recognized as the “father” of dental public health training of PHS officers (Diefenbach 1997).

The Dental Health Center seemed to be an ideal agency to take on the responsibility of developing a national DPH residency program that would meet training needs for the specialty. It not only fit with the mission of the center but also the larger mission of public service held by the U.S. Congress in the 1960s. Legislators were interested in programs that would help solve social problems like poverty, childcare, and access to care.

The San Francisco Dental Health Center mission and activities included epidemiological studies of oral diseases and conditions and applied research in educational methods. The Training Branch provided experiences for public health dentists, private practitioners, and dental school faculty. Development of a DPH residency program fit with the center’s established educational program, the expertise of its professional staff, and its organizational relationships.

According to an article in the *Spotlight* published by the Information Office of the Division of Dental Public Health and Health Resources, the overall goal of the dental public health residency program was to “develop training programs to accommodate 20 residents annually and to evaluate the content, operation, and education merit of each residency” (Division of Dental Health 1968). Selected health agencies throughout the nation were designated as training sites after review and approval by staff from the Dental Health Center. Plans included transfer of responsibilities for the residency programs to nonfederal agencies at the appropriate time.

Dr. Robert L. Weiss, chief of the Training Branch, was named program director for the residency program (USPHS 1963). Planning for the program began in 1962, and the first cohort of five residents was admitted to the program in the summer of 1963. Four were assigned to the New Jersey, California, Colorado, and Kentucky state health departments. The fifth was assigned to the U.S. Army Dental Center. The San

Francisco Dental Health Center became the umbrella organization for setting requirements, certifying training sites, and monitoring of activities at approved sites. Initially, on-site training lasting three months was provided as part of the training, a requirement that was later shortened. They set the structure of programs for years to come. Vestiges of the program structure remain more than sixty years later, and the process of individual residency plans, activities to meet specified competencies, monthly reports, completion of a significant project and observation of key federal agencies became the prototype structure for residencies accreditation standards today. The informational brochure entitled “Residency Training in Dental Public Health” provides an extensive list of training experiences available for residents (USPHS 1963).

In 1966, Viron Diefenbach, who succeeded Dr. Galagan as the director of the Division of Dental Public Health and Health Resources, notified the ABDPH that the Center was discontinuing the program. He reported, “It does not appear to be a sound function of the Division of Dental Health to continue any longer at the Dental Health Center an umbrella for the program of residencies inasmuch as all of the original objectives of the program have been accomplished and the specialty should be able to stand on its own feet.” An article in *Spotlight* on Dental Health published by the Division of Dental Public Health in 1968 reported that the program had been successfully completed and that the training responsibilities had been transferred to independent participating agencies (Division of Dental Health 1968).

The proceedings of the dental public health resident conference of 1967 stated that the Dental Health Center should “be commended for its important role and outstanding record of accomplishment in promoting and assisting in the development of residency programs, and that it be encouraged to continue active leadership, coordination and assistance to residency training activities” (Continuing Education Branch 1967, 12).

The Dental Health Center continued to train Federal dental officers, having six PHS officers in training in 1967. By 1967, three agencies (one federal, one university, one state health department) had received full accreditation. In addition, nine state or local health departments and one university had received preliminary provisional accreditation from the ADA. A total of thirty-two dentists had completed DPH residency training. An estimated thirty residency positions were available nationwide in 1968. The Dental Health Center provided an obvious boost to dental public health training in the United States.

Over the years, there has been an obvious shift of DPH specialty training from state and local agencies to academic institutions. As of January 2020, fourteen accredited programs were listed on the AAPHD website, only two of which were local in state public health programs. Of the remaining twelve, two were part of federal programs and ten, part of academic institutions. New York and North Carolina are the only two state residency programs remaining from the original nine health departments.

A largely behind-the-scenes debate about the appropriate training for specialists in dental public health flares up occasionally among various small groups of interested parties. Training has evolved from a mostly practice-based setting with competencies emphasizing policy-making and service delivery to one with more emphasis on research. In the formative years of the specialty, discussion centered around DPH competencies and the availability of a dentist on faculties of schools of public health. Lester Block (1975) recommended that each school training dentists have a least one dentist on the faculty. A conference organized by the Dental Health Center held in 1967 concluded that “a diplomate of the American Board of Dental Public Health is needed full time on the faculty of every school of public health which accepts dentists as students” (Continuing Education Branch 1967, 7).

Beginnings of the North Carolina Dental Public Health Residency Program

The N.C. State Health Department was chosen as a training site for the third cohort (1965–66) of Dental Health Center residents and thus marks the beginning of the DPH residency program in North Carolina. In a May 11, 1965, in a letter to Robert Hansen, the chief of the Dental Public Health Training Section, requesting that NC be considered for an approved residency training site, Alex Pearson wrote, “We recognize a definite need for specialized training on the graduate level for public health dentists. . . . We believe there are ample opportunities and competencies available within this state which could be utilized to provide broad field experiences for a public health dentist. Thus, we believe that North Carolina could provide a site for residency training” (Robert Hansen, personal communication).

The letter transmitted a document entitled *Residency Training Program of the Division of Dental Health, North Carolina State Board of Health*, which outlined the general areas in which special training and experience could be offered in North Carolina. The initial training objectives of the program were: (1) to supplement the formal academic preparation of the graduate student through supervised field experiences; (2) to increase the competence of the trainee in performing the functions of a public health dentist in: assessing community dental needs; and planning, conducting, and evaluating public health dental programs; (3) [to become] an effective member of the public health team; and (4) to contribute to the knowledge and advancement of the dental profession in providing service to the public.

The site was approved with Dr. John Hughes, Professor of Health Administration at the UNC-CH School of Public Health, as director of the residency program and Dr. Alex Pearson, state dental director, serving as the program’s codirector. The unique collaboration between the training program in the state health department and UNC-CH was established at the beginning and proved to be a strong, productive and enduring one.

Dr. Richard Murphy was a member of the third cohort (1965–66) of the San Francisco Dental Health Center residency program and was assigned to the N.C. State Health Department, becoming the first resident in what would become the North Carolina DPH residency program. According to an oral history conducted by Dr. Daniel Shingleton the day before Dr. Murphy’s retirement from state government in 1992, Murphy was from Philippe, a small coal mining town in the middle of West Virginia. He attended West Virginia University for two years and then the University of Maryland’s School of Dentistry, graduating in 1960. After graduation, he volunteered for the U.S. Air Force and was stationed in Amarillo, Texas, for two years. He began his public health career when he went to work for the North Carolina State Board of Health and was assigned to Shelby in Cleveland County. After two years, he enrolled in the MPH degree program at UNC in 1964 with support from a PHS traineeship and then enrolled in the USPHS residency program assigned to the North Carolina dental program established the following year. After one year, he replaced Dr. Dudley as field supervisor (1966–1970) for about two dozen dentists. He moved to Oklahoma City in the fall of 1970 and returned to a position in Greenville, North Carolina, after the state health department reorganized and created four regions in 1974 where he remained until his retirement in 1992.

In August 1965, Dr. Fulton sought approval of a residency program in dental public health at UNC. Application forms dated August 14, 1965, identify the School of Public Health as the program institution. Faculty include, in addition to Dr. Fulton, Charles M. Cameron, Professor and Chair of Health Administration; Roy R. Kuebler, Professor of Biostatistics; and Grover C. Hunter, Professor of Periodontology. Basic courses proposed for the program include: Epidemiology 261 (Dental Epidemiology); Epidemiology 300 (Population Research Methods); a Public Health Administration course entitled “Advanced Study of Administration of Public Health Programs”; Biostatistics 130 (Probability and Statistics); and Oral Pathology 263 (Histopathology); Public Health 140 (Special Problems in Dental Public Health). Proposed training in the latter course included experiences in program administration; preventive, diagnostic and corrective services; program development and consultation services; and special projects.

It is not clear what became of this application from the School of Public Health, but apparently plans were never implemented. No records were found of any residents ever having been enrolled in a UNC program although the application does state that two dentists had completed similar programs in the past year.

Development of the NC Dental Public Health Residency as an Independent Program

The North Carolina State Health Department and the University of North Carolina chose to continue the North Carolina DPH residency program with the original

organizational structure established in collaboration with the Dental Health Center in San Francisco. The state-university partnership continued with Hughes as director and Pearson as codirector. Initial accreditation status of “preliminary provisional approval” for the residency program was obtained in May 1967 as a satellite site for the Dental Health Center program. It was accomplished by completion of a paper survey in October 1964 from the Council on Dental Education. It sought information on existing specialty residency programs, the first step after the ADA House of Delegates approved accreditation standards for the evaluation of postgraduate education programs in 1962.

At that time, three agencies had received full accreditation (USPHS, Harvard’s School of Dental Medicine, and the Minnesota Department of Health) and eleven had received preliminary provisional accreditation. Nationally, a total of thirty-two dentists had completed DPH residency training in these programs.

About the same time as Dr. Fulton was applying for recognition from the Council on Dental Education, the state was negotiating with the Dental Health Center to become a training site. It is understandable how parallel efforts could evolve in the initial stages of development of a North Carolina residency program for a state in which residency training would, over the next fifty years, remain so entrenched in the state health department. Leadership for the DPH program was shifting from Dr. Fulton, whose appointment was in the Department of Epidemiology, because of his pending retirement and the hiring of John Hughes, whose primary appointment was in Health Administration. The accreditation process itself was evolving, and some confusion about the process seemed to exist in the initial stages of development of the process. Finally, federal traineeships had just been extended to medical and dental residency programs, and only academic institutions qualified for these funds. This distinction would become an issue in future funding.

On March 8, 1968, the North Carolina Dental Health Division submitted an initial description of the program and application with John Hughes as program director as part of the accreditation process. In 1968, Dr. Wesley Young from the University of Alabama led an accreditation site visit for Council on Dental Education and recommended approval. The council granted “approval” status in December 1968 (Young 1968).

By 1965, when North Carolina became a residency training site for the Dental Health Center, only five state health departments had been approved by the Dental Health Center process for training—North Carolina, Kentucky, California, Colorado, and New Jersey. These were followed soon by planning or implementation of programs in Georgia, Jefferson County (Alabama), Philadelphia, Minnesota, Harvard, University of Michigan, New York, Illinois, Pennsylvania, and the Indian Health Service. The New Jersey program claimed to be the first residency to be supported by the state funds, enrolling residents as early as 1963 (USPHS 1967). Not all of these pro-

grams subsequently sought accreditation from the ADA independent of the accreditation granted to the Dental Health Center, as North Carolina's did. North Carolina appears to have been the fifth state health department to experiment with a DPH residency program and along with New York, likely to be one of the two or three longest-running programs in state health departments accredited by the ADA and the Council on Dental Education. Accreditation was interpreted only once in its fifty-year history. In May 1979, commission accreditation was discontinued at the request of the Dental Health Division because of a lack of financial resources, but training was reestablished in the next year.

Goals of North Carolina's Dental Public Health Residency Program

The overall goal of the residency program is to train dentists who are qualified to practice dental public health within an array of public health settings, with contributions of graduates to improvements in the public's oral health being the goal. Current objectives are to produce dentists who have the competencies required of a specialist in DPH as outlined in the current version of Dental Public Health Competencies. Initially, the curriculum included activities in areas recommended by the Dental Health Center. These were heavily weighted toward activities in DPH practice, particularly state health departments.

Now, graduates are expected to have content knowledge of general public-health principles and specific areas of DPH, including health policy and management, prevention of oral diseases and promotion of oral health, the delivery of oral health services, and scientific knowledge which forms the basis of the practice of public health dentistry. In addition, they should be competent in DPH practice, that is, have the ability to plan and run community-based public-health programs, advocate for disadvantaged groups and other worthwhile policies affecting the public's health, and be able to contribute to the scientific basis of public-health practice through the conduct of applied public-health research, all while adhering to the DPH code of ethics and respecting cultural diversity.

The program was founded on two major principles: (1) strong collaboration between practice and academics, and (2) it is best if not necessary that knowledge, skills, and competencies be developed in a public health setting such as the state health department, where the resident can experience DPH practice every day. In this regard, the DPH residency year following the MPH degree is equivalent to clinical experiences that are a key component of clinical residency programs in dentistry. Because the residency is based in the state health department, the expectation is that it provides training primarily for those dentists who wish to make a career in public health administration and policy-making, whether at the federal, state, or local level.

In its initial years, the residency program served an important role in developing the DPH workforce to support the expanding oral health programs in North Carolina. Among the first seven residents, five went on to serve the state and its citizens for a combined total of nearly 150 years. Although this goal has continued to be strongly supported by those involved in the program, its mission was expanded in the 1980s to train dentists in the U.S. military and in the USPHS in population-based oral health strategies. In the 2000s, educational qualifications for the residency program were changed to allow more international dentists to qualify in recognition of the increasing presence of global considerations in public health dentistry.

Expansion of Program Goals

United States Army

In the early 1980s an informal agreement was established between Dr. John T. Hughes of the UNC-CH School of Public Health and the U.S. Army to train dentists for leadership positions in dental public health. This agreement was part of the army's strategic plan to train dentists in preventive dentistry that had been in place since 1960, when the Army Dental Corps initiated a major preventive dentistry program (Bernier 1965; Bernier and Sumnicht 1966).

General Joseph L. Bernier, Chief of the Dental Division and Assistant Surgeon General for the U.S. Army Dental Services from 1960 to 1967, is credited with initiating this army-wide preventive dentistry program. As an aside, he also is known for his contributions to the preventive dentistry movement in private practice, as well as helping to form the American Academy of Oral Pathology and the oral pathology specialty.

The army preventive dentistry initiative sought to change the philosophy and culture of patient care. Now, it seems like standard care, but at the time his ideas about dental care were novel. Historically, people entering the military were at high risk for dental disease and had an enormous amount of untreated disease. The consequences were reported in Chandler (1990): "Dental and oral disease is universal and is the most common disease of man. Whereas, in civilian life poor oral health may only cause discomfort and pain, in the military environment a simple toothache can incapacitate a combat soldier as effectively as a combat wound."

The army's dental workforce was ill-equipped to meet the needs of soldiers. The professional education of dentists entering the army focused mostly on dental disease and its repair, not on oral health and preventive dentistry. In many instances, soldiers were faced with time-consuming demands during training, had assignments that made dental visits difficult to schedule, or had supervisors who did not fully support time away from duties needed for dental care. Other soldiers were serving for months at a time in locations without access to army dental clinics. Many patients

were not motivated to take care of their oral health, which not only led to a lot of disease but minimal investment of time in care of the mouth. For these and other reasons, a “treatment” philosophy prevailed in the Dental Corps, often-times in a culture of hopelessness on the part of line dentists.

Bernier sought to change this philosophy. He called for the use of modern preventive dentistry techniques and a precise order of applying prevention and treatment procedures, coupled with a continuous program of patient instruction that promoted patient self-care during the periods between dental visits. All soldiers were to have a “preventive” treatment plan that was to be attended to before all nonemergency treatment was completed. Most of the accounts of the program focus on clinical services, but there was full acknowledgment that oral health is affected as much if not more so by what would later come to be called “social determinants” as by individual behaviors. Thus, post-wide, community interventions were considered, mostly public education in schools, the media, and the like.

Bernier described this approach in a 1964 Preventive Dentistry Conference held in Washington, D.C., as follows:

It implies a primary concern for the patient, rather than his disease, and considers all significant factors that affect his oral health. It demands the application of preventive measures to total individuals and the employment of all useful means for the early detection of disease. More important is the implication that comprehensive dentistry also recognizes the importance of understanding the many factors that influence the relationship between the dentist and patient and the communication that takes place between them. (Bernier 1965)

A tiered organizational structure was developed for the initiative to be supported by a plan of professional education that would provide the workforce needed for implementation across the army. Dentists with postgraduate education leading to a doctoral degree in preventive dentistry or to certification by the American Board of Dental Public Health were assigned to higher headquarters as field directors of the program, as directors of basic and clinical research efforts, or to teaching positions. Officers with one-year MPH degrees were given responsibility for preventive dentistry activities at large army posts. Other dentists who participated in one-week short courses in preventive dentistry offered at the United States Army’s Institute of Dental Research were appointed as preventive dentistry officers at their installations. They were responsible for, among other things, preventive dentistry education at their installations.

Several dentists were trained in preventive dentistry at Indiana University and others in public health at the University of Michigan during the initial years of the initiative. John King was the first of ten dentists to be trained at UNC-CH under these arrangements beginning in 1980. They came to be known as “Rozier’s Rangers.” In 2010, Dr. Rozier was recognized for his global public health support of the mission

of the Tri-Service Center for Oral Health Studies (TSCOHS) (U.S. Army, Air Force, Navy and Marine Corps). The award read, in part, “Your un-sparing consultation with staff of TSCOHS and the Graduate Dental Education in Public Health Dentistry of DoD personnel has impacted the oral health of millions of service members and importantly the readiness of our fighting force to defend our nation. Your contribution is indeed of strategic importance. Through the good work of UNC students and North Carolina Dental Public Health Residents who you have educated and trained, you have influenced policy and practice, prevention and promotion, resource management and many programs in the Department of Defense.”

King became a spokesman for dental public health and the population approach to public health.

Experimentation with the “Twenty-Four-Month” Residency Option

The opportunity for taking second-level graduate courses in public health generally is not available in the two-year program consisting of the one-year MPH degree and one-year residency programs, or the so-called “twelve-month, twelve-month option.” Candidates’ experiences in DPH or requirements of future employment create the need among some candidates for educational experiences in specialized areas of DPH such as research design, economics, management, epidemiology, or the behavioral sciences. A track leading to ABDPH eligibility was created in the residency program in the mid-1980s to provide for both upper-level didactic instruction and field application of DPH principles through a “twenty-four-month” didactic program combining the Masters of Science in Public Health (MSPH) degree in the Department of Health Policy and Administration, UNC School of Public Health, with the residency program in the Division of Dental Health.

In the “twenty-four-month” option, students could take several didactic courses at the UNC School of Public Health while enrolled concurrently in the residency program in the state health department. The first nine months of the program were spent in course work at the School of Public Health, followed by a full-time, three-month residency internship in the state health department. The residents concurrently enrolled in courses in the School of Public Health and the residency for months thirteen to twenty-one. The final three months were devoted entirely to residency activities in the state health department. Nine credit hours of the forty-eight hours required for the MSPH degree are DPH courses. The courses in dental public health, the six months of full-time training in the Division of Dental Health in the two summers, and the MSPH paper devoted to a DPH issue together amount to about 50 percent of the curriculum time, or twelve months devoted to residency activities required for Council on Education for Public Health (CEPH) accreditation.

Few schools of public health have DPH expertise on the faculty or are linked to academic departments that do. The list of accredited residency programs as of January 2019 does not include a school of public health in the addresses. In the “twelve-twelve” option, the residency director must ensure that the resident has received necessary exposure in the MPH degree according to CEPH guidelines, and if not, that training is to be provided in the residency. These arrangements place a heavy burden on residency programs that must ensure that all required knowledge, skills, and competencies are acquired by the end of the residency.

The twenty-four-month option has some advantages over the traditional model, especially related to the continuity of the two traditionally separately administered programs. Nevertheless, this option was never fully implemented. The major disadvantage is that the applicant must make a two-year commitment from the beginning.

National Health Service Corps

In the mid-1980s, the North Carolina residency program was expanded under a partnership with the USPHS to train dentists in the National Health Service Corps (NHSC). NHSC dentists without an MPH were enrolled in the Department of Maternal and Child Health and core DPH curriculum at the UNC School of Public Health for the first of two years and the regular on-site residency program in the North Carolina state health department for a second year. NHSC dentists who already had an MPH degree were enrolled in the North Carolina residency program but assigned for two years to an off-site location in the South Carolina health department under the day-to-day supervision of John P. Daniel, DMD, MMS, state dental director. Here the resident conducted resident-related activities half-time and work-related activities the other half of the time.

Assistant surgeon general Edward D. Martin described the goals of the Bureau of Health Care Delivery and Assistance (BHCDA)–sponsored, off-site state health agency activity for dentists in a memorandum to Health Administrators in Regions IV (Atlanta, Georgia) and VI (Dallas, Texas) as follows:

... to provide an opportunity for a select group of career-oriented PHS commissioned officers to receive wide exposure to the operation of dental programs at the state level. Particular emphasis will be placed on the integration of dental activities and services into state/FHCDA programs operated as part of the MCH Service Block Grant, the NHSC, Community Health Center, Migrant Health center and the Head Start programs. This program is perceived as a component of the Bureau’s career development strategy. Skills and experiences obtained during the program will enhance the officers’ usefulness to the BHCDA and the PHS, and prepare the officers for additional leadership responsibilities. (Rozier archives)

The initiative also provided benefits to the participating state. The assignment of NHSC dentists to a state would assist the state in its efforts to build public health capacity in dental health, with particular emphasis being placed on integration of oral health activities into state/BHCDA programs operated as part of the Maternal and Child Health Services Block Grant and other BHCDA programs.

Criteria that the PHS considered in selecting the participating states included: (1) the perceived dental health needs of the state in relation to the potential for improvement of the state's dental capacity as a result of the assignment; (2) the interest expressed by the state's current dental program personnel regarding participation in the program; (3) the potential for coordinating dental health activities of the state's dental unit with the state's MCH activities; and (4) the geographic proximity of the state to the available university residency programs. States originally considered were Kentucky, Arkansas, Mississippi, Oklahoma, and South Carolina, with South Carolina ultimately being the only state that identified eligible NHSC dentists.

Dentists placed with the state health department in South Carolina essentially acted as a deputy state dental director because of the small program, which included a budget of approximately \$650,000 and fourteen professionals. As deputy director, the resident was able to broaden his or her DPH background by participating in the management of oral health programs at the state level. Because South Carolina has much less manpower and resources available for dental public health than North Carolina or other neighboring states do, residents could appreciate that their services were truly needed.

The memorandum of agreement between the PHS NHSC, the N.C. state health department, the S.C. state health department, and UNC's School of Public Health was signed in late Spring of 1986. Signatures included Merle McPherson, MD, Acting Director, DNCH, BHCDA; Kenneth P. Moritsugu, MD, MPH, Director, NHSC, BHCDA; Stephen H. King, MD, Regional Health Administrator, Region IV, DHHS; Vince L. Hutchins, MD, Acting Director, BHCDA; Gary Rozier, DDS, MPH, Associated Professor and Residency Director, Department of Health Policy and Administration, UNC School of Public Health; George G. Dudley, DDS, MPH, Chief, Dental Health Section and Residency Administrator, Division of Health Services, NCDHR; and Robert S. Jackson, MD, Commissioner, SCDHEC, CPT. Donald Schneider of the USPHS was instrumental in arranging the program and seeing it implemented.

The first resident was assigned to the South Carolina Health Department in 1985–87 under the supervision of Dr. John Daniel, who had served as the state dental director for South Carolina since the early 1980s. Under his leadership a statewide oral health survey had been conducted in 1982–83, and a statewide oral health plan was developed for 1987–1992. He particularly targeted school-based sealant programs for development and dental practice act changes to make them more efficient (Selwitz et al. 1992).

Demand for Public Health Training from International Students

A substantial increase in the number of inquiries and applications from individuals who were not U.S. citizens and from individuals who received their dental training outside the United States or Canada occurred in the early 2000s. Alongside this trend was a decline in the number of applicants who were U.S. citizens and who had received their training in the United States. Nationally, the outcome of this trend in applications from graduates of foreign dental schools was that the specialty of dental public health was becoming more diverse. More internationally trained dentists were graduating from residency programs outside North Carolina and were successful in becoming diplomates of the American Board of Dental Public Health (Weintraub and Rozier 2016). In North Carolina, these dentists were not eligible for the North Carolina residency program according to longstanding admission requirements.

For the first three decades of the residency program, to be eligible for admission applicants were required to be graduates of a U.S. dental school accredited by the American Dental Association (CODA) or an accredited Canadian dental school (CDAC), and a graduate of an MPH or equivalent degree program accredited by the Council on Education for Public Health (CEPH) of the American Public Health Association. The public health degree had to include coursework in the required five content areas of biostatistics, epidemiology, health care policy and management, environmental health, and behavioral sciences.

Because of the trends in applicants from foreign-trained dentists and the growing recognition of the need for dentists with public health training in the United States and other countries, the long-standing eligibility policy was modified in 2002. In addition to graduates of a school of dentistry accredited by CODA or CDAC, applicants who were graduates of a non-U.S./Canadian dental school deemed equivalent by a credentials evaluation service could be considered for admission. Further, applicants who had satisfactorily completed two or more years of advance education in an area related to the practice of dental public health in an institution outside the United States deemed equivalent by a credential evaluation service could be considered for admission.

A dentist from Argentina (Irene Garbero) was the first of six international residents to be admitted to the program between 2002 and 2016. The countries of origin included Argentina, India, Nigeria, Sudan, Cameroon, and Japan.

Administrative Structure of the NC Residency Program

The major features of the administrative structure of the residency program have remained the same since its beginning, with only three program directors in the first fifty years. The Dental Public Health Residency Program is based in the Oral Health Section, Division of Public Health, N.C. Department of Health and Human Services.



Fig. 8. Advisors and Residents Attend Oral Health Section Executive Committee Meeting.

It is mandated by general Statute 130A-11 of the North Carolina Public Health Laws to maintain public health residencies. The Residency Program Advisory Committee has the official endorsement of, and is appointed by, the State Health Director adding further institutionalization and recognition of the program. The N.C. Division of Public Health has a Memorandum of Understanding with UNC-CH to provide the services of a faculty member as the Dental Public Health Residency Director and core faculty.

The initial structure had John Hughes, who was faculty at UNC, as the program director with overall responsibility for the training, but specific oversight responsibility for the major project and other research activities undertaken by the resident. Alex Pearson, the state dental director, served as day-to-day supervisor for the resident, who was based in the state health department. The structure was initially put in place to meet the requirement that the director be ABDPH certified and to provide continuity between the academic training for the MPH degree when at UNC and the residency. The arrangement also facilitated academic input from faculty expertise at UNC-CH, particularly for the major project. Dr. Hughes remained in this position for eighteen years (1965–83) until his retirement from UNC-CH in 1983.

Dr. Rozier replaced Dr. Hughes as director under the same administrative structure for the residency program and served in that position for thirteen years (1983–96) with Drs. Spratt and King serving as core faculty, day-to-day supervisors, and residency administrators. After Dr. King became certified by the ABDPH, she assumed the position of Residency Director and served in that position for seventeen years

(1996–2013) with Dr. Rozier as codirector, thus maintaining linkages with UNC-CH and primary responsibility and oversight of residency research activities. Upon Dr. King’s retirement in 2013, Dr. Rozier again assumed the position of director until 2015, when he retired from the university, at which point this account leaves off.

This administrative structure functioned well through the years but is highly dependent on the goodwill of many people and agencies and their commitment to specialty training in dental public health. Its primary advantage is that it provides a gateway to university resources while also providing the resident with a day-to-day, inside look at the political, professional, administrative, and scientific issues associated with running a state dental program. It also can provide experiences in developing new programs. The North Carolina DPH program is one of the larger ones in the country, but smaller than most units at UNC-CH. Thus, it seems more likely to provide stability to weather the storm of budget cuts.

Curriculum of North Carolina Dental Public Health Residency Program

The general format of the residency curriculum is recommended and approved by the Council on Dental Education. A residency plan, an advisory committee, regular reporting, and a major project are all required. The initial structure for the residency followed the USPHS Dental Health Center recommendations and evolved alongside the development of DPH knowledge, skills, and competencies needed for the practice of dental public health. There is no “core” curriculum required of residency programs, but rather suggested knowledge, skills, and competencies in certain domains that provide a general guideline for activities. Experiences vary considerably from resident to resident and from residency program to residency program and are shaped by the type of agency that sponsors the residency, its goals, and its programmatic activities. The following idiom is often used to compare residency programs: “If you’ve seen one dental public health residency program you’ve seen one dental public health residency program.”

The variety, quality, and currency of the DPH program is important because the type of activities determines curriculum possibilities. Although the experiences themselves might vary from residency program to residency program, and from resident to resident, major categories of activities have been identified for many years. The distribution of time in the North Carolina program initially followed closely the recommendations of the USPHS Dental Health Center, a requirement for participation in the national program. An individual training plan for each resident generally ensures that experiences are distributed according to major required activities. The distribution of time according to major topical areas for Dr. Murphy, the first resident in 1965, was as follows: 20 percent program administration, 30 percent administration of preventive diagnostic and corrective services, 5 percent development of program outlines and learning skills in consultation, 15 percent dental education and informa-

tion, 5 percent teaching methods and practice, and 25 percent research and special projects (Young, 1968).

A major project occupying 20 to 40 percent of the resident's time has been a valuable educational experience. At the 1967 residency directors' conference in Michigan, there was general agreement that having a resident responsible for a special project has value. In a session at the conference devoted to a description of the thirteen residency programs at the time, Dr. Pearson commented, "North Carolina has the philosophy that residency training is extremely important for the specialty and for the individual resident. Plans and projects are closely tailored to individual interests and needs and may not always involve priority considerations of the Division" (Continuing Education Branch 1967, 31).

However, the details on project emphasis, scope, and selection were viewed differently by meeting participants. Some felt the project should be of a quality that could serve as a case for the American Board of Dental Public Health board exam. Others felt that too much time and emphasis was being given to the project and that not all residents were ready to conduct a project adequate for specialty case examination. Experiences, opinions, and recommendations about this part of the curriculum, which would occupy a substantial portion of the curriculum, continued to vary and have not been fully resolved to this day.

One advantage of the close ties that existed between the University of North Carolina and the practice-based residency was that PhD students at UNC can collaborate with residents on clearly demarcated activities, which can benefit both the DPH resident and the doctoral student. The PhD student can develop skills in consultation and teaching, while the resident is exposed to some aspect of a project that they were not exposed to in their master's degree program, often some aspect of research methods or statistical analysis. An active research agenda in the university and doctoral programs in health services research and epidemiology also provide residents access to ongoing seminars.

Trends in Dental Public Health Practice Affecting the North Carolina Residency Program: 1960s–2000s

The structure of residency programs recommended by the USPHS Dental Health Center based on its experiences with developing programs in the early 1960s, mostly for state health departments, has not changed much over the years. What changes are the experiences themselves, which generally reflect changes in DPH practice, its evolving science base, and the different levels of emphasis on activities that are needed in DPH and thus are given priority. The program activities of organizations that sponsor the residency programs define the curriculum and experiences of the residency. The evolution of the state DPH program in North Carolina between 1918 and the 1990s is described in Table 5.1.

Table 5.1. Timeline for Selected Examples of the Evolution of the N.C. State Dental Public Health Program

<p>1960s and Before: Relief of pain and infection by school dentists was the predominate theme prior to the 1960s. Implementation of water fluoridation that started in NC in 1949 dominated the 1960s. Activities that provided the initial scientific basis for school-based preventive programs were prevalent. Treatment was deemphasized in school programs and prevention activities promoted.</p>
<p>1966 – National fluoridation and NC fluoridation conferences to promote fluoridation</p> <p>1969 – NC Citizens Committee for Dental Health formed</p> <p>1969 – School water fluoridation</p> <p>1969 – NC Citizens Committee for Dental Health established and lobbied successfully for funds from the Legislature to match local funds to buy fluoridation equipment</p>
<p>1970s: Were dominated by the development of school-based preventive dentistry programs with school water fluoridation, classroom education, and fluoride mouthrinse programs implemented by dental hygienists.</p> <p>1970 – NC submitted its Medicaid State Plan to the Health Care Financing Administration in 1969 and received approval that year. NC General Statutes, Chapter 108A implemented Title XIX, beginning the Medicaid Program on January 1, 1970, under the direction of the NC Division of Social Services.</p> <p>1971 – Task Force for Community Preventive Dentistry established by the Dental Society; worked with public health to teach plaque control techniques</p> <p>1972 – Preventive dentistry (plaque control) workshops conducted across the state</p> <p>1972 – First 4 dental hygienists hired by the state dental public health program to implement community-based dental programs</p> <p>1972 – First fluoride mouthrinse program in Robeson County</p> <p>1973 – NC Dental Society, dental public health, allied agencies and institutions launched a 10-year preventive dentistry plan designed to reduce dental diseases by specific percentages using a variety of approaches. Preventive Dentistry Bill passed General Assembly providing support for program.</p> <p>1975 – General Assembly approved a Preventive Dentistry Bill providing for additional dental hygienists</p>
<p>1980s: Continued expansion of the school-based preventive dentistry program with development of surveillance systems and plaque control programs.</p> <p>1980 – Framework for dental education for use by public school teachers published</p> <p>1984 – All dental public health staff trained in use of dental sealants according to guidelines</p> <p>1989 – Fluorosis study in Asheville pediatric dentistry practice</p>

1990s: Entered an era of “redefinition” of dental public health because of concern over excessive fluoride exposures and disparities in disease led to preventive programs targeted toward high risk.

- 1990 – stopped surgical/ restorative care and became 100% preventive
- 1992 – traveling oral health exhibits
- 1994 – discontinued school water fluoridation
- 1994 – 5-part sealant initiative
- 1995 – standardized assessment techniques developed for dental caries
- 1998 – “Seal the State in 98” Community sealant projects in every county
- 1999 – Smart Smiles initiated for low-income preschool children
- 1999 – S-CHIP legislation expands public insurance for low-income children

2000s: Dominated by innovative preschool programs and concern about access to dental care.

- 2000 – “Into the Mouths of Babes” initiated after pilot testing in 1999
- 2002 – discontinued fluoride mouthrinse program
- 2006 – reestablished fluoride mouthrinse programs for high-risk schools
- 2006 – Early Head Start oral health curriculum developed
- 2007 – Carolina Dental Home project implemented screening and referral guidelines for medical offices

Primary Source: N.C. Department of Health and Human Resources. 2020. “History of Dental Public Health in North Carolina / 1856–2010.” Oral Health Section, NCDHHS. <https://publichealth.nc.gov/oralhealth/aboutUs/history.htm>.

Relief of pain and infection was the predominate theme for activities in the Oral Health Section in the years leading up to establishment of the residency program in North Carolina in 1965. Emphasis was placed on screening for dental disease in schoolchildren, provision of some surgical and restorative treatment for dental caries, and referral of students to the private dental-care delivery system that generally was limited in its ability to respond to the demand created by referrals. This era provided limited opportunities for research, although John Hughes provided some descriptive studies of dentists' productivity when he was assistant dental director. Treatment gradually became a smaller and smaller part of the program.

The state DPH program emphasized the promotion of water fluoridation during the 1950s and 1960s. In 1948, Charlotte became the first city to be fluoridated in North Carolina. Numerous pre- and post-fluoridation surveys provided the opportunity to determine the measure's efficacy and to document whether promises that oral health would be improved through its implementation were met.

During the next two decades, a large expansion of public health preventive dental activities occurred in North Carolina, particularity in school-based programs. In 1970, the North Carolina Dental Society, the Dental Division of the N.C. Department of Human Resources, and UNC's Schools of Dentistry and Public Health combined their efforts to develop the North Carolina Preventive Dentistry Program for Children. Early efforts during the 1970s included plaque-control programs, with the first teacher workshop in Rockingham County; hiring of the first four dental hygienists who would work in schools; and the first fluoride mouthrinse program, in Robeson County.

A ten-year plan, known as the "Law Report" because it was written by Frank Law (but heavily edited by James Bawden), was submitted to the North Carolina General Assembly in 1973 (Herget 2009). This history and the thinking behind it would provide a roadmap for public-health activities in the state for several years. Funds provided by the legislature supported expansion of community water fluoridation, school water fluoridation, the fluoride mouthrinse program, teacher-training workshops, workshops for extended nutrition aides, workshops for day-care-center teachers, new research projects and development of new evaluation techniques (Levy et al. 1985). The importance of these events was captured in the following quote from an application to help fund the Preventive Dentistry Program: "The coalescence of the interest of these component groups in the dental profession and the collaborative articulation of a concrete program based on the philosophy that prevention of disease is better and more cost-effective than treatment, is not an insignificant development" (Dental Foundation of North Carolina 1976).

Interventions were based on the best evidence available at the time, many provided by studies conducted by the National Caries Program at the National Institute of Dental Research. North Carolina was a participant in their studies of water fluori-

dation in Randolph County, fluoride mouthrinse in Robeson County, and dietary fluoride supplements in Lenore County. School water fluoridation, fluoride mouthrinse, and dental sealant programs were successfully promoted and implemented in schools. They were effective in reducing dental caries. Less success was achieved with plaque-control programs (Horowitz and Thomas 1981).

In the 1990s, several events led to a “redefinition” of activities for DPH programs, with more selective and targeted use of community-based DPH services. Persistent disparities came into sharper focus, as downward trends in dental caries became apparent and segments of the population previously affected with this disease went without severe disease. For efficiency and safety, the state DPH program shifted to targeting its services toward high-risk groups. Concern had been raised by a study published in the journal *Lancet* that some children were ingesting too much fluoride, which was causing an increase in the prevalence of enamel fluorosis. By 1990, the dental program had evolved to the point that its clinical program is almost entirely preventive services being the primary service.

The 2000s saw the development of innovative dental caries programs for preschool-aged children, a population group that previously had been given a low priority in the planning of state DPH program activities. These advances were in response to a convergence of disturbing trends in North Carolina’s population and dentistry in the state, supported by documents providing the need for broad-scale and innovative interventions. Dental caries prevalence was increasing in preschool children while it was decreasing in permanent teeth; the population was increasing in size and in economic diversity. A child was born into poverty every twenty-three minutes. Nationally, North Carolina ranked forty-seventh in dentists by population, forty-fourth in dentists’ participation in Medicaid, and twenty-eight N.C. counties had fewer than three dentists per 10,000 residents. The crisis was well represented at the national level in an issue brief from the Children’s Dental Health Project, a major advocacy group in this period. It documented seven hearings held by the U.S. Congress and thirteen studies by the Government Accountability Office (GAO) over a ten-year period starting in 2002 that focused on oral-health issues. The primary focus of these investigations was on access to services provided through public insurance programs (Edelstein 2012). For example, a 2008 GAO report estimated that 1 in 3 children between two and eighteen years old who were enrolled in Medicaid were affected by disease, and 1 in 9 had untreated disease, amounting to 6.5 million children with untreated dental caries, a rate almost twice that of children of the same age with private insurance.

A partnership of medical and dental professional organizations, state agencies, and academic entities designed and implemented a progression of projects in response to the crisis. They were funded by several agencies, including the Appalachian Regional Commission, the Health Resources and Services Administration, the Centers for Medicare and Medicaid Services, the Centers for Disease Control and Prevention, the National Institutes of Health and the North Carolina Division of Medical Assis-

tance. The goals were to increase access to preventive dental services, reduce the prevalence of dental caries, and reduce the burden of treatment needs on a dental care system already stretched beyond its capacity to service young children, for a total of about \$50 million by the end of the decade. These projects, which continued into the next decade—Smart Smiles, Into the Mouths of Babes, Carolina Dental Home, the PORRT Initiative, the ZOE Early Head Start Initiative, Connecting the Docs, and Brushing is Fun—are described in more detail in chapter 7.

Few states have enjoyed the close working relationships that existed among the major sectors of the dental profession as it worked to resolve North Carolina's public health problems. Residents were provided with a front-row seat to these trends in dental public health and creative dental public health practitioners at work. Competencies required by a DPH specialist were on full display. Importantly, the efforts of the partnership provided the opportunity for residents to investigate many important questions through public health practice-based practice evaluation and research. Effectiveness of prevention programs, effects of public insurance on oral health, planning and implementation of surveillance systems, safety of fluorides and monitoring of oral health changes and their determinants were all topics of many of the projects undertaken by residents. Key strategic decisions faced by public-health administrators were informed by the evidence provided by studies in which residents led or played a big part in their completion. Collaborative efforts to develop the North Carolina Preventive Dentistry Program for Children and the Early Childhood Oral Health Collaborative for preschool initiatives that occurred over several decades are examples. [See Section that follows and list of resident's major projects and publications. [Appendix 5.2]

Development of Educational Requirements and Curriculum Guidance for Public Health Dentists

Approximately every dozen years or so beginning in 1973, the DPH community has developed a set of competency statements for public health dentists that identify core knowledge and skills needed in the dental public health specialty (see Table 5.2). Although referred to by various names over the course of four-plus decades, these documents list the knowledge, skills, abilities, and values that defined the practice of dental public health at the time. In general, they have been helpful in defining the practice of dental public health for the beginning practitioner. Specifically, they have been valuable in establishing accreditation standards for residency programs; helping the ABDPH identify content for the certification examination and guidance to candidates on how to prepare for the examination; informing content for curricula in schools of public health and dentistry; and designing the scope and content of curricula in dental public health residency programs. The graduate degree dental public health curriculum at UNC has used these documents to guide decisions about curriculum content.

Table 5.2. Development of competencies for specialists in dental public health education and practice

Year	1974 ¹	1988 ²	1997 ³	2016 ⁴
<i>Purpose</i>	To identify behavioral objectives in the following areas: <ul style="list-style-type: none"> • Public health administration • Research in dental public health • Prevention of oral diseases • Care, delivery & financing • Resources, study & development 	To review the Behavioral Objectives and modify them to reflect competencies needed for the practice of dental public health in the 1990s.	To develop competencies expected of a beginning practitioner after completing a two-year advanced education program in dental public health.	To develop a set of core competencies for the specialty of DPH aligned with the roles & functions that DPH specialists have in 21 st Century. New competencies should look to the future, not focus just on the behaviors and skills the specialty needs today.
<i>Development process</i>	5-member organizing committee appointed by ABDPH president & chaired by John Hughes, all diplomates	6-member planning committee appointed by AAPHD & chaired by Gary Rozier	10-member planning committee chaired by Jane Weintraub	9-member expert panel chaired by Don Altman & Ana Karina Mascarenhas
	5-member working committee each chairing one of the 5 topical areas used in 1974 workshop drafted objectives	5-member working committee each chairing one of the 5 topical areas used in 1974 workshop drafted objectives	Survey of all Board members, residency program directors, recent diplomates, current students (response n=48).	Survey of diplomates (77% RR)
	Workshop participants reviewed and commented on existing objectives before workshop; assembled into 26-pg document	Workshop participants reviewed and commented on existing objectives before workshop; assembled into 26-pg document	Invited participants evaluated each objective and summary provided to each group chair	Feedback from Advisory and Community of Interest Panels (representing 27 organizations)

<i>Development of competencies</i>	<p>3-day workshop in Boone, NC Keynote: Donald Galagan ⁴ 28 participants, all diplomates equally divided among 5 workgroups</p>	<p>3-day workshop in Bethesda, MD Keynote: Bob Mecklenburg⁵ Chairs of each workgroup presented thoughts on their area based on pre-workshop comments Participants provided with draft of objectives and discussed in plenary session. 35 participants, all diplomates 10 DPH residents, recorders (46 developed objectives)</p>	<p>3-day workshop in San Mateo, CA DoE education requirements ACPM process for development of competencies Discussion of competencies and their evaluation 34 diplomates 4 DPH residents, recorders HRSA project officer ADA representative County representative Competency expert 2 staff (43 developed competencies)</p>	<p>2-day meeting of Expert Panel in Chapel Hill, N.C. Drafted competencies after review of: (1) existing competencies & related documents; (2) Input of Advisory and Community of Interest Panel; & (3) results of survey of diplomates. Distributed for comment. Second meeting of Expert Panel in Chapel Hill, N.C. Considered comments on draft competencies from Advisory Panel, the Community of Interest Panel and DPH Diplomates.</p>
<i>Disposition of final document</i>	<p>Original organizing committee (Hershel Horowitz, John Hughes, Stan Letzkar, Quentin Smith, David Striffler) plus Gary Rozier review at meeting in Gainesville, FL</p>	<p>Chairs used 30-pg document with comments from last plenary session of workshop to construct objectives Approved by AAPHD Executive Committee Distributed to all Diplomates and communities of interest for comment Chairs of workgroups made final revisions Reviewed by Executive Committee of AAPHD Approved by the ABDPH</p>	<p>Draft report distributed to planning committee, workshop participants, key stake holders for feedback. Approved by AAPHD Executive Committee.</p>	<p>Final review and approval by the AAPHD Executive Committee.</p>

<i>Content & structure of final document</i>	5 topical areas 18 objectives 71 sub-objectives	4 topical areas • Health policy & management • Research • Prevention • Health services delivery 26 goals 165 competency objectives	10 competencies in behavioral terms that integrate skill, understanding and values and describe what a graduate of a dental public health program can do 60 performance indicators	10 competencies in new format like CODA. Description of each competency supported by statement of intent that explains rationale, meaning, significance; knowledge, skills and values integrated into competency. 74 core tasks as examples
<i>Funding sources</i>	Division of Dentistry, Bureau of Resources Development, Health Resources Administration	CDC AAPHD ABDPH	AAPHD Bureau of Health Professions, HRSA (\$50,000)	DentaQuest Foundation

¹. Hughes JT. 1978 "Behavioral Objectives for Dental Public Health." *Journal of Public Health Dentistry* 38: 100–107.

². Rozier RG. 1990. "Proceedings: Workshop to Develop Competency Objectives in Dental Public Health." *Journal of Public Health Dentistry* 50: 330–44.

³. Weintraub JA. 1998. "The Development of Competencies for Specialists in Dental Public Health." *Journal of Public Health Dentistry* 58, suppl. 1: 114–22.

⁴. Altman D, and Mascarenhas AK. 2016. "New Competencies for the 21st Century Dental Public Health Specialist." *Journal of Public Health Dentistry* 76, suppl. 1: S18–S28.

⁵. Galagan DJ. 1976. "Some Comments on the Future of Dental Public Health." *Journal of Public Health Dentistry* 36: 96–102.

⁶. Mecklenburg R. 1990. "Keynote Address: Creating a Future for Dental Public Health." *Journal of Public Health Dentistry* 50: 334–37.

While these documents have several characteristics in common, they reflect how the knowledge, skills, and values needed for the practice of dental public health have changed over the forty-three years between the first and last efforts. The changing content demonstrates the increasing breadth and intended flexibility in use to account for the normal push and pull of advances in knowledge and practice. The first version introduced the “health care, delivery and financing” domain and the last version, the “social determinants” domain. In his keynote address at the 1973 workshop, Donald Galagan, who was executive director of the American Association of Dental Schools, called on schools of public health to include dental health care in their curricula, as he had done in his dedication speech for the School of Public Health’s Rosenau Building at UNC in 1962. In Boone, he called for a third generation of epidemiologists, unlike the first (who addressed infectious diseases), or the second (who addressed chronic diseases), but a third that “will apply their principles and their epidemiological methods to the search for solutions to the problems of health care delivery.”

Weintraub and Rozier (2016) identified some of the national trends between 1997 and 2016 that could affect dental public health and dental public health competencies. Among the trends that provided a strong rationale for updating the “San Mateo” (1997) version were the following: entry into the digital age; federal and state legislation impacting access to dental care; advances in genetics research and precision dentistry; trends in oral-health status; recognition of the importance of social determinants in preventing oral diseases; relationships between oral health and general health; and the integration of medical and dental services.

All four efforts represented in Table 5.2 were led by the American Board of Dental Public Health and the American Association of Public Health Dentistry but sought broad input from the public health and dental professions at large. UNC faculty have played an important role in developing the set of competencies and thus contributed to advancing the specialty through defining the practice of dental public health. Hughes coordinated the first effort in 1976; Rozier the second in 1988; and Weintraub who was on the faculty at University of California–San Francisco at the time between her appointments at UNC, the third in 1997. Both Rozier and Weintraub were on the expert panel for the most recent effort in 2016. In addition, Chester Douglass was actively involved in the first three workshops

Initial efforts to identify functions of public health dentists

Sequential publication began in 1974 of the series of four documents displayed in table 5.2, which have played such an important role in the specialty. It was preceded by the efforts of several organizations to specify practices (functions) of public health dentists and their educational needs. Initially, the most active organization in formulating education guidelines in the nearly two decades before 1974 was the Committee

Organizations Providing Guidance on Education in Dental Public Health before 1973

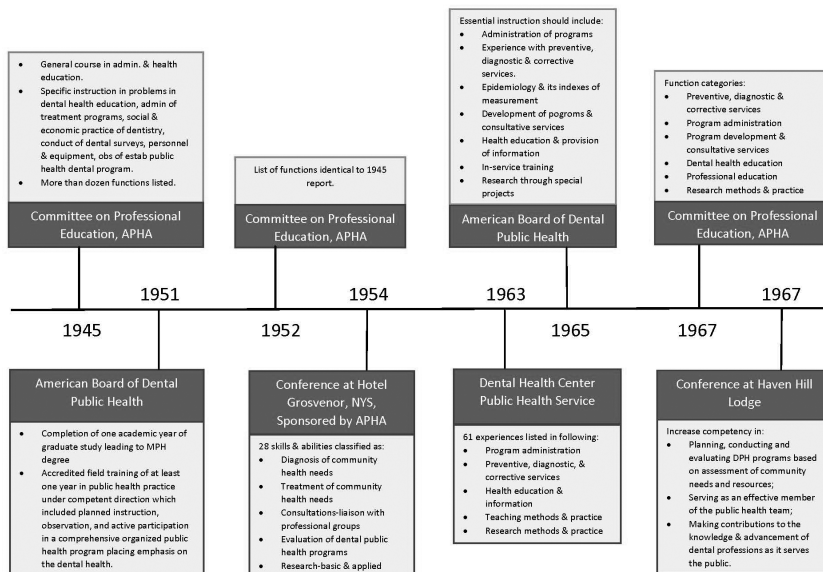


Fig. 9. The History of Developing the Competencies in Dental Public Health.

on Professional Education of the American Public Health Association (APHA 1952, 1954, 1967). This committee had two major responsibilities, one of which was the accreditation of schools of public health. From 1945 to 1973, the committee carried out accreditation of graduate professional education in public health before this function shifted to the independent Council on Education for Public Health (CEPH).

The committee's other responsibility was the promulgation of educational qualifications for the different types of public-health workers, accomplished through policy statements and conferences. The 1954 conference held at the Hotel Grosvenor in New York was cosponsored by the Dental Health Section and Committee on Professional Development of APHA, with broad representation from dentistry and public health. It was one of a series of conferences funded by the W. K. Kellogg Foundation and devoted to field training for various types of public-health personnel.

The 1954 workshop identified twenty-eight skills and abilities needed by the public health dentist that could best be developed through residency training. In addition to the major domains for skills and abilities presented in figure 9, those in attendance reached consensus agreement that the most important personal qualities were: (1) confidence in one's own abilities; (2) the ability to establish relationships and work cooperative with other agencies, public health workers and the dental profession; (3) the ability to work with limited facilities if necessary; (4) the ability to plan dental programs with local groups; and (5) the ability to adapt to different learning situations.

Suggestions at the conference for organizing the broad areas of dental public health work and their specific subitems were:

1. Diagnosis of community health needs – total health and dental health needs;
2. Treatment of community health needs – the whole public health and the dental public health problem.
3. Consultations- liaison with professional groups and with other program personnel;
4. Evaluation – the total public health and the dental public health program.
5. Research – basic and applied.

The ABDPH did not have a published list of functions or core competencies to work with when it was constructing and administrating the original examination in the early 1950s. Walter Pelton, who was a founding member and president at the time, commented in his presentation on board policies at the conference held at Hotel Grosvenor: “It should be understood that no formal criteria or crystalized concepts about field training are held by the ABDPH” (ABDPH 1951).

In 1965, the ABDPH, with some concern and urgency, drafted a document entitled *Statement of Educational and Experiential Requirements for Certifying Examination* in response to the ADA House of Delegates’ 1959 resolution and 1965 amendment to that resolution that stated: “Each board shall require the eligibility for certification as a diplomate a minimum of two academic years of postgraduate study in recognized institutions, or two calendar years of advanced study if the programs involve hospital internships and residencies.” Meeting this requirement continued to be a problem for dental public health. Still only a small number of dentists nationwide had completed an approved residency program.

The ABDPH document included reference to an earlier document of the Board entitled *Essential Areas of Instruction for Graduate and Postgraduate Education in Dental Public Health*, which contained requirements for a residency in dental public health. Residency programs should, according to the document: (1) be supervised by a diplomate; (2) be carried out in close working relationship with the school that grants the MPH degree; (3) permit the resident to apply, test, and develop the techniques learned in the academic program; and (4) include essential instruction in the areas listed in figure 9 (administration of programs; preventive, diagnostic and corrective services; epidemiology and it indexes of measurement; development of programs and consultative services; health education and provision of information; in-service teaching; and research).

Other than the APHA’s Committee on Professional Development and the ABDPH, the organization having the largest impact on evolving core competencies for the public-health dentist during the two-decade period included in figure 9 was the USPHS Dental Health Center in San Francisco (USPHS 1963). It published a

detailed list of sixty-one functions in five domains. The specification of core functions came later, but the initial list of functions was helpful in identifying the scope of dental public health practice.

The workshop at Haven Hill Lodge in Milford, Michigan, in 1967 referenced in figure 9 was sponsored by the Continuing Education Branch of the USPHS Dental Health Center and was motivated by the decision to limit the role of the PHS in the network of DPH residencies it had organized (USPHS 1967). One of the purposes of the conference was to discuss the objectives of DPH residency training. Objectives identified in the proceedings were rather general, but the list of experiences published by the Dental Health Center were pointed to for further guidance.

Attendees at the various workshops and conferences were working toward agreement on core functions, but still did not have them clearly identified by the end of the 1960s. Participants reaffirmed their support for the objectives listed in the Dental Health Center's residency guidebook but acknowledged that further work was necessary. A recommendation was made to develop more specific behavioral objectives for residency training. The conference provided an important bridge to the 1974 conference in Boone, North Carolina, which identified required behavioral objectives for accredited residency programs in dental public health.

The suggested residents' evaluation form included in the proceedings of the 1974 conference provides insight into learning domains expected at the time:

1. Special project development (e.g., research methodology, biostatistics, epidemiology);
2. Teaching experience (e.g., lectures to dental students);
3. Working with staff and staff meetings;
4. Attending conferences, seminars and visits (e.g., visit to national health survey unit);
5. Survey and analyzing data (e.g., indigent population);
6. Administration (e.g., budgeting and seminars);
7. Program planning (e.g., Federal legislation, fluoridation);
8. Consultation;
9. Supervision of Health Start Programs (e.g., grant applications; evaluation of programs);
10. Short courses (e.g., data processing, research design and writing, preventive dentistry)

By the end of the period represented in figure 9, major domains for core functions for a DPH specialist were taking shape. The specialty was becoming better defined by the experiences of those in leadership positions and on the front lines of DPH practice during the 1950s and 1960s, when public-health programs were experiencing

rapid growth. Domains common to the last few efforts were program administration, dental services, health education, and research, domains like those in the *Behavioral Objectives* published in 1974.

Several other points can be made about figure 9. The DPH functions emphasize program planning and the skills needed to manage treatment programs (Gerrie 1962). In a presentation at the conference in New York City, Edward McGavran suggested that DPH residents needed to gain experience in program planning and evaluation to be able to meet the unique needs of their communities, in keeping with his “scientific diagnosis and treatment” philosophy for public health. “Program planning” was a major part of the curricula in schools of public up until the 2000s.

Except for health education, the objectives focused heavily on personal preventive oral-health services rather than population-based preventive services. The reference to a limited number of population-based skills needed for preventive oral-health services reflects the increasing prominence of public-health treatment programs and the limited science base for prevention, particularly in the beginning of the period.

The historical evolution of the training of the DPH specialist reflects challenges in defining the type and amount of research that should be integrated into a DPH residency program. Applied research was justified, because it could include research in such problems as treatment, planning, financing, and community organization. Most efforts included research contributions that would help advance the dental profession.

In one area, the ideas represented in figure 9 are ahead of their time. Coordination of services, albeit within local community care programs, is emphasized, thus representing the current trend toward the integration of medicine, dentistry, and public health.

The documents referenced in figure 9, representing work of the APHA, Dental Health Section of APHA, ABDPH, AAPHD and others, reflects the strong opinion that every school of public health accepting dentists (and dental hygienists) as students should have a ABDPH-certified dentist on the faculty. Not much discussion has happened in recent years about the need for dentists on the faculty of schools of public health. Lester Block took the position that they are needed. It also seems that an opinion held at the time was that a residency in dental public health should maintain a collaboration with a school of public health, not solely with a school of dentistry, which is rarely mentioned in these documents if at all. As mentioned in a previous section, the trend for involvement of schools of public health in graduate education in public health is moving in the opposite direction.

Finally, these efforts during the 1950s and 1960s laid a strong foundation for the directed efforts that followed in the 1970s to the present to define the specialty. The competencies, although not without some disagreement among the DPH commu-

nity, are strong statements about the knowledge, skills, and competencies that the public health dentist should possess upon completion of an accredited dental public health residency program. The competencies are a bridge to the future, but one that must be maintained as the expectations and requirements for DPH practice, professional accreditation, education and research evolve.

Funding for the North Carolina DPH Residency Program

Initially, the North Carolina Dental Public Health residency program was supported by federal funds, but as these became increasingly difficult to obtain, the program directors began exploring other sources of funding. In July 1975, the Division of Health Services was awarded appropriations through the N.C. General Assembly to support one residency position in dental public health beginning July 1, 1975, and for a second position to begin July 1, 1976. The legislation also included funds for a position in preventive medicine for both years to be located in the state health department. The dental position was filled the first year by Dr. Rozier who had just completed an MPH degree at UNC-CH, but the second year was eliminated because of state budget concerns. The preventive medicine position was under the direction of Dr. Ann Wolfe, the state health director the first year, but was transferred to the UNC School of Medicine where it continues today under the direction of Dr. Deborah Porterfield in the Department of Family Medicine. In 1997 funding for North Carolina DPH residency program was provided by a training grant from HRSA with Gary Rozier as PI. This funding continued until 2006, and Rebecca King as the NC State Dental Director became the PI in 2001 (USPHS 1997). The specialty of Dental Public Health requires two years of academic course work after dental school, at least one year of which must be in a program accredited by the Commission on Dental Accreditation (CODA) of the American Dental Association. Core competencies are specified for management, policy, population-based prevention, research and oral health delivery systems. In our program here in North Carolina, board eligibility can be acquired through completion of a joint program between the SPH and the NC Division of Public Health, Oral Health Section. The program is approved by CODA for 2 FTEs per year. After completion of a master's degree at the UNC-CH SPH (graduates of other CEPH accredited programs are eligible as well), the resident enrolls in this one-year program. HPM provides approximately 2 days per month (unpaid) for the co-director of this program, whose primary responsibility is to oversee the research project required of the resident, and to assist with other faculty responsibilities such as serving on the admissions and advisory committees. The Oral Health Section now is the recipient of the HRSA training grant and has one resident enrolled. Of the 40 residents who have completed this program, about 10 were supported by this training grant.

North Carolina DPH Residency Program Faculty and Advisory Committees

The residency program has been guided by an advisory committee since early in its existence, but the committee has become more structured and active over the years. It was established in 1976 and consisted at the time of: Dr. Hughes, the program director; Dr. Pearson, the codirector; Dr. Dudley, the program administrator; Dr. Richard Murphy, a regional dental consultant; and Dr. William Johnson, the director of the Dental Health Section of the Georgia Department of Human Resources.

Since the mid-1980s, the committee members have been formally appointed by the secretary of the N.C. Department of Health and Human Services, with membership drawn from a national pool of public health experts. General Statutes 143B-10 and 130A-10 provide the authority for the committee. The text of the General Statute reads as follows:

130A-10. Advisory Committees. The Secretary is authorized to establish and appoint as many special advisory committees as may be necessary to advise and confer with the Department concerning public health. Members of any special advisory committee shall serve without compensation but may be allowed travel and subsistence expenses in accordance with G.S. 138-6. (1957, c. 1357, s. 1; 1975, c. 281; 1983, c. 891, s. 2.)

Department of Human Resources Directive 31 provides guidelines more specific to the residency program. Among the requirements for the committee are that it consist of eight members who shall serve two-year terms. Directive 31 also specifies agencies and expertise to be represented on the committee:

1. The Chief of the Dental Health Section, Division of Health Services, who will serve as Committee chairman and program administrator;
2. The Director of the Dental Public Health Tract at the UNC School of Public Health, who will serve as program director and shall be board certified;
3. A representative from the UNC Department of Health Affairs;
4. A regional dentist supervisor from the Dental Health Section, Division of Health Services;
5. Two dental directors from other states who shall be board certified;
6. The head of the Health Education Unit, Dental Health Section; and
7. A dentist who has public health experience.

Appendix 5.3 provides a list of advisory committee members making up the committee at approximately the time of each accreditation site visit. The advisory committee generally consists of core faculty plus six to ten individuals who represent a variety of backgrounds in DPH and provide advice on operation of the program to both program director and the resident.



Fig. 10. Bill Satterfield Accepts Certificate of Appreciation.

Changing Expectations for Residents' Research in the North Carolina Program

Completion of a major project based on a comprehensive protocol has been a big but debated part of the recommended residency curriculum in dental public health since the first residencies were organized by the Dental Health Center. The primary goal of these projects is to develop knowledge and skills in research and related competencies. Secondly, they are expected to contribute to DPH practice or the science base for public health dentistry, the focus of the next section. Although research amounts to about 40 percent of the curriculum time, producing quality proposals and a finished paper suitable for publication in a short, twelve-month residency program is challenging. This challenge has been central to discussions of curriculum quality at residency faculty workshops and at meetings of the ABDPH from the beginning of the specialty.

The North Carolina practice-based residency program embeds residents in real-life dental public health issues and increases the probability that they will gain quality experiential learning in required competency areas, as well as contribute to the operation of the state agency. Learning partnerships with faculty and doctoral students, who themselves learn mentoring among other skills from the experience, help ensure that residents gain experiences in more sophisticated aspects of research and the academic application of competencies and evidence-based practice.

Over time, the nature of the project has changed. The accreditation site-visit report of 1968 described the project as follows: “The resident first assembles a resource file relating to the geographic area or the area of program development. On the basis of this material, he develops a plan for the project, which must be approved by the staff. He carries out the project and prepares a report of his findings, which again must be approved by staff” (Young 1968).

This description is generic and could accommodate practice or research-based activities, but it contains more of the language from the program planning literature than research. As the sophistication of biostatistical and epidemiologic methods increased over the years, expectations for the residents’ projects increased concurrently. More rigorous projects and those using research methods were necessary for acceptance of work for competitive conference presentations and journal publications. The close link between the North Carolina DPH residency program and UNC-CH, particularly the Gillings School of Global Public Health and its ongoing research, provided the opportunity to explore many research questions directly relevant to dental public health practice.

Projects completed by the last four residents listed in appendix 5.2 are examples of where this trend has taken the program and curriculum. Go Matsuo, the last resident on the list, examined racial/ethnic disparities in dental caries among kindergarten students in North Carolina using oral-health surveillance information for 2009–2010. The analysis, published in the *American Journal of Public Health*, included 70,089 students in 1,067 schools in 95 counties. The prevalence of dental caries was 30.4 percent for White, 39.0 percent for Black, and 51.7 percent for Hispanic students. Results led to the conclusion that racial and ethnic oral health disparities exist among kindergarten students in North Carolina as a whole and regardless of school’s poverty status. An original finding important to public health was that disparities between White and Black students are larger in nonpoor schools than in poor schools, raising intriguing questions about causal pathways that might lead to these disparities.

Leo Achembong’s 2014 paper investigated the positive effects of the provision of oral-health services in medical offices on statewide trends in the dental caries experience of preschool-aged children in North Carolina. Using a dataset from the North Carolina Oral Health Surveillance System pertaining to almost 1 million kindergarten students from 1998 to 2009, he examined the effects of implementation of the Into the Mouths of Babies (IMB) program on decayed, missing, and filled teeth. This important analysis of a very large dataset of five-year-old children in North Carolina provided the first-ever evidence of the effects of a medical practice-based oral health intervention on population-based dental caries prevalence was published in *Pediatrics*.



Fig. 11. Jim Lalumandier and Dale Armstrong Accept Merit Awards at AAPHD Meeting.

The research by Drs. Matsuo and Achembong was recognized with AAPHD Graduate Student Merit Awards, as were projects completed by the two residents preceding them. Their work was published in the *Journal of the American Dental Association* and the *Journal of Dental Research*, highlighting the significance of their work not only for North Carolina but for national and international audiences.

The average impact factor for the journals in which the last four residents' projects were published as reported in 2015 by *Journal Citation Report*, a measure reflecting the average number of citations for an article per articles published in that journal over two years was 3.93. The *Journal of Dental Research* was the second-highest-rated of all journals listed in the "Dentistry, Oral Surgery, and Medicine" category, with an impact factor of 4.60. For context, the impact factors for the two major dental public health journals, the *Journal of Public Health Dentistry* and *Community Dentistry and Oral Epidemiology* were 1.18 and 2.23, respectively, in that year.

Fourteen residents in total, including the last six from 2007 onward, received one of the Leverett Graduate Student Merit Awards, the most prestigious award for graduate students given by the American Association of Public Health Dentistry to postgraduate residents, and masters and doctoral degree students in international competition. Residents were responsible for fourteen abstracts and twenty-one publications in the history of the program.

Residents' Contributions to Dental Public Health

Although the number of competitive presentations at national, state, and local conferences and scientific journal publications are traditional measures of a person's contributions in academia, impact on the practice of public health dentistry has become an equally important criterion, particularly for faculty and alumni of most schools of public health. Work that the state dental program and residents have done in developing and implementing oral health surveys and surveillance of dental conditions serves as good examples of "impact" and is presented in the following section. To avoid presenting a disjointed timeline, the section includes some epidemiological surveys in which the residents were not directly involved.

Epidemiological Surveys in North Carolina

Collection of clinical oral-health information on which to base public-health decisions has a long history in North Carolina. These efforts have consisted of periodic surveys of probability samples representative of the entire state population, surveys of subgroups of the population such as school children, and special populations like Head Start or prison populations (Rozier and King 2005).

The first recorded call for a statewide survey in North Carolina was made as part of a recommendation for an oral-health education program for schoolchildren voiced by Dr. John Parker of Asheville at the 1896 meeting of the North Carolina Dental Society. In his speech, he urged the dental society to designate dentists to examine the teeth of school children (Herget 2009). A committee was appointed to plan these activities, but it remained inactive and no evidence of further action was found.

Dental examinations of young men to see if they met selective service requirements for the military has produced crude epidemiological data used for workforce planning and other purposes. The number of men with "defective and deficient teeth" was 10.35 per 1,000 in 1917–18 and demonstrated a geographic gradient of increasing prevalence from coast to mountain (Love and Davenport 1920).

North Carolina played a small role in one of the initial chapters of water fluoridation as investigators sought to understand the association of fluoride in drinking water, enamel fluorosis, and dental caries. In 1931, three independent investigators reported an association between fluoride in drinking water and endemic fluorosis, called "mottled enamel" at the time. In a 1933 publication, H. Trendley Dean gave the results of a self-reported, national survey of dentists in which he sought to identify areas in the United States with endemic fluorosis (Dean 1933). Out of about 300 geographic areas in twenty-three states, two were located in North Carolina—one in Columbus and Brunswick Counties located in the southeastern section of the state adjacent to the South Carolina boarder, and the other in Bertie County located in the

northeastern section of the state. Dean previously had examined the teeth of a small sample of students in Windsor, the county seat of Bertie County. Of the 132 students in the sixth, seventh, and eighth grades, 22 had used the Windsor municipal water exclusively from birth, 19 or 86 percent of whom had enamel fluorosis.

In 1934, the North Carolina Dental Society conducted a “Mouth Health Survey.” During two days in February, dentists screened 235,697 schoolchildren, or 26.5 percent of the total enrolled school population statewide, in 705 schools in 76 counties. The survey found that 55.3 percent had never visited a dental office. Statewide, 82.5 percent needed permanent teeth filled, 7.9 percent had first molars extracted, and 24.4 percent had filled teeth. A description of methods is not available, and the survey likely suffers from several limitations compared to today’s standards. The original pages summarizing results by county are available. But known confounders such as race were not controlled, so comparisons with other survey results are not possible. Definitions and diagnostic criteria for dental conditions are not provided and training was likely not done. Nevertheless, this survey was being implemented at a time that development of survey methods in oral health was just beginning, led mostly by the USPHS in its investigations of fluoride effects. Results of this survey were used for advocacy purposes and purportedly resulted in funds being allocated by the legislature to support the Little Jack Puppet Show that educated schoolchildren for three decades beginning in 1935 (Herget 2009).

Beginning in the 1960s, the state dental program, in collaboration with the University of North Carolina at Chapel Hill, conducted surveys of scientific samples representative of the state and of schoolchildren. The first two of these four surveys, funded by the USPHS and the Kellogg Foundation, respectively, provided estimates for dental diseases for the entire North Carolina population for 1960–62 and 1976–77. The 1960–62 survey interviewed everyone in a sample of households and conducted clinical examinations while in the home. The methodology was pilot tested by John Hughes in his doctoral dissertation for UNC’s Department of Epidemiology entitled “Family Patterns of Dental Disease,” in which he studied the effects of social class on oral health status in Chapel Hill and Hillsborough. The survey design and content were heavily influenced by faculty in the Department of Epidemiology, where Dr. John Fulton had his appointment. The small faculty regularly met to discuss ongoing research. Ralph Patrick, a cultural anthropologist who had joined the faculty in 1958 after completing his doctoral studies in social anthropology at Harvard, played a pivotal role in the study, helping to focus study of the causes of dental diseases on social determinants, years before the term was popular.

The 1960s also was an active time for collecting data for study purposes in individual counties, primarily baseline and follow-up surveys for the evaluation of water fluoridation. Rozier summarized some of these studies in an assessment of trends

in dental caries over thirty-four years (1948–83). Twenty-seven studies, some published, some not, were retrieved from the files of John Hughes after his retirement. Virtually identical methods were used in all the surveys, so they are roughly comparable in their assessments of dental caries. In total, 24,330 children of six to seventeen years of age provided clinical examination information specific for study counties. Only baseline assessments for any intervention studies were included, so none of the estimates are affected by preventive programs implemented as part of any study. The average number of decayed, missing, and filled teeth (DMFT) per person declined in both White and Black children, but more so in Whites, demonstrating early improvements in oral health in North Carolina that later would be confirmed with the 1986–87 survey.

The 1976–77 statewide epidemiological survey was done as part of a large collaboration of state agencies and institutions funded by the W. K. Kellogg Foundation. The collaboration included the N.C. Dental Society, the Oral Health Section, the UNC Schools of Dentistry and Public Health, and the Sheps Center for Health Services Research. The project was motivated by the desire of the partnership to determine workforce needs for the state. The balance of supply and demand seems to vary, and concern at that time was expressed about an oversupply of dentists and the need for the School of Dentistry to enact enrollment reductions. The methodology used in the 1960–62 survey was repeated in 1976–77, providing updated information on oral-health status along with supplemental information not collected before but required for a comprehensive needs-based approach to workforce planning.

The 1986–87 and 2003–4 North Carolina surveys provided stable estimates to study changes in the prevalence of dental caries in school children in kindergarten through twelfth grade. In conjunction with the 1960–62 and 1976–77 surveys, these were particularly valuable for uncovering forty-year trends in dental disease in pediatric populations in the state, as well as the long-term outcomes of dental disease in different birth cohorts. The 2003–4 survey was designed to serve several purposes other than estimating the prevalence of dental caries. It evaluated the joint and individual preventive effects of the N.C. Preventive Dentistry Program implemented in 1973. It also had broader epidemiological contributions—to establish a baseline for enamel fluorosis and early carious lesions, neither of which had ever been measured in a statewide survey in North Carolina.

The clinical examinations of about 5,400 students in grades K–12 in 2003–4 were supplemented with questionnaires for parents and older children that included items in several domains, including sociodemographic characteristics; self-reported oral health; dental opinions; values and knowledge; access to dental care; preventive exposures (toothpaste, fluoride tablets, fluoride mouth rinse, fluoridated drinking water and sealants); and impact of dental problems on the lives of the child and family.

Development of the North Carolina Oral Health Surveillance System for Schoolchildren (North Carolina OHSS)

Surveillance requires ongoing data collection and the timely dissemination of that information to make decisions and undertake effective activities to prevent and control disease. Public-health programs rarely have mechanisms in place that meet these requirements. It was not until the 1990s that a system for assessing dental caries that met the definition of surveillance was developed in North Carolina. Its initial development, implementation, and evolution contains outstanding examples of the impact of DPH residents and their contributions of historical significance to improvements in the oral health of North Carolina children.

The use of school-based screenings to identify children in need of dental care goes back to the beginnings of the state dental program in North Carolina. By the 1980s, considerable resources were being devoted to this effort. Forty-eight public-health dental hygienists and twelve public health dentists working for the Division of Oral Health in counties spread across the state screened schoolchildren for dental disease every year using tongue blades and flashlights. In addition, local programs in six counties contributed to the annual screenings. (Spratt 1994). More than 280,000 elementary-school children in the state's 100 counties were screened for dental disease each year. Children were referred for obvious dental caries, pain and infection, questionable enamel areas needing evaluation by a dentist because they were thought to be candidates for sealants, severe gingivitis, orthodontic problems, and those obviously not under the care of a dentist. Although large numbers of children were screened, results could not be used for surveillance because of a lack of standardization or because information was not collected and processed in a way that would facilitate analysis and reporting. Little evidence existed about whether the screening and referral program increased access to dentists or improved oral-health status. A randomized trial in England suggests that it was not effective.

At a time when national models did not exist, Dr. Rebecca S. King envisioned modifying the school-based screening system so that it could be used for surveillance of dental caries experience (Phipps et al. 2013). Over the next several years, she oversaw the development and implementation of a statewide system in her position as Deputy Director and later, Head of Oral Epidemiology of the Dental Health Section. The North Carolina OHSS was designed to provide annual surveillance of dental caries in kindergarten and fifth-grade students. More specifically, it provided a measure of the total number of caries free children, the total number of decayed and filled primary and permanent teeth per child, and the proportion of dental caries in both primary and permanent teeth that had not been treated. This dental surveillance information could be used to monitor dental disease levels over time and compare disease in one county with another. Implemented in the 1996–97 school year, it continued with

open-mouth assessments of about 80 percent of all children in these grades in almost all North Carolina counties for fifteen years.

Dental-public-health residents were heavily involved in work leading up to state-wide implementation of the North Carolina OHSS. Their work focused on practical aspects of the proposed surveillance system and the potential to calibrate existing DPH staff.

Before work on the dental caries surveillance system began, the Dental Health Section was busy developing and testing a system for surveillance of enamel fluorosis that would ultimately be helpful to the caries surveillance effort. Prompted by national and state concerns about a rise in the prevalence of objectionable levels of enamel fluorosis and confirmed by a study of patients in a pediatric practice in Asheville, North Carolina, Jerry L. Batten, a DPH resident, undertook a project to develop and test a method to acquire a cost-efficient estimate of the statewide prevalence of enamel fluorosis. Motivated by a publication by Leverett (1982), which revealed an increase in fluorosis in some populations, state leaders were already taking action to reduce excessive fluoride exposures. Educational materials were being written with greater attention to instructions for fluoride use and the published American Dental Association dietary fluoride supplement schedule was changed to reduce fluoride intake in the early years of life. But decision-makers needed to know the answer to one key public-health question: was enamel fluorosis a problem in the state and if so in what parts? With this information, more detailed studies could be undertaken to investigate the primary causes of the problem and interventions that could reduce those exposures.

Dr. Batten (1996) led the Division of Oral Health's Fluorosis Study Group consisting of Dr. Bill Satterfield, Martha Taylor, and Dr. Rebecca King in developing a new fluorosis index, testing its accuracy, and taking it to the field for application. He focused the section's studies on the reliability and validity of school-based hygienists to screen the facial surfaces of maxillary anterior teeth for the presence of objectionable fluorosis involving one third or more of the tooth surface (TSIF [Tooth Surface Index of Fluorosis] threshold of 2 or greater). They were seeking a method to identify schools or communities in which the prevalence was high, or "hot spots" indicating that fluoride intake was at unacceptably high levels and interventions were needed to reduce population exposures. Where needed, more detailed follow-up could be undertaken by the Division of Oral Health so that well-informed interventions could be undertaken.

Dr. Batten and colleagues designed a series of studies to develop and test the new index. A small pilot study conducted in December 1991, with five dental hygienists and the standard examiner (Batten) in Cleveland County with 255 students, proved successful and demonstrated generally good agreement with each other and the standard. A follow-up pilot study in April 1992 with two hygienists and the standard examiner (Batten) in two schools also resulted in good agreement. Batten and his colleagues

concluded: “As a reliability pilot, these comparisons suggested the fluorosis screening index to be a useful instrument for the screening of large numbers of children for dental fluorosis by minimally trained field examiners” (Batten 1996).

In 1992–93, division field staff collected statewide fluorosis data on some 20,000 sixth-grade schoolchildren. Instruction was provided for 90 field staff at the annual staff conference held in September 1992, including 57 hygienists in three groups of approximately 30 each. Training in all the studies was similar—two hours of didactic lecture with clinical slides and paper and pencil pre- and post-test assessments conducted with two different sets of twenty clinical slides each.

Further evaluation studies were conducted in the fall of 1993. Replicate screener-standard clinical assessments of students in 2 to 4 classrooms from 40 schools were done, yielding 100 paired observations. To address remaining uncertainties the most comprehensive study yet was done in the fall of 1994 involving 49 hygienists, assessments of 3,063 sixth-grade students in 46 North Carolina counties. Reliability and validity of the screeners was assessed using replicate screenings by dental hygienists and a standard examiner, which was Dr. Batten in all cases. He had been trained by Dr. Herschel Horowitz, among others, for the Asheville fluorosis study.

This series of studies provide several conclusions. Studies demonstrated some difficulty in scoring fluorosis. Nevertheless, Dr. Batten (1996) in his final report on the topic concluded the fluorosis screening index “... to be a valid and reliable instrument when used by minimally-trained hygienists in assessing mild-to-moderate fluorosis among school age populations.” The screening method provided a viable means of collecting preliminary data upon which decisions about geographic areas needing follow-up studies could be done, making this two-step screening process feasible. Results of statewide screenings for fluorosis in 1992–93 are not available, but a cursory review of nonrepresentative samples used for calibration of screeners would suggest that the prevalence of objectionable fluorosis was around 10 percent using the screening method and about 20 percentage points higher using the TSIF in the validation studies. Finally, Batten concluded that the entire process demonstrated the feasibility and desirability but challenges of enhancements of the school-based, case finding screening process for purposes of surveillance for dental caries (enamel fluorosis).

In the fall of 1995, the surveillance ideas of Dr. King evolved further with pilot testing of a method to determine the number of decayed and filled teeth that could replace the public health dental hygienists’ annual screenings. A training manual was written and pilot-tested with staff. The surveillance technique itself was pretested in Lee County to determine if the logistics of incorporating it into the Division of Oral Health’s routine screening and referral process made it a realistic expectation for all DPH staff. A training session and field-testing of the technique occurred in September 1995 in Madison and Mitchell Counties. Reliability was tested through its use by five screeners. All second-grade students in two schools in Mitchell County (n=160)



Fig. 12. Rebecca King and Martha Taylor Screen School Children in N.C.

were screened by five public-health staff using tongue blades and flashlights. Complete information was provided for examination of 160 students. The five screeners generated 800 screenings and 80 replicated screening. As a test of validity, surveillance results were compared with data from the Madison County Oral Health Intervention Project, which used traditional epidemiological survey techniques for the measurement of dental caries.

The methods provided person-level counts of the total number of primary teeth with restorations or missing molars (fmt) and the total number of decayed teeth without treatment (dt). The number of permanent teeth with restorations, missing permanent teeth (FMT) and the number of decayed permanent teeth were obtained in older students.

Dr. King concluded that

a simple technique for the measurement of caries-free status and the number of primary and permanent teeth that shows evidence of caries experience has been developed and pilot tested. The technique proved to be both reliable and valid. The procedure can be performed by trained public health dental hygienists and gives an indication of the prevalence of dental caries and access to dental care. The results from use of the technique can be used to compare caries status in one county or school to another, to measure caries-free status, or access to dental care at the county level and to track these changes over time. These data are useful for program planning, evaluation and accountability for funding. (King 1996)

Based on this positive experience, calibrated dental caries screening assessments for kindergarten and fifth grade were implemented statewide in 1996–97.

Residents' contributions to the North Carolina OHSS continued. Dr. Mark Piotrowski (1998), the resident during the 1997–98 academic year, analyzed the data generated from the inaugural year (1996–97) of the North Carolina OHSS, which included 69,303 kindergarten students in 790 schools and 62,282 fifth-grade students in 694 schools. His study revealed the challenges inherent in a paper-based system in

which a roster of students and screening results were produced for every classroom. To address this concern, a system linked with the Department of Education electronic student files was introduced in 2009 that allowed Oral Health Section staff to access class rosters, to enter surveillance data directly into the class roster and obtain individual-level socio-demographic information about students being screening.

Dr. Piotrowski (1998) also demonstrated the value of the North Carolina OHSS for program planning. Secondary data sources with elements considered to be important risk factors for dental caries and access to care were linked with the surveillance data. He identified 32 percent of schools in which kindergarten students were screened and 29 percent of schools in which fifth-grade students were screened to be at high risk for dental caries. Poor and rural kindergarten schools, and schools located in non-fluoridated communities with high rates of infant mortality were found to be high risk. Poor fifth-grade schools with prevalent primary tooth caries in non-fluoridated areas were found to be high-risk. Enrollment in free and reduced lunch, the indicator for schools with children whose families were classified as poor, was among the strongest indicators for caries prevalence. County-level maps with color coding of disease levels were provided for planning purposes.

Another example of residents' contributions to DPH practice as well as the value of the K/5 North Carolina OHSS, particularly after residents with doctoral students began collaborating in health services research in the Gillings School of Global Public Health's Department of Health Policy and Management was the study by Achembong et al. (2014). This ecologic study used panel data and regression techniques to examine the association between implementation of Into the Mouths of Babies (IMB) program starting in the year 2000 and caries experience recorded in the kindergarten North Carolina-OHSS for academic years 1998–99 to 2009–10. The analytical sample included 11,694 school-year observations (1,294 unique schools) and 946,911 students (mean per year = 86,291). Surveillance had previously revealed an increase in caries experience during the initial years of the observation period and a downward turn in the trend line around 2004 that continued to the end of the period. Provision of IMB preventive services increased steadily ever year. This study concluded that the IMB program contributed to the observed downward trend in dental caries among North Carolina preschool-aged children. The IMB intervention in medical offices appears to be widespread enough among high-risk populations in North Carolina and effective enough that its impact on the prevalence of dental caries was detected at the population level, a unique finding of importance to North Carolina and the nation.

The K/5 North Carolina OHSS provided valuable information at the state level, but importantly it for the first time provided information at the county and school levels. It provided information never available at the local level before, much-needed and requested information for planning oral-health programs and advocating for oral health at a time that oral health was in the spotlight. It met legislative requests for local

information and was used to inform several workshops by the North Carolina Institute of Medicine. It also provided a wealth of data for research and evaluation. The kindergarten data were particularly valuable because they provided an assessment of the impact of public health and private practice programs and policies directed toward preschool-aged children. These programs were heavily invested in beginning in the late 1990s. A conservative estimate for the investment, counting only external grants and Medicaid reimbursements for preventive services, amounts to almost a \$1 billion during the decade of the 2000s.

National Oral Health Surveillance System (National OHSS)

North Carolina's was the first state public-health system to have a population-based survey of the entire population, the first to have a surveillance system that provided comprehensive dental caries data for very specific geographic areas, and the first to enhance available surveillance data for research purposes by linking the North Carolina OHSS with other secondary data sources like Medicaid enrollment and claims files. The development and implementation of these public-health measures provided a learning environment for DPH residents in the state, as well as master's and doctoral students at the University of North Carolina.

Efforts to implement a National Oral Health Surveillance system (National OHSS) took place slightly after those of North Carolina had initiated its efforts. The Association of State and Territorial Dental Directors (ASTDD), CDC, Council of State and Territorial Epidemiologists (CSTE), and several workgroups and advisory committees worked diligently during the 1990s to develop the national surveillance system that would include several adult, child, and water fluoridation indicators. It was in place in an initial format in the early 2000s (Beltrán-Aguilar et al. 2003; Malvitz et al. 2009; Phipps et al. 2013).

The child indicators are derived from clinical assessments of children in Head Start, and grades K–3. State data collection is supported using the seven-step model, a framework developed in 1996 by the ASTDD to plan, implement and use the results from surveillance. The clinical assessments are collected according to a protocol published in 1999 by the ASTDD. Known as the Basic Screening Survey protocol, it provides guidance to states on data collection of oral-health outcomes.

In 1999, the CSTE approved several oral-health indicators, adding to the two already approved in 1998. Importantly, the indicators included clinical data for grades K–3, capturing the percentage of students with any dental caries experience, untreated tooth decay, or dental sealants.

As a final step in its initial development, in 1999 the CDC launched the National OHSS website housing available data, for two states initially. For the first sixteen years, beginning with Maine and Pennsylvania in 1998, an average of 5.5 states per

year added data with infrequent repeats that would prevent monitoring of trends in dental disease. As of January 2020, the National OHSS included thirteen states with caries experience for kindergarten posted for 2010 or later. The total sample size for these states was about 34,000, only about one third as many kindergarten students as were screened in North Carolina every year for some fifteen years.

Ultimately, the national and state systems differed in an important way in their initial formats. The National OHSS includes screening of third-grade students to determine caries experience, untreated decay, and sealants, while the North Carolina OHSS included kindergarten and the fifth grade. The National OHSS justified third grade as being needed to evaluate school-based sealant programs. The North Carolina OHSS justified kindergarten being included to provide a look back at the effects of preschool programs on children. It justified fifth rather than third grade because the former provided a “post-intervention” evaluation of the impact of elementary-school-based oral-health programs.

Development and implementation of the North Carolina OHSS was a large undertaking charting a new path in oral epidemiology for a state health department, just as the Fulton-Hughes study and the Hughes pilot study had been innovative in the 1960s because they provided prevalence estimates of oral-health conditions of the entire population, but particularly adults. The North Carolina OHSS was in place and provided data for fifteen years beginning in 1996 and ending in 2013, with screening averaging more than 150,000 students per year.

Approximately a dozen studies were published by residents using North Carolina OHSS surveillance or survey data. Questions important to the state, such as the effects of public insurance, school-based preventive dentistry programs, and provision of oral-health preventive services by physicians and dentists, are included in these publications.

Summary

The North Carolina DPH residency program is one of thirteen in the country and one of only two still located in a state health department. The program has served an important role in producing a more qualified DPH workforce, and in the process helped to put DPH practice on a more solid evidence-based foundation through application of research findings and recommendations to public health practice (see Table 5.3). The vibrancy and broad scope of programs and activities in the North Carolina state DPH program have provided an excellent training environment through the years. Graduates have served important leadership roles in federal, state, and local governmental agencies in North Carolina and beyond. This review of some of its history reveals a strong collaboration between the state health department and the University of North Carolina, which from the very beginning helped strengthen the program and its contributions to dental public health. The 1962 *Survey of Dentistry*, the Institute of Medicine’s *Future of Public Health*, and other agencies for decades

Table 5.3. Some topics of residents' major project organized into broad competency areas

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1. Oral health status and needs assessments: Conducted for various conditions including caries, periodontal disease, enamel fluorosis, oral-facial injuries, treatment and oral health-related quality of life; among diverse populations such as the school for the blind, the department of corrections, migrant and seasonal farmworkers, Head Start, dental practices, and public school children.
 2. Development of Survey methods: Studies on the effects of monetary incentives on response rates in school surveys, examiner reliability study of oral health assessments, and development of surveillance techniques for caries, dental treatment, and sealants.
 3. Evaluation of Preventive services: Assessments of fluoride supplement prescribing practices by dentists, factors influencing the use of pit and fissure sealants among dentists, effectiveness of school-based referral techniques, effectiveness of pit and fissure sealant use in the North Carolina Medicaid program, the effectiveness of school water fluoridation, parental knowledge about fluoride, integrating oral health into programs for pregnant women, and effectiveness of preventive dental services provided in medical offices.
 4. Evaluation of access to health services and effects on oral health: Studies of public insurance (Medicaid reimbursement rates and dentists' willingness to participate, impact of public health clinics on access, Medicaid vs. SCHIP effects); demand (parents' perceptions of access, social support and child use of dental care in recently immigrated Latino families, prevalence of a dental home among Hispanics); and, treatment status (treatment of early childhood caries and oral health-related quality of life, the Great Recession and untreated dental caries).
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have called for a better-trained public health workforce with an emphasis on delivery of population-based services. The North Carolina DPH residency program has been responsive to these training needs.

References Chapter 5

- Achembong LN, Kranz AM, and Rozier RG. 2014. "Office-Based Preventive Dental Program and Statewide Trends in Dental Caries." *Pediatrics*. 2014;133, no. (4): e827–e834.
- Batten JL. 1996. "Validity and Reliability of a Fluorosis Screening Index Used in a School-Based Oral Health Project." Submitted to the North Carolina Dental Public Health Residency Advisory Committee. January 1996.
- Beltrán-Aguilar ED, Malvitz DM, Lockwood SA, Rozier RG, and Tomar SL. 2003. "Oral Health Surveillance: Past, Present, and Future Challenges." *Journal of Public Health Dentistry* 63, no. 3: 141–49.
- Bernier JL. 1965. "The Army Preventive Dentistry Program." In *Symposium—Applied Preventive Dentistry*, 2nd ed., 8–17. Papers presented July 27–30, 1964, Washington, D.C. Columbia: Curators, University of Missouri.

- Bernier JL, and Sumnicht RW. 1966. "The Emergence of Preventive Dental Practice in the U.S. Army." *Military Medicine* 131, no. 6: 520–24.
- Block LE. 1975. "Educational Programs in Dental Public Health at Schools of Public Health as of Fall 1973." *Journal of Public Health Dentistry* 35, no. 3: 195–205.
- Chandler HT. 1990. "Evolution of the U.S. Army Dental Corp." *Dental Corps International* 2, no.1/90: 9.
- Continuing Education Branch, Division of Dental Health, Bureau of Health Manpower, Dental Health Center. 1967. Summary of Dental Public Health Residency Conference. May 24–26, 1967. Milford, Mich.
- Dean HT. 1933. "Distribution of Mottled Enamel in the United States." *Public Health Reports* 48: 703–44.
- Dental Foundation of North Carolina. 1976. "Toward the Development of a Rational Policy for the Prevention of Dental Disease and the Delivery of Dental Care Services on a State-wide Basis." Proposal Submitted to the W. K. Kellogg Foundation, Battle Creek, Michigan. March 1, 1976.
- Diefenbach VL. 1997. "Genesis of Residency Programs in Dental Public Health: Reflections of the First Dental Public Health Resident?" *Journal of Public Health Dentistry* 57, no. 2: 89–92.
- Division of Dental Health. 1968. "Residency Training in Dental Public Health Now a National Program." *Spotlight* 31, no. 2 (May).
- Dunning JM. 1958. "The Harvard Dental Public Health Unit." *Journal of Public Health Dentistry* 18, no. 2 (June): 7–10.
- Dunning JM. 1970. *Principles of Dental Public Health*. 2nd ed. Cambridge, Mass.: Harvard University Press.
- Easlick KA. 1963. *The Administration of Local Dental Programs. Fifth Workshop on Dental Public Health*. Ann Arbor: University of Michigan, School of Public Health.
- . 1974. *The American Board of Dental Public Health. The First Twenty-two Years*. [Bethesda, Md.]: American Board of Dental Public Health.
- Edelstein BL. 2012. Federal supports for state oral health plans. *Journal of Public Health Dentistry* 72, no. 1: 554–559.
- Gerrie NF. 1962. "The Professional Training Needs Of Public Health Dentists: Is It Time For A Second Look?" *Journal of Public Health Dentistry* 22, no. 1: 3–6.
- Herget JB. 2009. *The North Carolina Dental Society, 1856–2006: A History*. Cary, N.C.: North Carolina Dental Society.
- Hollingshead BS. *The Survey of Dentistry: The Final Report*. Published by Commission on the Survey of Dentistry in the United States. Washington DC. 1961.
- Horowitz AM, and Thomas HB. 1981. *Dental Caries Prevention in Public Health Programs: Proceedings of a Conference, October 27–28, 1980*. [Bethesda, Md.]: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health.
- King RS. 1996. "Development and Testing of a Surveillance Technique for Dental Caries in Schoolchildren." Residency Project. Division of Dental Health, N.C. Department of Environment, Health and Natural Resources. Submitted in partial fulfillment of requirements for Board Certification by the American Board of Dental Public Health, September 22–24, 1996.

- Knutson JW. 1955. "What Is Public Health?" In *Dentistry in Public Health*, edited by WJ Pelton and JM Wisan, 1–11. 2nd ed. Philadelphia: W.B. Saunders.
- Leverett DH. 1982. "Fluorides and the Changing Prevalence of Dental Caries." *Science* 217 (4554): 26–30.
- Levy SM, Murphy RF, and Dudney GG. 1985. *Preventive Dentistry in North Carolina: A Ten-Year Report*. N.C. Department of Human Resources, Division of Health Services, Dental Health Section, January 1985.
- Love AG, and Davenport CB. 1920. *Defects Found in Drafted Men*. Washington, D.C.: U.S. Government Printing Office.
- Malvitz DM, Barker LK, and Phipps KR. 2009. "Development and Status of the National Oral Health Surveillance System." *Preventing Chronic Disease* 6, no. 2: A66.
- Phipps K, Kuthy R, Marianos D, and Isman B. 2013. *State-Based Oral Health Surveillance Systems Conceptual Framework and Operational Definition*. Association of State and Territorial Dental Directors. Available at: <https://www.astdd.org/docs/state-based-oral-health-surveillance-systems-cste-whitepaper-oct-2013.pdf>.
- Piotrowski MJ. 1998. "North Carolina Dental Surveillance: Community Level Risk Factors Associated with Dental Caries of Children in Kindergarten and Fifth Grades, School Year 1996/1997." A research paper submitted to the North Carolina Dental Public Health Residency Advisory Committee in partial fulfillment of the requirements for completion of Residency in Dental Public Health.
- Rozier RG, and King RS. 2005. "Defining the Need for Dental Care in North Carolina: Contributions of Public Health Surveillance of Dental Diseases and Conditions." *North Carolina Medical Journal* 66, no. 6: 438–44. <https://pubmed.ncbi.nlm.nih.gov/16438100/>.
- Self Study Guide for the Evaluation of an Advanced Dental Education Program in Dental Public Health. 2020. Commission on Dental Accreditation, Chicago, IL.
- Selwitz RH, Colley BJ, and Rozier RG. 1992. "Factors Associated with Parental Acceptance of Dental Sealants." *Journal of Public Health Dentistry* 52, no. 3: 137–45.
- Spratt J. 1994. "Smiling Through Seventy-Five Years." *North Carolina Public Health Forum* 3, no. 1: 3–7. Published by the North Carolina Public Health Association.
- Snyder LP. 1994. "Seventy-Five Years of Dentistry in the Public Health Service and the Commissioned Corps: Public Health through Service, Research, and Prevention." *PHS Dental Notes—Special Edition*. June 24.
- University of North Carolina at Chapel Hill and North Carolina State Health Department Dental Health Division. 2002. Self Study for Dental Public Health Residency. Commission on Dental Accreditation, Chicago, IL.
- Vick M. 1989. "Little Jack Promotion of Good Teeth Returns." *Kenly [North Carolina] News*, March 8.
- Weintraub JA, and Rozier RG. 2016. "Updated Competencies for the Dental Public Health Specialist: Using the Past and Present to Frame the Future." *Journal of Public Health Dentistry* 76, suppl. 1: S4–S10.
- Winslow CEA. 1920. "The Untilled Field of Public Health." *Modern Medicine* 2 (1306): 183–91.
- Young W. 1968. Report of accreditation site visit, May 24, 1968. North Carolina Dental Health Division Dental Public Health Residency Program. Commission on Dental Accreditation. Chicago, IL.

References for Figure 9, guidance on education in dental public health before 1973

- 1945: American Public Health Association. "Proposed Report on the Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 35 (1945): 43–48.
- 1951: American Board of Dental Public Health. *Information Concerning Certification as a Specialist in Dental Public Health*. Bethesda, MD. 8 pp.
- 1952: American Public Health Association. "Proposed Report on Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 42, no. 2 (1952): 188–191.
- 1954: American Public Health Association. Conference on Field Training for Public Health Dentists. Hotel Grosvenor, New York City, June 28–29, 1954.
- 1963: U. S. Public Health Service. U.S. Department of Health, Education and Welfare. Residency Training in Dental Public Health, 1963.
- 1965: American Board of Dental Public Health. Statement of Educational and Experiential Requirements for Certifying Examination. 1965; 3 pp.
- 1967: American Public Health Association. "Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 57, no. 4 (1967): 682–91.
- 1967: U. S. Public Health Service (USPHS) Summary of Dental Public Health Residency Conference. Conference at Haven Hill Lodge, Division of Dental Health, Bureau of Health Manpower. May 24–26, 1967. Milford, Mich.

Degree Programs in Public Health Dentistry at UNC-CH

Dental public health education consists of continuing education for frontline practitioners (often referred to as “short courses” in public health because they are more than a few hours in length), graduate-level degree-granting academic programs, and residency programs for dentists that can lead to board eligibility and for those who choose to take the ABDPH examination, specialty status. PhD or DrPH programs in public-health disciplines provide a national resource for population-based research and policy. This chapter describes the first graduate courses in dental public health that were taught for degree credit at the University of North Carolina at Chapel Hill starting in the late 1950s and early 1960s and the national context for offering these courses. Previous chapters have reviewed the history of short courses at UNC-CH, and the North Carolina DPH residency program offered by the state health department in partnership with UNC-CH. This chapter reviews the origins of dental public health academic course work at UNC-CH, some of the forces shaping it into a cohesive program in dental public health, the administrative structure of the program, and the evolution in the curriculum content during the period from 1958 through 2014.

This history of academic dental public health at UNC-CH can be divided into three major phases—the foundation years (1957–76); the growth years (1977–99); and the more recent period (2000–2014), in which the predominant program emphasis shifted from a focus on educating practitioners to educating researchers and conducting research. Although the phases are demarcated by nonoverlapping years, the dividing lines between them are arbitrary because of the lack of major defining events in graduate DPH education. The trend line clearly shows a rise and fall for enrollment in master’s degree programs on three separate occasions.

The Number of Public Health Dentists in the 1950s and 1960s

The first courses for graduate degree credit in DPH were taught at UNC-CH in the late 1950s in the Department of Public Health Administration and Epidemiology. Striffler (1963) described the 1950s and 1960s in the United States as a time of “ferment” in DPH education. The *Survey of Dentistry* conducted under the auspices of the Commission on the Survey of Dentistry in the United States had just been completed (Hollinshead 1961). Among its 603 pages and its almost six dozen ($n=71$) recommendations was the conclusion that DPH programs were ineffective, mostly because of

Number of dental professionals enrolled in masters degree programs in Gillings School of Global Public Health by year, 1952-2016

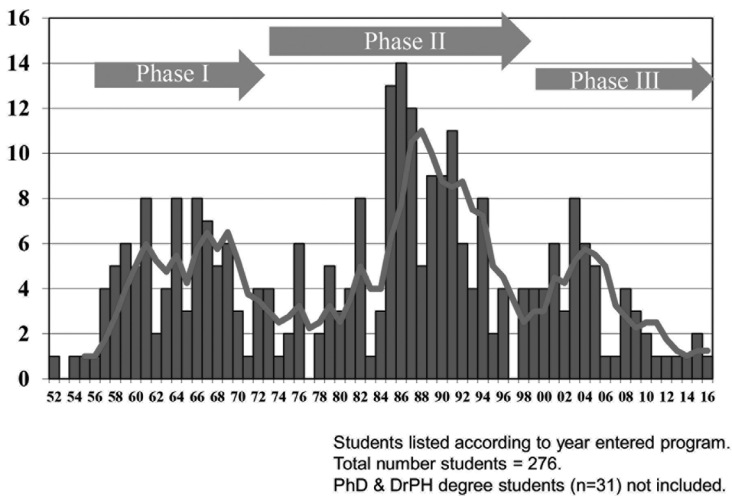


Fig. 13. Number of Dental Professionals in Masters Degree Programs in Public Health.

a critical shortage of trained dental public health personnel to staff the increasing number of public health programs (see Table 6.1).

The Committee on Professional Education of the American Public Health Association (1967) estimated that a small number of dentists were employed in public health and related agencies in the early 1960s. About 290 were employed full-time in state public-health agencies, and 400 to 700 in local programs. At the federal level, about 420 public-health dentists were commissioned officers in the USPHS, of whom about 300 were in clinical practice, 85 in public health and administrative activities, and 40 in research. Other agencies like the military, the Veterans Administration, and dental service organizations employed an additional small number. The number responsible for clinical care and those responsible for DPH functions were not known, but a large proportion probably were mostly in clinical positions.

In 1967, 102 vacant positions existed at the local level, of which 95 required at least one year of postgraduate training in public health. Of these, 75 positions remained unfilled for six months. The authors stated that it was virtually impossible to make an accurate estimate of the need for public health dentists; nevertheless, they observed that departments of community dentistry were increasing in schools of dentistry and should contribute to the need for trained dentists in this area. They concluded that there was already a deficit, and with the increasingly prominent role that government was playing in health affairs, that this deficit could be expected to increase. About 60–75 dentists per year received public-health training during the previous five years. (Author's 1969 class notes)

Table 6.1. Need for dental public health workforce: recommendations in policy documents, 1945–2017

Study (Year) [Ref]	Purpose	Findings
Committee on Professional Education APHA (1945, 1952) [1, 2]	To provide a statement on the educational qualifications of dentists who anticipate careers as directors or administrators of dental public health programs.	<i>“The future outlook of public health dentistry as a profession is most encouraging. Even now the needs and demands for qualified public health dentists far exceed the supply, and adequate preparation of dentists for effective careers in public health dentistry is an obligation of universities equipped to offer such education and training.”</i>
Survey of Dentistry (1960) [3]	To assess the achievement, resources, and potentialities of dentistry with a view to determining the desirable areas of future growth and development for the purpose of describing and recommending improved approaches, techniques and methods for the better provision of an essential health service to the American people.	<p><i>“To carry out [dental public health functions]... would require manpower and resources which most state dental divisions do not have... Only about 100 dentists in the 44 states [are available] to carry out [non-clinical functions of public health programs]. The total budget of the state dental health programs reported in 1958 was only \$3.72 million.... It is obvious that most state dental programs can make only a token effort toward meeting the problems of dental disease—‘everybody’s disease.’”</i></p> <p><i>“One of the major barriers to the utilization of topical fluoride application has been the shortage of professional personnel.”</i></p> <p><i>“The major barrier to the development of more effective dental public health programs is the inadequate supply of qualified public health specialists.” (93)</i></p> <p><i>“Another critical shortage... is that of people with skills in dental administration. The most immediate hope for the development of better training in administrative skills probably lies in the schools of public health. The specialty of public health is the only area of dental practice that formally recognized administrative skills as an important part of the competence needed in its field. There are already in existence... formal graduate training programs and a specialty group concerned with the development of executive ability and vision. A wider use of these resources should be made.” (91)</i></p>

Striffler (1963) [4]**Committee on Professional Education. APHA (1967) [5]**

To report functions of public health dentists and report on their education qualifications. Provides an update of previous reports.

"Estimates of the number of public health dentists needed are necessarily crude. One source estimates that by 1980, just to keep up with population growth, an additional 40 percent over 1962 will be needed. The further rapid development of dental public health programs would suggest that a significantly larger number will be required to keep pace with program development. In addition, there is, and will continue to be, an increasing demand for public health dentists to serve as teachers, as administrators in dental service corporations and public welfare programs, and as preventive dentistry officers in various branches of the military services."

Block (1974) [6]

To determine the type of programming in dental public health available at each accredited school of public health.

"It is unlikely that many of the schools of public health are providing programs for dentist which meet the standards established in the ABDPH guidelines for the American Public Health Association's 'Educational Qualifications of Public Health Dentists.'" He further concluded that "it . . . is time to question seriously the blanket acceptance, by either the Council on Dental Education or the American Board of Dental Public Health, of a year's training at a school of public health as meeting the academic requirements of specializing in dental public health."

Meskin & Block (1975) [7]

To examine the possible effects of special purpose training programs or formulae grants for schools of public health on the future of dental public health training.

"The immediate result for dental public health programs [reduction of student support] has been a reduction both in staff and students. The future is not auspicious; if additional funds are not found identifiable dental program in school of public health many become nonexistent."

Task Force on Advanced Dental Education, AADS (1980) [8] To review issues and problems, explore solutions to them, and suggest improvements in the advance education of dentists.

“The task force believes that society and the profession would be served better by a carefully planned restructuring of the existing specialties and a reduction in the number of specialties recognized by the profession.”

“The total number of first-year clinical dental specialty position should be decreased in order to maintain the current ratio of 7.4 clinical dental specialists per 1000,000 people.”

“The two nondental specialties, dental public health and oral pathology, are excluded from the recommended reduction in the number of first-year positions. These two specialties and the professional activities of their graduates differ significantly from the clinical specialties. . . . The number of dentists enrolled in these areas has always been extremely small and does not affect appreciably the specialist-to-population balance of the dental work force. Nonetheless, attention should be paid to the number of entry positions in these two specialties at periodic intervals.”

USDHHS (1984) [9]

“It is essential that dental professionals continue to enter training in dental public health. It is critical that highly competent educators and researchers be prepared for and retained in the field of dental public health. Only through serious and dependable investments can the nation be guaranteed a supply of dental public health professional who will promote oral health and dental disease prevention in population groups.”

Lotzkar (1985) [10]

To determine the status of dental public health training and employment opportunities for public health dentists; better means for assessing the need for public health dentists; issues concerning specialization in dental public health; and the correlation among training, employment, and diplomate status.

*"The number of dentists working in public health is unknown."
 "At least 19 (of 23) schools of public health have trained dentists over the past 10 years."
 "A significant number of dentists (613) have obtained at least the basic training (an MPH degree) to function as public health dentists from schools of public health in the last 10 years."
 "At least 233 dentists have received advanced training in residency programs in the last 10 years. Of these... approximately 60 have since become diplomates. [There] still is a need to increase training opportunities, at least to provide better geographical distribution."
 "A significant number of dentists have completed sufficient training to qualify them for responsible dental public health positions."
 "There has been a continuing downward trend in the percentage of diplomates employed by the federal government. The percentage of diplomates in state and local health departments has remained relatively constant although there does appear to be a downward trend. Educational institutions have had the greatest amount of growth."
 "The number of residency programs should be increased, and the geographical distribution of those programs should be improved."*

*"There is a need for a better means for determining the number of board-certified public health dentist as well as those not certified needed to serve the public in the future."
 "Many dental public health positions are occupied by personnel lacking appropriate or sufficient training, while professionally prepared dental public health workers may be unemployed or underemployed."*

Future of Dental Public Health. AAPHD and Oral Health Section (1994) [12]

Review of dental public health's origins, scope of responsibilities, and its future challenges and roles.

*"In a changing health care environment, opportunities and responsibilities for expanding [professional education] roles likely will increase."
 "While the number of [DPH residency] programs and student positions currently remain small, changes in the health care environment generated by health care reform may alter this picture."*

Simon-Rusinowitz (1988) [11]

To familiarize dental public health professionals with a marketing strategy she developed for the dental public health profession.

*"There is a need for a better means for determining the number of board-certified public health dentist as well as those not certified needed to serve the public in the future."
 "Many dental public health positions are occupied by personnel lacking appropriate or sufficient training, while professionally prepared dental public health workers may be unemployed or underemployed."*

Institute of Medicine (1995) [13]

IOM Committee was charged with assessing dental education in the U.S. and making recommendations regarding its future. Among other objectives, it was to examine the current status of dental education and oral health; develop a statement of how oral health and oral health services should be improved in the next 25 years; and describe strategies that will help dental education, research and practice improve oral health.

“In presentations to the committee, some groups were worried that insufficient numbers were being trained in particular specialties, for instance, pediatric and public health dentistry.” (117)

“More common was a concern that the proportion of specialists was increasing in dentistry because the number of specialists being trained had remained fairly steady while the number of dental graduates had dropped.”

Wotman (1998) [14]

To estimate the need for DPH specialists in the 21st Century.

“While opportunities for public health education and residency training are declining, the need for public health skills is likely to increase.”

Shulman (1998) [15]

To estimate the need for dental public health specialists in the 21st century.

“Evidence suggests that the supply of public health dentists will not be sufficient to meet the increased demands by society on the dental public health infrastructure as its roles in prevention and primary care expand in a reformed health care system.”

“[A] constant theme: appears to be a shortage of public health trained dental professionals is imminent and creative methods will be needed to recruit and train future public health dentists.”

“Overall, the same number, if not more, dental public health personnel will be needed... only small number of personnel will be needed for the new roles... (environmental specialist, informatics, fluoridation engineer, social marketing, nutrition, ombudsman, program evaluator, prevention), and that not all of these necessarily will require a dental degree.”

**Surgeon General's Report
(2000) [16]**

The first report on oral health, addressed individual and environmental factors for oral health and disease. The report outlines safe and effective disease prevention measures that everyone can adopt to improve oral health and prevent disease.

**Future of Dentistry, American
Dental Association (2001) [17]**

To look unflinchingly into the future; recommend actions and activities that will help the profession meet its responsibilities in the years ahead. Panelists were to pinpoint trends; to separate what is known from pure speculation; and to offer reasonable, logical predictions for the future, defined as the next 5 to 15 years, depending on the area of interest. Finally, each panel was to forge recommendations aimed at helping the profession meet future challenges. Made no reference to dental public health specialists, but numerous references to and recommendations about improvements needed for population health, which need the skills of public health.

"The public health infrastructure for oral health is insufficient to address the needs of disadvantaged groups, and the integration of oral and general health programs is lacking."

National Dental Public Health Workshop (2002) [18]

A 2.5 day workshop was convened in Bethesda MD to review the current state of dental public health training in the U.S. and to create a series of recommendations to address identified problems.

"The dental public health workforce is inadequate in both size and distribution to meet national needs. Moreover, the rate at which dentists (both recent graduates and experienced practitioners) seek dental public health training appears to be declining."
"Dental public health workers are a vital national resource and all of the stakeholders concerned with the oral health of the nation need to work collectively to ensure the specialty's continued vitality."

Healthy People 2020 (2009) [19]

Healthy People 2020 is the federal government's prevention agenda for building a healthier nation. It is a statement of national health objectives designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats.

"23.4 percent of States (including the District of Columbia) and local health agencies that served jurisdictions of 250,000 or more persons had a dental public health program directed by a dental professional with public health training in 2008."

"Increase the proportion of States (including the District of Columbia) and local health agencies that serve jurisdictions of 250,000 or more persons with a dental public health program directed by a dental professional with public health training."

Thierer & Meyerowitz (2017) [20]

This article reviews the data on advanced dental education for the past decade and explores what advanced dental education might look like in the years leading up to 2040, including how its graduates will address the oral health needs of the population. This article was written as part of the project "Advancing Dental Education in the 21st Century."

"The profession has a duty to consider patients' preferences, and their social, economic, and emotional circumstances when providing care, as well as to attend to patients whose medical, physical, and psychological or social situation make it necessary to modify normal dental routines in order to provide dental treatment." However, this duty is not reflected in any of the specific standards for specialty or general dentistry. As dentistry becomes increasingly integrated with medicine, advanced dental education program standards will likely need to evolve in this direction." (S168)

"Advanced dental education has been content to either maintain the status quo or make only small incremental curricular changes in response to financial opportunities (for example, in implant dentistry), rather than pursue significant changes that address the needs of the U.S. population."

Advancing Dental Education in the 21st Century (2017) [21]

This strategic planning project examined the current status and future trends that are likely to impact the dental profession over the next 25 years. That information was used to make strategic recommendations to assist dental schools and allied dental education programs in preparing graduates for practice in 2040 and to meet their institutions' missions for scholarship and service.

"Graduates (of dental school) need to understand the bigger picture of social determinants of health and health disparities to be leaders in their communities to improve population health. Social workers, patient navigators, and electronic tools are becoming available to assist people and better coordinate their care." (eS10)

"More dental care in the future will... be provided outside the walls of dental offices—in schools, medical group practices, nursing homes, and other community settings, with many types of dental and medical providers delivering the care." 44 (eS11)

References:

- Committee on Professional Education of the American Public Health Association. 1945. "Proposed Report on the Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 35: 43–48.
- Committee on Professional Education of the American Public Health Association. 1952. "Proposed Report on Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 42, no. 2: 188–91.
- Hollinshead BS, director. 1961. *The Survey of Dentistry. The Final Report*. Commission on the Survey of Dentistry in the United States. Washington, D.C.: American Council on Education.
- Striffler DF. 1963. "Education of Public Health Dentists in the United States and Canada." *J Am Dent Assoc* 66: 758–62.
- Committee on Professional Education, American Public Health Association. "Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 57, no. 4 (1967): 682–91.
- Block LE. 1975. "Educational Programs in Dental Public Health at Schools of Public Health as of Fall 1973." *Journal of Public Health Dentistry* 35, no. 3: 195–205.
- Meskin LH, and Block LE. 1975. "The Effect of the New Federalism on Education for Dental Public Health." *Journal of Public Health Dentistry* 35, no. 3: 192–94.
- Task Force on Advance Dental Education, American Association of Dental Schools. 1980. *Advanced Dental Education: Recommendations for the 80s. Issues in Dental Health Policy*. W. K. Kellogg Foundation.

- U.S. Dept. of Health and Human Services. 1984. *Report to the President and Congress on the Status of Health Personnel in the United States*. Rockville, Md.: U.S. Dept. of Health and Human Services, Public Health Service, Health Resources and Services Administration, Bureau of Health Professions.
- Lotzkar S. 1985. "Analysis of the Need for Training, Employment, and Specialization in Dental Public Health." *Journal of Public Health Dentistry* 45, no. 2: 106–13.
- Simon-Rusinowitz L. 1988. "A Marketing Strategy for the Dental Public Health Profession: What Is It? Why Is It Needed?" *Journal of Public Health Dentistry* 48, no. 1: 45–51.
- AAPHD and Oral Health Section. 1994. "The Future of Dental Public Health Report. Preparing Dental Public Health to Meet the Challenges and Opportunities of the 21st Century." *Journal of Public Health Dentistry* 54, no. 2: 80–91.
- Committee on the Future of Dental Education. 1995. *Dental Education at the Crossroads: Challenge and Change*. Institute of Medicine, Division of Health Care Services. Washington D.C.: National Academy Press.
- Wotman S, Pyle M, and Duffy R. 1998. "Residency Training in Dental Public Health: Assessment of Status, Needs, and Issues." *Journal of Public Health Dentistry* 58, suppl. 1: 68–74.
- Shulman JD, Niessen LC, Kress GC Jr, DeSpain B, and Duffy R. 1998. "Dental Public Health for the 21st Century: Implications for Specialty Education and Practice." *Journal of Public Health Dentistry* 58, suppl. 1: 75–83.
- U.S. Department of Health and Human Services. 2000. *Oral Health in America: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.
- American Dental Association. 2001. *Future of Dentistry*. Chicago: American Dental Association, Health Policy Resources Center.
- Weyant RJ. 2002. National Dental Public Health Workshop. American Association of Public Health Dentistry. February 10–12, 2002. Bethesda, Md. 37 pp. Office of Disease Prevention and Health Promotion. 2018. *Healthy People 2020*. Oral Health. U.S. Department of Health and Human Services. <https://www.healthypeople.gov/2020/topics-objectives/topic/oral-health>.
- Thierer TE, and Meyerowitz C. 2017. "Trends in Generalist and Specialty Advanced Dental Education and Practice, 2005–6 to 2015–16 and Beyond." *Journal of Dental Education* 81, no. 8: eS162–eS170. doi:10.21815/JDE.017.023.
- Formicola AJ, Bailit HL, Weintraub JA, Fried JL, and Polverini PJ. 2018. "Advancing Dental Education in the 21st Century: Phase 2 Report on Strategic Analysis and Recommendations." *Journal of Dental Education* 82, no. 10: eS1–eS32.

A Shortage of Public Health Dentists: A Deficit in a Vital National Resource

Quantitative workforce studies projecting the need for public-health dentists is difficult because of the many different types of positions they can occupy. Such studies have rarely been attempted. Nevertheless, the APHA Committee on Professional Education felt that “the needs and demands of qualified public health dentists far exceed the supply” (Committee on Professional Education 1967).

Then as now, national workforce studies generally set aside any direct considerations about public-health dentists and oral pathologists, the two specialties considered to be nonclinical, even when other trends and considerations provided a strong justification for determining workforce needs in dental public health. For a recent example, the study “Advancing Dental Education in the 21st Century,” conducted by the American Dental Education Association (ADEA) in 2017, concluded that fewer clinical dentist specialists need to be trained (Formicola et al. 2018). It also concluded, however, that severe inequities in oral-health status and access to dental care are growing in the United States population. While this trend toward oral-health disparities suggests the need for dentists with knowledge and skills possessed by public-health dentists, there was no mention in the final report about the supply of public-health dentists and the need for training.

About the time the DPH program was being organized at UNC-CH, an analysis found that by 1980 a 40 percent increase in specialists would be needed over 1962 just to keep pace with population growth. The projection was bolstered by the opinion that dental public health programs were developing rapidly (Second National Conference on Public Health Training, 1963). Only one study has provided quantitative projections of future needs for DPH specialists. Using estimates for the recommended ratio of DPH specialists to population (0.1 per 100,000; or 1 per million) provided by the Task Force on Advanced Dental Education of the American Association of Dental Schools, Lotzkar (1985) reported the need for 304 DPH specialty dentists in 2000, almost a three-fold increase over the 106 available in 1979, the baseline year.

Using methods in the ADEA report, the number of board-certified public-health dentists needed in 2030 to maintain the current specialist-to-population ratio is estimated to be 354 dentists, an increase of 190 over the current supply, or almost a doubling of the number needed in less than fifteen years. It also appears that the U.S. population is growing faster than the supply of DPH specialists.

Qualitative Consensus Statements on the Need for Public Health Dentists

Table 6.1 provides a list of major documents published during the period from 1945 through 2017 that include some consideration of workforce needs from a DPH

perspective. The third column in the table provides quotations from the documents that provide an assessment of DPH workforce needs and related comments about the need for DPH education. Most of these documents address predoctoral dental education, with a smaller number including advanced dental education and a smaller number yet providing specific recommendations about postgraduate DPH education.

The statements in the third column provide opinions of the authors of each study based on their interpretation of the literature at the time or findings from their study. Some of the studies were focused on predoctoral education or clinical specialties but made some recommendations of significance about advanced dental public health education.

The overwhelming conclusion, based almost entirely on expert opinion and qualitative considerations in these two dozen documents, is that throughout the years the need for public-health dentists has exceeded both the supply and demand. This theme is constant throughout the seventy-seven years covered in the documents. This theme is evident even during the 1980s, when concern was growing that the number of clinical specialists was increasing too rapidly and positions for specialists should be decreased in specialty education programs.

Three other more nuanced conclusions can be made considering the sources of information in table 6.1. Robert Weyant expresses the sentiment that detailed estimates are not needed because of the obvious gap between the large population need and the small capacity of DPH programs (Weyant 2002). A second is the empty cell in the third column of table 6.1, which signifies no findings about the topic in the 2001 Future of Dentistry Report by the American Dental Association.

A final perspective is provided by Lori Simon-Rusinowitz (1988), and it is a unique one. She writes, “Many dental public health positions are occupied by personnel lacking appropriate or sufficient training, while professionally prepared dental public health workers may be unemployed or underemployed.” Often, positions in state or local government are filled with dentists who do not have DPH specialty training. The opposite situation also is common. Dentists with doctoral degrees in epidemiology, health services research, or related social sciences are in nonresearch positions, that is, teaching in a dental school with no research expectations or history of research.

Several aspects of dental public health make it difficult to estimate workforce needs. Some of the positions available at any one time are not clearly identified, responsibilities can change rapidly with trends in program budgets, and the scope of DPH is hard to define precisely.

It is important, however, to continuously define the knowledge, skills and values of DPH practice and promote policies and programs that will use the contributions of DPH practitioners. Although a small specialty, activities of its members have a

big impact. It is helpful to repeat the paragraph from the document prepared by the AAPHD (1982) for the ADA's Council on dental Education:

Although, comparatively, the number of diplomates in the specialty has been small, the impact they have had on the oral health of the public has been far reaching, through the use of clinical trials, epidemiological studies in the community and clinical surveys, dental public health practitioners were responsible for early studies that established community water fluoridation as an effective caries-preventive method, the promotion of water fluoridation activities, and the development of new and effective methods of preventing and controlling dental disease. Members of the specialty have been developing "access" programs to the private sector for years through pre- and post-payment mechanisms, program and resource development, dental health promotion, and referral of patients to generalists and specialists in the community. Activities in the specialty of dental public health have complemented those of the general dental practitioner to bring dentistry in the United State to the current high standard it is known for throughout the world. . . .

. . . Public health dentists trained in the science and art of the specialty of dental public health play a vital role and provide important services to society and the dental profession. Public health dentists serve as initiators, catalysts, butters, communicators, facilitators, ombudsmen, and evaluators not only of the needs of the public and the community but also of the dental profession. (AAPHD 1982)

Status and Trends in Graduate Training in Dental Public Health During the 1960s and Early 1970s

One of the most important trends in dental education after World War II was an increase in the number of dentists completing formal programs leading to a master's degree, doctoral degree, or certificate. In the 1958–59 academic year, 542 students were enrolled in 246 graduate programs offered in 30 areas of the dental curriculum, a 19 percent increase in the number of programs within a two-year period and a 269 percent increase since 1947–48. During the same academic year, 517 students were enrolled in 127 postgraduate programs in 19 areas of the dental curriculum. Yet, there were only three DPH programs identified by the Council on Dental Education in this report. Oral surgery and orthodontics led the list, with 24 and 20 programs, respectively (Hollinshead 1961, 169). The number of DPH specialty programs is not unexpected of such a small specialty. In 1960, the American Board of Dental Public Health had thirty-three active members (Lotzkar, 1985).

According to Striffler (1963; with Block's [1975] modifications), 2 of the 14 accredited schools of public health in 1963 had full-time dentists on the faculty, 9 schools had a total of 12 part-time dental faculty, and 3 had no dentist faculty. One of the two schools he named with full-time dental faculty was UNC, with three (Fulton, Law

and Creighton); the other one was the University of Michigan, with two (Easlick and Striffler).

A decade later, Block (1975) revealed important but mixed changes in the status of dental public health education in schools of public health. On the positive side, the number of accredited schools of public health had increased to 19 and the number with full-time dental faculty had increased from 2 to 7 schools with 8 full-time dental public health faculty. Of the 8 full-time dentists in 1973, only 3 spent most of their time in activities specifically related to dental public health. By 1973 there had been a substantial increase in part-time faculty since 1963, from 12 to 62.

Twelve of the 19 schools in Block's study listed at least one dental public health course in their school bulletin. Michigan and Minnesota listed 9 courses, 5 schools listed 1 course, and 4 listed 3 courses. Like faculty, the number of courses reported by Block can be misleading because of the variability in credit hours.

Block (1975) argued that two elements must be present to count a school as having a minimal curriculum in dental public health: teaching faculty and a reasonable number of DPH courses. Using these two criteria, he concluded that only 7 of the 19 schools of public health had a program in dental public health in 1973 (Columbia, Harvard, Johns Hopkins, Michigan, Minnesota, North Carolina, and Toronto). Michigan and Minnesota had administratively separate programs with full-time faculty in their schools of public health as directors; both programs had 9 courses in dental public health listed in their bulletins. While UNC listed only 3 courses in its course catalogue, the courses were 3 credits each. Combined with 6 full-time weeks devoted to field training, almost half of a 36-credit MPH degree program at UNC-CH was devoted to dental public health.

Block concluded from his review of information collected from schools of public health and consideration of information conveyed in Striffler's article that schools had taken steps during the 1960s to improve the curricula for dental public health. But he further concluded that "it is unlikely that many of the schools of public health are providing programs for dentists which meet the standards established in the [ABDPH] guidelines or the American Public Health Association's "Educational Qualifications of Public Health Dentists" (Block 1975, 204).

Meskin and Block (1975) sounded a dire warning over the possibility of a lapse in federal funds for schools of public health because of "New Federalism" implemented during the Nixon Administration. Although the 1958 U.S. Congress passed legislation which recognized the national character of schools of public health by providing funds for their support fifteen years into the future until 1973, restrictions in the legislation reduced the amount of funding for schools of public health. The immediate result was a reduction in faculty and resources. Three of the seven schools with a program reported reassignment of faculty to new administrative responsibilities or research project buyouts for their dental public health teaching responsibilities.

Summary Comments

Running through the literature is the strong and persistent theme that a shortage of public-health dentists exists and that the health, particularly the oral health, of the nation is harmed by this shortage. This shortage has been validated through the years by statements from major professional organizations like the APHA, AAPHD, Institute of Medicine, and the Office of the Surgeon General. The presumption is that the capacity to train dentists is likewise insufficient to meet the needs for public-health dentists.

This belief about a shortage was strongly held, particularly early in the history of DPH when it was emerging as a discipline. As reviewed in this chapter, recognition of the importance of public-health dentists to the nation's oral health and universities' obligations to provide training appeared in the literature as early as 1945.

In recent years, commentaries on epidemiological trends in oral-health status have acknowledged marked disparities in oral-health status and access to dental services. Also, of note is the understanding that the full resolution of these problems will require dentists with the knowledge, skills, and competencies possessed by public-health dentists. Yet only periodic acknowledgment has been made of the need for postgraduate programs to educate public-health dentists to help address those needs. Allocating faculty positions for DPH requires not only an academic and philosophical commitment to DPH, but a political one. Other substantive areas and methods such as economics, financial management, strategic planning, implementation science, epidemiology, and biostatistics, among many others, are competing for academic space in the curriculum.

The number and size of graduate programs have not always been aligned with the need for public-health dentists. The value of the intervening variables between need and supply in workforce considerations, that is the demand for graduates is not as clear as it is for need, and this is rarely addressed directly in the literature. Rational decisions about investing university resources into starting or expanding a graduate program ideally should consider the existing supply of professionals in the discipline under consideration, the degree to which it is able to meet societal needs with effective programs, and if acceptable positions are available or can be created for graduates. Yet the decision about these investments often rests on political considerations. At UNC-CH, the establishment of the Institute of Dental Public Health in the 1930s, subsequent short courses beginning in the early 1960s, and courses for degree credit in DPH program management and epidemiology in the 1950s had strong support from the university administration.

The remainder of this chapter describes the development of degree programs in dental public health at UNC-CH designed to educate a workforce that is prepared to meet the oral-health needs of the population.

The first twenty years of development of the graduate program in DPH in the UNC School of Public Health is tied closely for purposes of this chapter to three five-year federal grants beginning in 1961 and lasting until 1977. These grants made possible the



Fig. 14. Students and Faculty in Dental Public Health Program, 1987.

hiring of a full-time director who could coordinate activities and prepare graduates for positions in dental public health practice. The first grant followed four years in which Harry Bruce taught a course in health administration and John Fulton joined the faculty in Epidemiology and taught a course in oral epidemiology.

The Formative Era for Graduate Dental Public Health Education at UNC-CH (1957–77)

An occasional dentist or dental hygienist was enrolled in the Department of Public Health Administration beginning in 1952, but no courses in dental public health were available to them. Academic coursework in DPH began for dentists enrolled in the UNC-CH School of Public Health during the 1957–58 academic year, when Dr. Harry Bruce, a USPHS dentist stationed in Region III of the Public Health Service Office in Charlottesville, Virginia, began coordinating a monthly seminar in DPH practice. He continued to teach the course, required of all dentists enrolled in the Department of Public Health Administration, for the next three years as a volunteer visiting assistant professor.

Dr. Bruce had graduated from the University of Tennessee School of Dentistry in 1946 and earned an MPH degree from the University of Michigan in 1950. Before entering the MPH degree program at Michigan, he was a dentist with the Chattanooga–Hamilton County Health Department and a regional public-health dental consultant for the Tennessee Department of Public Health. Having just joined the USPHS in

1954, he was at the beginning of his career in the public health service but would go on to have a distinguished career. By the time Dr. Frank Law organized the course for the 1961–62 academic year and Dr. Bruce returned as a guest lecturer, Bruce had been promoted to the position of Assistant Chief, Manpower and Education Branch, Division of Dental Public Health and Resources, USPHS. He held the position of assistant surgeon general from 1971 to 1974 when he also was the associate director of operations at the Bureau of Health Manpower. On leaving the USPHS in 1975, he accepted the position of Executive Director of the American Dental Education Association. He died unexpectedly in 1984, at the young age of sixty-three.

Bruce's course, listed as "P.H. 140: Problems in Dental Public Health," met six times at monthly intervals and at night to fit Dr. Bruce's schedule. The first class had four MPH students in the Department of Public Health Administration—John T. Hughes, Earnest A. Pearson, William T. Johnson and David R. Wallace. Dr. Johnson would become the state dental director in Georgia; Dr. Wallace resumed his position as state dental director in Virginia after completing his MPH degree; Dr. Pearson became the state dental director for North Carolina after the sudden death of Ernest Branch; and John Hughes would continue his studies in the Department of Epidemiology as a doctoral student.

Two course packets with handouts for this first dental course offered for academic credit in the School of Public Health were available in the DPH files. One has notes in handwriting recognizable as that belonging to John Hughes who was a student in the course. The objectives of the course were listed in a handout for the first class as follows: (1) to help public-health dental personnel appreciate and understand the basic principles of public-health administration when applied to a program of DPH; (2) to provide assistance in applying principles of public-health administration to a DPH program; and (3) to help DPH personnel organize, plan, and administer a critical, scientific, and comprehensive outlook toward programs of DPH be they local, state, or national.

Seminar Topics, 1957–58 Course

- Nov 18 Introduction (Dr. Harry W. Bruce Jr.)
 - Review of status of dental public health programs
 - Introduction to the mechanics of planning dental health programs
- Nov 25 Indices of oral health (Dr. Robert Weiss)
- Dec 2 Surveys and dental health statistics (Mr. Jack Vermillion)
- Dec 9 Dental Health Education (Miss Elizabeth Warner)
- Dec 16 Program planning (Dr. Harry W. Bruce Jr.)
- Jan 6 Program planning and evaluation (Dr. Bruce, Dr. Weiss, Mr. Vermillion, Miss Warner)

The topics for each seminar are displayed in the adjacent box. The course content is very practice-oriented, as would be expected for a program designed for a master's-level DPH course being offered by a department emphasizing the teaching of public-health administrators and devoted to professional service. The course mostly covered program planning with descriptive information about the public-health-care system. Each session was taught by someone in the USPHS—besides Bruce, there was Weiss, Vermillion, and Warner.

The topics included in Dr. Bruce's first class were: status of DPH programs (program, personnel, budgets and finances); objectives of DPH; functions of public-health dentists; role of state health department dental programs; job of the administration; hypothesis of public-health problems; project assignment; and mechanism of program planning.

Bruce's notes from unpublished course packets described above identify the project assignment for the class: "We are to work on 3 aspects of a state dental program for North Carolina: a dental program for chronically ill adults (21 plus years); plan a dental program for the recipients of public welfare; and plan a caries prevention program for the state." A detailed outline for program planning was provided, presumably specific guidance for students' preparation of their program plans. It contained essential elements of good program planning and criteria for program methods.

Indexes for Oral Health

Definition and purposes of indexes;

Indexes for caries

Standard—DMF, def

Special—Knutson Simplified, increments in the mixed dentition

Practical considerations—time element, examiner differences, reading error in radiographic interpretation

Indexes for periodontal diseases

Gingivitis—PMA

Bone loss

Periodontal disease – Russell's Index;

Indexes for malocclusion

Moore, DFI

Index of fluorosis

Dean, Enamel Opacities

Caries susceptibility tests

Snyder, Lactobacillus Count, Rickles Test, SL Count, SL Colorimetric Tube

The topics covered in the seminar by Dr. Weiss are displayed in the adjacent box.

Mr. Vermillion, Public Health Adviser, Division of Dental Public Health, USPHS, led the seminar on surveys and dental health statistics. He had done research in the 1950s with Donald Galagan on water intake and the optimum level for fluoridation. In the 1960s and 1970s, Vermillion worked with Dr. John Greene on the development of the Simplified Oral Hygiene Index and its use in several epidemiological investigations studying the association between oral hygiene and periodontal diseases.

Vermillion included a detailed manual in his class handouts about measurement of dental diseases, parts excerpted from Massler (1956). He included topics on purpose of surveys (epidemiological studies, program planning, program evaluation); kinds of dental surveys (prevalence, care needs, resources, practices and attitudes); planning and doing surveys—practical considerations: (community and individual involvement, sampling and screening, scheduling, calibrating examiners, recording data); and processing and interpreting survey data (tabular and graphic presentation, pitfalls to avoid, useful statistical methods). Thus the students in Vermillion's class learned that the basic reasons for doing a survey applied to both large and small communities alike.

The outline for the session on dental health education taught by Ms. Warner was: (1) definition and objectives of dental health education; (2) selection of subject matter in dental health education; (3) the role of various types of personnel in dental health education programs; (4) dental health education programs for specific groups—professional and lay groups; (5) dental health education programs in schools—survey of current programs, planning school programs; (6) methods and materials in dental health education; and (7) evaluation of dental health education programs.

Dr. Bruce coordinated the course again in the next academic year (1958–59), and with assistance from the medical staff in the Department of Public Health Administration assumed full responsibility for teaching it in the following two academic years (1959–60 and 1960–61). Two sessions were added for the second time the class was offered. One of the new sessions provided a second session for health education and the other a new topic by Franz J. Maier on “Engineering aspects of Fluoridation.” Maier was a sanitary engineer with the USPHS and an expert on water fluoridation who promoted water fluoridation through engineering techniques.

Dr. Fulton joined the Department of Epidemiology in 1958 as one of five initial faculty members in the department. He developed and taught the first course in dental epidemiology in the spring of 1959, in addition to fulfilling other faculty responsibilities not related to public-health dentistry that he had as a member of the Department of Epidemiology (see Appendix 6.1). Dr. Fulton was born in 1902 in Uhrichsville, a town in eastern Ohio with a population of about 4,500 people according to the 1900 census. He received his DDS degree from Ohio State University in 1925 and

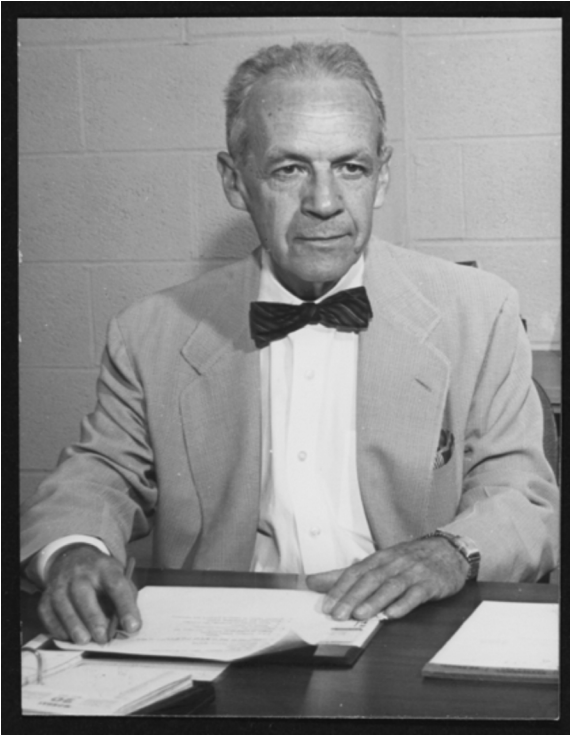


Fig. 15. John Fulton, DDS, MPH.

a degree in public health from the University of Michigan in 1942. He also studied mental hygiene at Ohio State and administration at American University. He practiced pediatric dentistry from 1926–43 and subsequently held positions as Assistant Director of Dental Health in the Ohio Department of Health (1940–43); Director of Dental Health in the Connecticut Department of Health (1943–45); Dental Services Advisor in the U.S. Children’s Bureau (1945–58). He was author of a major publication evaluating school dental nurses in New Zealand (Fulton and WHO 1951; Fulton 1951), and brought an important perspective on dental care to the school, the Department of Epidemiology, and the dental program.

As part of his teaching in the Principles of Epidemiology, a core course required of all students in the School of Public Health, Dr. Fulton included a case study about the New Zealand school dental program as a laboratory exercise. Medical inspections of New Zealand schoolchildren instituted shortly after 1910 regularly found that “decayed and neglected teeth” were the most common defects. Motivated by additional information about the poor oral health of young men gathered when New

DMFT in children 12-14 years of age, New Zealand and selected areas of the U.S.

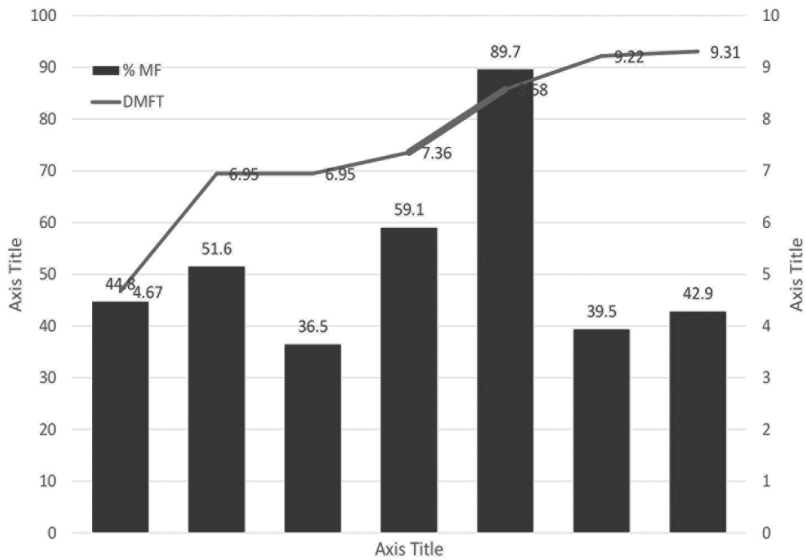


Fig. 16. Dental Disease Data in Children Used by John Fulton.

Zealand entered World War I, New Zealand inaugurated a school-based program in 1921 to provide routine dental care for elementary-school children. By 1950, 97 percent of elementary schools had dental clinics staffed by dental nurses providing regular treatment for children. Fulton provided a table with data (used to construct figure 16) that called for a discussion about several important aspects of the data.

He added further information to the case study about inspections of young men entering the military during World War II. Forty-five percent of men had artificial dentures; 21 percent were completely edentulous. The point being made for discussion, one can assume, is that the school-based program was effective in treating disease but not in primary prevention.

The course in dental epidemiology was required of all dentists enrolled in the Departments of Epidemiology and Public Health Administration. The collaboration between the Departments of Epidemiology and Public Health Administration would provide the foundation for the DPH program for the next era reviewed in this history. These two courses were repeated for the next two academic years, with Bruce and Fulton teaching health administration and epidemiology courses, respectively. Fulton also managed one-on-one seminars with doctoral students in the Department of Epidemiology.

Resources for an Academic Program in Dental Public Health: The Hill-Rhodes Training Grant (1961–66)

Even though the School of Public Health was relying on a visiting faculty member who was volunteering his time and another faculty member who had other responsibilities associated with being a new full professor in a small, growing department, a DPH program began to emerge in the late 1950s and early 1960s. Between the 1957–58 and 1960–61 academic years, the school enrolled twenty dentists, dental faculty lectured in courses in the School of Dentistry, and they helped organize and teach the initial DPH short course in the summer of 1960.

Dr. Charles Cameron Jr., acting chairman of the Department of Public Health Administration, saw the importance and potential for a core set of courses in DPH for dentists like the curriculum designed specifically for physician, nonmedical, and veterinary health administrators who were students in the department. He and his colleagues had taught public health, epidemiology, and medical care administration in the UNC-CH School of Dentistry during the previous four years and were aware of the growing national demand for dentists who held an MPH degree.

A physician with a degree from Vanderbilt's School of Medicine (1948) and an MPH degree from Harvard, Cameron had joined the UNC School of Public Health faculty in 1955 after serving as district health officer with the Tennessee Department of Health and Chief of the Communicable Disease Control and chief of the Accident Prevention Section of the North Carolina State Board of Health.

It is likely that Dr. Cameron also saw this training grant as an opportunity to acquire additional resources to help relieve some of the teaching burden placed on him and his colleagues by the dental school. The department had no training or research grants from any source. At the time, the Department of Public Health Administration budget consisted of approximately \$35,000 from state funds and another \$13,000 from the Rhodes Bill funds to support general program of instruction. The annual award for the dental grant they would obtain was approximately \$22,000, or about 45 percent of the departmental budget.

Dr. Cameron and Dean McGavran applied for a Hill-Rhodes Project Grant for Graduate Training in Public Health to put the emerging DPH program on a firmer basis. During preparation for the grant application entitled, "A Project to Provide Support for the Strengthening of a Program of Study in Dental Public Health Administration," they decided to locate the program in the Department of Public Health Administration rather than Epidemiology or to have a program independent of any of the existing departments. Most dentists applying to the school were interested in public-health management positions in state or local government. Of the fifteen dentists who graduated with an MPH degree between 1962 and 1965, all but two returned to or assumed positions in state or local health departments in Arizona, Georgia, North

Carolina, New Hampshire, New Jersey, or Tennessee; those two went on to work for the USPHS and the Navy. Admission to the Department of Epidemiology was limited to doctoral studies and required an MPH degree to be eligible for admission (Rozier archives, box 2; Memo from Cameron to McGavran, Oct 26, 1960).

That decision by Cameron and McGavran in 1960 would establish the academic home for the dental program in the Department of Public Health Administration (subsequently renamed “Department of Health Administration,” “Department of Health Policy and Administration,” and finally “Department of Health Policy and Management”) for the next sixty years. The decision to have the program located in the School of Public Health was in agreement with the recommendations of several organizations.

The physical home for the department and particularly the dental program moved multiple times as the department grew larger. As mentioned in chapter 3, the dental program, or Institute of Dental Public Health, started in Caldwell Hall, then the home of the medical school, with courses for DPH practitioners in North Carolina. When Bruce and Fulton started their seminars, the department was housed in MacNider Hall. Everyone in the department moved to Rosenau Hall in the early 1960s, when that building was completed. John Hughes always said that one of the offices occupied by the Department of Health Administration in Rosenau Hall had plumbing that would accommodate a dental chair. The plumbing was there, but a dental chair or equipment was never seen. Purportedly, the reason for having the ability to install a dental chair was in case a calibration exercise for measurement of dental conditions was needed, a common exercise in one of the dental courses.

The Hill-Rhodes Training Grant, awarded in 1961 for a duration of five years (Public Health Service, Bureau of State Services, Division of Community Health Practice) funded a full-time faculty position in the Department of Health Administration. The position was filled by Dr. Frank Law for two academic years (1961–63) followed by Dr. Carl Holmes (1963–66) who was in the position for the remaining three years of the grant. Dr. John Hughes (1966–83), the first doctoral student in the Department of Epidemiology, joined the Department of Health Administration after Holmes left to take a position in Tennessee. Hughes was director of the DPH program for thirteen years beginning in 1966. Training grants for two consecutive five-year funding cycles supported the program (1966–72, 1972–77) beyond the initial five years, with the 1966–72 grant serving to support development of a preventive dentistry training program and the third to support training in practice, teaching, and research.

The initial Hill-Rhodes Training Grant (1961–66) provided a needed faculty member to coordinate a graduate-degree program in DPH. But it also set broad expectations for a comprehensive DPH program. Among the objectives of the grant were the following: (1) increase the number of dentists who could be admitted to the department of public-health administration; (2) offer an improved and strengthened program of professional preparation through the availability of a full-time faculty member in DPH



Fig. 17. Frank Law, DDS, MPH.

in the department; (3) provide an opportunity for an expanded curriculum in the graduate program at the master's-degree level through the expansion of the present course and the possible development of new course offerings; (4) strengthen the teaching of DPH in general through augmentation of this area in the basic core courses required of all students in the School of Public health; (5) facilitate the development of a residency program; and (6) stimulate the entire field of DPH through fostering interchange of ideas, experiences, and approaches which would follow the development of this additional program of activity within the frame of reference and philosophy of another education institution devoted to the preparation of professional personnel for careers in public health.

Frank Law's appointment on October 1, 1961, as Professor of Public Health Administration and director of the DPH activities brought to the position a full-time faculty member with thirty years of experience in the U.S. Public Health Service. A graduate of the University of Minnesota School of Dentistry (1931) and the Harvard School of



Fig. 18. Carl Holmes, DDS, MPH.

Public Health (1952), he also brought experience as a diplomate of the ABDPH and board member, being among the first nine candidates, along with John Fulton, who took the first examination administered by the board in 1952. Holmes also was a diplomate of the ABDPH but had less experience in DPH than did Dr. Law, as Law had been dental director of Sullivan County Health Department for two years (1954–56) and Regional Dental Director in Chattanooga of the Tennessee Department of Public Health.

Dr. Law, and subsequently Dr. Holmes, strengthened Dr. Bruce's original course in DPH practice and developed a new seminar course in dental health administration with a strong list of guest lecturers from the USPHS (see Table 6.2). The introductory course, Principles of Dental Public Health Practice, included topics on prevention and control of dental disease and other program areas in DPH such as payment plans and fluoridation. The DPH curriculum was expanded with the addition of two to three other courses, listed as "P.H. 140: Problems in (Dental) Public Health," to explore areas of DPH practice considered essential. Fulton's course in Epidemiology continued to be offered and was required of each class enrolled in the dental program.

Table 6.2: Evolution of MPH courses and content for dental public health, Phase I Foundation Years

Course-Primary Domain (Program Director)	1957-60 (Bruce)	1961-63 (Law) Hill-Rhodes	1963-66 (Holmes) Hill-Rhodes	1966-72 (Hughes)	1972-77 (Hughes)
PH 140	-DPH systems	-Principles of DDPH	-History/phil DPH	-Survey of the theory & practice of DPH, including a description of the NHDD and the current methods of prevention and control in groups.	
HADM 130 (Revised)	-Epid survey methods -Ds measurement -Health Education -Water fluoridation -Program Planning	-DPH practice -Prevention & control -Other, e.g. radiological health chronically ill Payment plans	-Nat history of ds -Biologic, ecologic, social variables -Measurement -Calibration exercise		
Introduction to DPH					
Health Administration					
Prevention					
Epidemiology					
PH 140					
PH 140 (3 credits)					
PH 207					
Dent PH Practice 230-231					
Program Planning / Eval					
Prevention					



PH 307

Survey of Issues

- Chronically ill
- National surveys
- Radiological health
- Prepayment plans
- Legislation & workforce
- Social sciences
- Fluoridation
- Research Bureau State Services



Fulton

EPID 261

Epidemiology

- Etiology of dent ds.
- Ds. Measurement
- Tooth eruption
- Tooth mortality
- Biological factors
- Social structure
- Cultural factors
- Physical habitat
- Determinant processes

Designed for study in epid methods as applied to dental diseases, including dental caries, perio ds, dento-facial deformities, growth problems, & manifestations of systemic ds.



Hill-Rhodes Training Grant

A Graduate Public Health Training Grant: "Dental Public Health" [July 1, 1966 – June 30, 1971]

Dental Public Health Practice, Research and Teaching. 1 D04 AH01130-07; Division of Allied Health Manpower, BHMS, NIH

The syllabus for the seminar course developed by Dr. Law is provided in Appendix 6.2. The purpose of this course was to: (1) help DPH personnel appreciate and understand the basic principles of public-health administration when applied to a program of DPH; (2) provide assistance in applying principles of public-health administration to a DPH program; and (3) help DPH personnel organize, plan, and administer a critical, scientific, and comprehensive outlook toward programs of DPH, be they local, state, or national.

The *Chapel Hill News* (March 26, 1962) announced the availability of the seminars to the university and town communities. The article described these dental seminars as having been made possible through a grant from the USPHS to the School of Public Health to “develop a teaching program in public health practice” for dentists enrolled in the Department of Public Health Administration. The article acknowledged that Dr. Law oversaw the program.

The Hill-Rhodes Training Grant established an initial framework for the DPH program and created from the beginning strong expectations for teaching and service on campus and beyond. The position was envisioned as an on-campus and state-wide advocate for dental public health. Dr. Law, and later Dr. Holmes, lectured on public health programs and preventive methods in the Departments of Maternal and Child Health, Public Health Nursing, and Nutrition, and they gave general public health courses within the Department and School of Public Health. In the school of dentistry, Law and then Holmes taught DPH to dental assistants, dental hygienists, undergraduate dental students, and dentists in graduate programs. It is not clear from the remaining records if the course was ever taught, but mention is made of an intriguing and likely unique seminar for specialists in which their role in public health was to be explored.

Ties were maintained with the state health department through partnerships in the development of the DPH residency program described in the previous chapter and continuing education for public-health professionals. By the end of the Hill-Rhodes grant in 1966, from six to ten credit-hours of required classes for dentists enrolled in the Departments of Health Administration and Epidemiology had been added to the curriculum. Nineteen dentists completed the program during these five years.

William Mayes, who authored an account of the School of Public Health during his deanship (which he held mostly in the 1960s), wrote that one of the half-dozen or so “firsts” in the university attributable to the School of Public Health was “the provision of the faculty and facilities for a teaching program in dental public health, leading to the MPH degree” (Mayes 1975, 31).

Strengthening the Dental Public Health Program; Graduate Training Grant: “Dental Public Health” (July 1, 1966–June 30, 1971)

The Department of Health Administration was successful in securing a five-year NIH training grant in 1966 to “prepare dentists for careers as teachers of preventive dentistry.” Funding was awarded after a site visit in March 1966 chaired by Dr. Wesley O. Young, Chairman of the Department of Community Dentistry at the University of Kentucky. Drs. Elmer Hill and Stanley Lotzkar represented the USPHS in the visit. John Hughes was recruited to the university to fill the position of Associate Professor of Health Administration and director of the PDH program, a position supported by the new Hill-Rhodes Training Grant funded by the Bureau of Health Manpower of the USPHS.

The training plan was developed in collaboration with the School of Dentistry and its faculty, who had just implemented its preventive dentistry curriculum for dental students under the leadership of Dr. Ben Barker. The preventive dentistry movement was gaining momentum in the country as the dentist workforce shortage became more acute. Faculty at UNC-CH believed that dentists trained in public health and preventive dentistry would be needed to fill new positions in the nation’s dental schools and large number of dental auxiliary training schools, as teaching demands increased for preventive dentistry.

The proposed training plan required two calendar years of study (seventy semester hours) for an MPH, with courses in the School of Public Health and Dentistry, field study, and a thesis. Substantial opportunities were available in the School of Dentistry for the required practice teaching. About forty courses devoted to preventive dentistry were distributed throughout the undergraduate dental school curriculum, and some 300 hours of supervised clinical instruction for students in upper classes.

The plan was never fully implemented, likely because it required two years of study and provided no individual stipends for students. This period also was a time of transition in the department. Dr. Robert E. Coker Jr., a Vanderbilt-trained physician, former director of the North Carolina syphilis prevention and control program, and long-time chair of the department (since 1947), died during the first year of the grant. An acting chair was appointed, followed by Dr. Morris Schaefer who was in the position for only three years. The next chair, Sagar Jain, was appointed to develop a mission that would respond to the changing health-care environment.

Yet the lack of progress in implementing the program for training in preventive dentistry did not affect funding for the training grant. The National Advisory Committee on Public Health Training in approving the application recommended that the project could continue, essentially supporting teaching of the dental aspects of the master’s degree program in Public Health Administration. The exact wording

of the award letter was as follows: “The NC School of Public Health should not feel compelled to move into the new areas outlined in its proposal although this movement would be desirable if developments in the Schools of Public Health and Dentistry make it appropriate.” Dr. Hughes continued to refine the DPH curriculum in the master’s degree curriculum in the department, formalized contributions to the School of Dentistry, and continued partnerships with the state health department begun under the Hills-Rhodes Training Grant. Courses were offered in the School of Dentistry for dental hygiene students (DH44: The Dental Hygienists in Community Dentistry; and DH48: Community Dentistry II) and dental students (DENT 173: Natural History of Disease and Its Control; and DENT 192: Dental Public Health).

The additions and enhancements to master’s degree courses resulted in three well-developed courses in DPH, or about 20 percent of the total credit-hours completed during the academic portion of the year. Thus, the standard for curriculum time for the specialty program was set. The academic standards committee, faculty, and administration face constant pressure to expand the curriculum as knowledge, skills, and competencies for a core public health function like management expand. The decision to locate the specialty program in a department, one like the Department of Health Policy and Management with a rather diverse overall curriculum but compact programs that, require goodwill on the part of the department to support a rather small program. Centralization of the MPH degree at the school level in the late 2010s and early 2020s will require that the academic home for the dental program be considered once again.

HADM 130 Dental Public Health

Fall 1968

- History & Philosophy of Public Health
- Development of Dental Public Health
- Measurement of Dental Ds.
- Life Cycle of Teeth
- Natural History of Dental Diseases
 - Study design
 - Biologic characteristics
 - Ecologic Characteristics
 - Social characteristics

HADM 230: Dental Public Health Practice

Spring 1971

- Planning & Evaluation
- Federal Programs
- State & Local Programs
- Organization & management
- Preventive Dentistry
- Dental Health Education
- Research & Development
- Dental care & Delivery Systems
- Workforce
- Dental Legislature & Financing

HADM 130 (outline in box) and HADM 230 (outline in box) were fall- and spring-semester courses, respectively. Responsibility for Dr. Fulton's course in epidemiology (EPID 261) was assumed by Hughes and eventually moved into the Department of Health Administration.

During the grant, thirty-six dentists completed the MPH degree. Four (Hughes, Schonfeld, Williams, Duany) completed doctoral degrees on the following topics: microbiological study of caries free and caries-active students; family patterns of dental disease; periodontal diseases and unmet dental needs; and sialic acid and dental caries.

“Hanging by a Thread!”

Project Grant for Graduate Training in Public Health: “Dental Public Health Practice, Research and Teaching” [07/01/72–06/30/77; 5 D04 AH 01138-09]

Under the Great Society programs of the 1960s, the health-care system in the United States became more complex and required steady and substantial increases in resources to maintain its expected delivery of health services. By the 1970s, the financial impact of the expansion of health-care activities that had begun in the 1930s, compounded by federal programs in the 1960s, became apparent as they consumed larger and larger portions of health-care expenditures. It became a national objective to contain health costs caused by social programs such as Medicare, Medicaid, and Head Start.

Faculty in the Department of Public Health Administration were unprepared to adjust the curriculum to the rapidly changing health-care system. Bill Herzog, who

joined the department in 1964, was quoted in as saying, “The Department of Health Administration at the time didn’t have much depth. Most of the principal faculty were physicians. It wasn’t until the late sixties that they began pulling in faculty who were trained in public administration, sociology, health care finance, and health care administration” (Korstad 1990, 124).

The demographic characteristics of students enrolling in graduate public-health programs also were changing. Enrolling students were younger and had less public-health experience than students in the past. Some of the dentists applying to the program no longer had real-world experience in public-health programs, either clinical or administrative, being just out of dental school, some without major community-outreach programs. A typical dentist applicant in the past had from five to eight years of clinical experience in a public-health program and had at that point had decided to make dental public health a career. Dentists just graduated from dental school seemed to have different expectations for teaching methods, which required different pedagogical strategies on the part of faculty. They were more likely to be passive learners compared to dentists with experience and even non-dentists in the graduate program.

The 1960s was a period of rapid growth for the School of Public Health. But growth was uneven across departments and generated anxiety among some faculty who saw a divide developing between primarily research departments and teaching departments. Epidemiology, Biostatistics and Environment Science, and Engineering expanded rapidly because of the availability of funding, largely through the NIH and various foundations. Their success in gaining grant funds meant that they did not have to rely solely on state funds to expand. In 1962, the school had a budget of almost \$2 million, with just over \$1 million coming from the USPHS. By 1972, the USPHS contributed \$3.5 million out of an \$8.3 million budget (Korstad 1990, 111). Conflicts were created over the mission of the school, where long-standing traditions favored teaching and service over research. The Department of Health Administration was one of the larger departments, but it had little research funding from sources like NIH. A critical mass was lacking in emerging research areas, and demand for continuing education courses and consultation services remained strong. The research expectations and productivity of faculty in the Department of Health Administration would remain an issue for years to come.

The limited exposure of faculty to current health-delivery issues was evident in the classroom and led to student complaints about the quality of teaching. Sagar Jain became chair of the department in 1971 and undertook a plan to address concerns about the department. His undergraduate degree was in economics, and he had earned a PhD degree from Cornell University in 1964, where he studied organizational behavior, public administration, and sociology. He set about hiring faculty with training in operations research, finance, and economics, and he emphasized teaching

using group seminars to help address concerns about the quality of teaching in the degree core courses. But creating an environment for research was not a priority of his.

The name of the department was eventually changed from the “Department of Public Health Administration” to the “Department of Health Administration” to acknowledge the broader orientation of the department beyond public-health agencies toward the entire health-care system. The change also acknowledged that “health administration” constituted a body of theoretical and practical knowledge about the formulation and execution of public policies, transcending the management of programs in public agencies.

Enrollment in UNC’s dental program declined in the early 1970s, as part of a national trend. Meskin and Block (1975) had predicted the harmful effects of the “New Federalism” on education in dental public health, and it was becoming apparent that their prediction was correct. For the decade from 1960 to 1969, 56 dentists received the MPH degree from UNC-CH; in the following decade only 28 received it. The types of positions available to graduates also changed dramatically. Of the 64 dentist graduates of the program in the 1953–70 period who held known positions, 17 were state administrators, 18 regional or local administrators, 10 federal administrators, 7 were in teaching positions, 3 research positions, and 9 in other positions such as further studies or clinical positions. Up to 1970, 70.3 percent of graduates went into administrative positions. During the 1970s, fewer than one half of the graduates assumed administrative positions upon graduation. Of the 19 graduates during academic years 1972–76, 7 (36.8 percent) went on to become faculty in universities or colleges, 8 (42.1 percent) held positions as director or assistant director of a state or local dental program, and 4 (21.0 percent) obtained other types of positions.

The number of dentists and dental hygienists in long-term training nationally who were supported with federal funds peaked at close to seventy in 1972 and declined rapidly thereafter (Rozier 1997). More dental professionals were in training during this single year than in all other years in the subsequent two and a half decades. The number of dentists in DPH residencies supported with DHHS funds declined from a high of 24 in 1973 to 0 in 1983, when dentists were no longer eligible for this funding. Gaps in the front lines of DPH practice were readily apparent. By 1999, the dental director’s position in twenty states was either vacant or filled by a part-time person. Fewer than 10 percent of county or city health departments had dental programs. Only 20 of the 55 U.S. dental schools had a diplomate of the ABDPH, severely limiting the presence of dental public health in predoctoral dental education (Kaste et al. 1998).

In this difficult environment, the five-year Project Grant for Training in Public Health entitled “Dental Public Health Practice, Research and Teaching,” with Dr. Hughes as director, was awarded in 1972. The objectives of the new training grant were to: (1) strengthen the graduate training program of the School of Public Health at the master’s-degree level specifically designed to prepare DPH personnel for careers in

general or special aspects of dental health administration in official, voluntary, and private health agencies at the local, state, and national levels; and (2) establish a graduate training program in the School of Public Health at the doctoral level to prepare DPH personnel for careers in research and teaching.

The emphasis of the program for these five years was on teaching DPH in the master's program in public health administration, basically a continuation of the previous training grant.

The grant activities devoted to the training of DrPH graduates for research positions (objective no. 2) did not materialize. UNC's Graduate School had just approved the program of doctoral studies for the Department of Health Administration in 1968, and authorization was granted for the department to provide studies leading to the degree of Doctor of Public Health. The theoretical basis for the program was health administration and organizational behavior of large, multidimensional organizations that had little direct or strong relevance to small, one-dentist dental offices and related policies. The proposed doctoral program also can be considered "ahead of its time."

After Dr. Coker's death, Morris Schaffer was appointed chair. These administrative changes led to a period of developmental changes and growth in the department. Research disciplines needed to supervise students were not available and were to come later. As the department gained faculty in economics, medical care, finance, quality of care, and dental health services research, the number of doctoral students completing a degree in the department increased.

The structure and content of coursework for the DPH curriculum continued as it had evolved in the previous grant periods. Three DPH courses introduced students to public-health practice and the organization of oral-health services.

The content of courses taught during the early to mid-1970s was not based on a cohesive framework but adjusted to appropriately address changes in DPH knowledge and practice. Revisions in subsequent years ensured that the courses addressed priority knowledge, competencies and skills recommended in the *Behavioral Objectives in Dental Public Health* (Hughes 1978) and subsequent updates. From the late 1970s on, the "curriculum" in dental public health consisted of nine credit-hours of classroom time, six weeks of field training, and a master's paper.

Introduction to Dental Public Health, Fall 2000

The Dental Public Health Tradition

- Philosophy & practice of dental public health
- The scientific method & dental public health
- Knowledge & skills needed for DPH

Community Diagnosis and Data Needs in DPH

- Community diagnosis: risk vs. population strategy

Dental Delivery System Goals

- Healthy 2000 goals
- Healthy People 2010 goals

Delivery of Dental Health Services

- Structure of U.S. Dental Health Care System
- Financing dental care
- State & local programs
- Federal programs

Reform of the U.S. Health Care System

- U.S. experiments in financing dental care
- National-level reform
- State-level reform

In the 1960s and 1970s, the departmental curriculum was flexible enough to accommodate DPH electives, allowing for at least nine credit-hours. The expanding time devoted to dental public health in the MPH curriculum, allowed for more depth of inquiry and a more logical allocation of content across courses available in the overall MPH curriculum. For example, Bruce's initial course in 1957–58 provided about eighteen hours of class contact time. The three-course curriculum in DPH that was to evolve over the next several years provided from thirty-five to forty-five clock-hours per course of contact time, not counting field training or research related to the master's paper.

Students enrolled for six weeks, full-time, in the summer to meet their field training requirements. Their placement locations varied according to the interests and needs of the student with placements in other academic units on campus like the Sheps Center, but mostly in the state health department or other practice-based positions at the state or federal levels.

An outline of content for the three, core dental public health courses is included in adjacent boxes; the purpose for each course is included as text in the following paragraphs.

Introduction to Dental Public Health (2000): *The purpose of this course is to expose the student to the philosophy, practice and scope of dental health as it exists in the healthcare system today. Four areas identified by the American Board of Dental Public Health as knowledge needed for the specialty practice of dental public health (adminis-*

tration, research, prevention and control of oral diseases, and delivery and financing of dental care) will be used as a framework for examining dental public health practice. The emphasis will be on basic knowledge and skills necessary for the planning and evaluation of public programs: understanding the organization, delivery and financing of oral health care, primarily in the United States, and how public health dentistry does and should fit into the health care system. This course forms the basis for in-depth studies of oral health are (HPAA 227: Dental Public Health Practice) and oral epidemiology (HPAA 228: (Oral Epidemiology: Administrative and Policy Implications) in the second semester of the dental public health program. The primary focus of HPAA 263 is on methods available for the prevention and control of oral diseases, an area not dealt with in this course.

Dental Public Health Practice (2003): Dentistry has a rich tradition in the promotion of oral health and prevention of oral diseases. Research begun in the mid-1940s has resulted in many prevention measures that can be used safely and effectively by individuals, health care providers and the community. This course will review the evidence of effectiveness for these major methods, with an emphasis on community interventions available to the public health practitioner. It also will concentrate on major systematic reviews and resulting recommendations of major organizations.

This course will use a problem-based approach to learning how to evaluate information for use in dental public health decision-making. Several recent preventive dentistry documents will be reviewed and discussed, and key issues identified. Students will cover these issues or others that they might have faced in everyday clinical or public health practice into questions that need to be answered in order to improve public health practice. Then they will search the literature for the best evidence to answer these questions, critically appraise the evidence for its validity, impact, and applicability, and provide their best answer to the question. Findings will be presented in a 10-page paper and presented at the end of the semester.

HPAA 227: Dental Public Health Practice

Spring 2003

Science of Prevention

- Prevention & its value
- Evidence-based practice & examples

Methods of collating evidence

- Is health education effective?
- Are fluoride gels effective?
- Are fluoride varnishes effective?

Evidence-based reports on of oral ds.

- York Water Fluoridation Report
 - CDC Fluoride Report
 - Guide to Community Preventive Services
 - Surgeon General's Report on Oral Health
- Class presentations on review

Oral Epidemiology (1983): *Epidemiology can be viewed both as a specific body of knowledge concerning various states of health and as a scientific method of study. Thus, it is appropriate to talk of "the epidemiology of" dental caries or periodontal disease, i.e., the specific body of epidemiology knowledge concerning these two diseases. It also is appropriate to talk of "an epidemiological investigation" to determine the factors responsible for any disease or disorder. This course is concerned mainly with familiarizing students with the epidemiology of dental diseases and conditions, primarily dental caries and periodontal disease. As time permits, other dental conditions such as edentulousness, or cancer, enamel opacities, and malocclusion will be studied. About 20 percent of the course will be devoted to "epidemiological methods" and their application to dentistry. A basic understanding of epidemiology as a method of study, i.e., the scope, potentialities and limitations of this approach, at the level of the introductory course taught in the Department of Epidemiology is a prerequisite.*

Oral Epidemiology for Health Administration

Spring 1983

- Epidemiological model & methods
- Ethical considerations in epidemiological investigations
- Biological & time determinants of caries
- Ecological determinants of caries and enamel opacities
- Nutritional & dietary determinants of caries
- Incidence & progression of caries with administrative implications
- Biological determinants of perio Ds
- Time determinants of perio Ds
- Incidence & progression of perio Ds
- Oral cancer, cleft lip & palate

Curriculum content was allocated across the three courses in a more logical and integrated manner. The course that Dr. Bruce taught can be considered the equivalent to the introductory course in the three-course curriculum. His course had several sessions devoted to epidemiology, including measurement of dental diseases. This content was later moved to the oral epidemiology course. Program planning remained a small part of the introductory course, but one of the two follow-up courses increasingly was devoted to prevention of oral diseases, both individual and population interventions. The study of preventive methods became less descriptive and was taught almost entirely using evidence-based practice as the framework.

During the early 1970s, the DPH program in the Department of Health Administration seemed to be hanging by a thread. Dr. Hughes had assumed the position as Director for Continuation Education and Field Services for the School of Public Health, which was a full-time position, but he continued to teach and supervise dentists in the department. Later he would be Deputy Chair of the Department of Health Administration. The DPH program was at a crossroads, with a decision to be made about continuing it at the end of the grant. The DPH program at UNC-CH seemed to be reflecting the national landscape for DPH education, which had been predicted with the development of “New Federalism.”

In 1979, the Department of Health Administration undertook a self-review to develop a vision for the future. Lead faculty in the eight interest areas in the department (health policy, health planning, community health administration, medical care and hospital administration, human services administration, dental public health, population policy program management, and mental health policy administration) developed position papers for their interest areas. The position papers reviewed the current status of teaching, research, and service; they also made projections and recommendations for the number and types of students, faculty, and research. The results of this departmental review supported continuing and strengthening the DPH program within the department.

A bridge to Phase II and the future of the DPH program was provided by the W. K. Kellogg Foundation when it funded a comprehensive project in 1976 to determine dental workforce needs for North Carolina. The Schools of Public Health and Dentistry, the Sheps Center for Health Services Research, the North Carolina Dental Society and the Oral Health Section joined forces to conduct different components of the workforce study including: (1) a repeat of the statewide oral health survey (*Natural History of Dental Disease*) done in 1960–62; (2) determination of the supply and distribution of dentists in the state; (3) a survey of dental practices to determine their productivity; (4) a study converting epidemiological oral-health status data into treatment needs; and (5) likely demand for dental services. Coordination of the different components was led by Jim Bawden (representing the School of Dentistry), Gordon DeFries (representing the Sheps Center for Health Services Research), Alex Pearson



Fig. 19. Gary Rozier as an Assistant Professor.

(representing the Oral Health Section) and John Hughes (representing the School of Public Health). John Hughes hired Gary Rozier in 1976 as a research assistant professor of Health Policy and Administration to help coordinate the statewide epidemiological survey and assist with teaching dental public health.

John Hughes continued to coordinate the DPH program until his retirement in 1983, when Rozier assumed that responsibility for the next thirty years. The different programs implemented in the next several years collectively increased the number of students. The University of North Carolina at Chapel Hill had a strong faculty with expertise in dental public health who taught one or more of the DPH courses, mostly in the 1990s, as described in the next section.

The Era of Dental Public Health Program Expansion (1977–1999)

“The Magic Lantern”

This era in graduate education at the UNC-CH School of Public Health is characterized by an increase in the number of options for dentists and dental hygienists to obtain master’s and doctoral degrees while studying dental public health. Seven “programs” were available during this period: (1) Joint MPH-DDS program (1976–77); (2) informal agreement with the U.S. Army (1979–80); (3) formal agreement with the U.S. Public Health Service (1986); (4) the Executive Master’s Program Dental Tract (1986); (5) the PhD in Oral Epidemiology Program (1990–2005); (6) a dual pediatric dentistry–MPH degree program (and other specialty programs) (1995–2005); and

(7) a PhD Program in Health Services Research offered in conjunction with the Sheps Center for Health Services Research (1997–2000).

Thus, specific pathways were provided for dental students, active-duty military and public-health-service dentists, dentists working in an administrative or other public-health positions, pediatric dental residents, and those showing promise as a researcher to obtain degrees in public health. Three traditional degree programs remained available: the residential eleven-month MPH degree program, the residential twenty-four-month MSPH degree, and the DrPH degree in public health leadership, available to students who did not fit into one of the seven program categories. The number of dentists enrolled in the program during the period increased as well.

This period also is characterized by an increase in the use of educational technology, particularly in the remote-learning degree programs. The subtitle for this section, the “Magic Lantern,” a predecessor of the slide projector, is used to emphasize progress in this area.

Joint DDS/M(S)PH Degree Program (1976–77)

A conjoint DDS/MPH degree program between the School of Public Health and the School of Dentistry was approved in 1977, giving undergraduate dental students the opportunity to work toward a master’s degree in public health while enrolled as a dental student. Development of the program was led by Dr. Chester Douglass (1971–78) who had joined the UNC-CH faculties of dentistry and public health as an assistant professor in 1971 after receiving his PhD at the University of Michigan.

Douglass lectured in several courses including a course on evaluation techniques in public health that he taught along with Dr. Dennis Gillings, the namesake for the School of Public Health. During his time at UNC-CH, he was involved with at least four research projects funded by the Bureau of Health Manpower and other agencies. The projects included an evaluation of extended functions for dental assistants in solo practice; the evaluation of peer review quality control mechanisms and standards in private practice; the effects of dental insurance on utilization, need for care, and health status; and public policy options for better dental health. He also developed the joint DDS/MPH degree program and served as its coordinator for dental students. He was on a leave of absence during the 1975–76 academic year as a Robert Wood Johnson Health Policy Fellow, soon after which he accepted an appointment at Harvard University, where he was professor and chair of the Department of Oral Health Policy and Epidemiology for thirty years. He continued to be very active at UNC-CH after retiring to Chapel Hill in the mid-2010s. A board-certified public-health dentist, Dr. Douglass was president of the board in 1991–92, and coordinated the Board preparation course at Harvard and then at UNC-CH after moving to Chapel Hill.

The proposal for a conjoint program for dental students was strongly endorsed by the deans of the School of Dentistry and the School of Public Health. In his letter to Vice Chancellor Lyle V. Jones in August 1976, Dr. Raymond P. White, dean of the School of Dentistry, wrote,

In my view this proposal facilitates the development of a most important program in the area of dental health with long range implications for our students and for citizens in North Carolina. It is the capacity for programs of this type coupled with excellent efforts of individual schools that has gained the University of North Carolina its just reputation.

In his letter of support, Dr. B. G. Greenberg, dean of the School of Public Health, emphasized the “pressing need to recruit and train qualified public health dentists, as is demonstrated by the number of unfilled positions in the NC Division of Health Services and similar agencies elsewhere” Approval by the Graduate School meant that the joint degree could be earned by dental students in 4.5 years instead of 5, as would have been the case if the programs were not integrated.

Dr. Jones notified Greenberg and White that the Administrative Board of the Graduate School had approved the joint DDS/MPH degree program. Specifically, “the Board authorized the counting of as many as 15 credit hours in the Public Health coursework both for the MPH Degree and the DDS degree.” Elective course and clinic time in the dental school curriculum were to be used to meet MPH requirements.

U.S. Army and U.S. Public Health Service

Arrangements with the U.S. Army and U.S. Public Health Service in the early to mid-1990s were described in a previous chapter. Under these arrangements, dentists enrolled in the master’s-degree program in the UNC-CH School of Public Health and then the DPH residency program. However, the USPHS chose some candidates for the program who already had an MPH degree, so they enrolled directly in the residency, in either the North Carolina or South Carolina health departments. The Army dentists enrolled in the Department of Health Policy and Management, while the USPHS officers were required by their funding agency to enroll in the Department of Maternal and Child Health. Both departments required the same core classes in public health and dental public health.

Graduates sponsored by the military, primarily in the 1980s, became known as “Rozier’s Rangers.” They spread around the globe conducting research such as preventing injuries to the oral and maxillofacial area of the head, documenting the prevalence of oral conditions affecting soldiers, developing systems to triage soldiers for deployment to battle zones based on their oral health status, and formulating policies and implementing and administering programs to prevent oral diseases.

Remote Learning Master's Degree in Public Health

"I am today allocating \$3,000 State Appropriations to match the Federal Grant obtained for developing the off-campus master's program to be offered in Raleigh. This is an experimental program that is to be tried out for the first year, and at the end of the first year it should be evaluated before it is continued for a second year."

- Dr. Jacob Koomen, State Health Director, July 29, 1969

Little did Dr. Koomen or others imagine that the program with all its successes would be celebrated fifty years later. The Department of Health Policy and Management at UNC-CH has become known nationally for its distance-learning programs. It was among the first if not the first university in the United States to offer an off-campus master's degree designed especially for working health-care professionals.

In the fall of 2020, it celebrated fifty years of continuous operation and its sixty-ninth cohort of students. Under Dr. Schaefer's leadership, the school initiated the Off-Campus Master's Degree Program to allow employees of state and local health departments to complete degree requirements on a part-time basis while they continued to work. Students received an MPH in health administration at the end of three years. Faculty traveled to Raleigh to teach classes for the first cohorts of students, followed by programs in Asheville in 1974 and in Fayetteville in 1977. The school added a degree in public-health nursing, taught in Greenville in 1977 and Hickory in 1980. As the program evolved, courses were offered in Chapel Hill but with increasingly less time on campus as distance learning technology permitted. Now the instruction is accomplished almost entirely through distance learning with only a few days on campus each semester.

A brochure described the purpose of the program and its students as follows:

Program Purpose? The Executive Master's Program is designed to provide graduate level education to employed health professionals and health administrators. This program has been in operation for 20 years and is based on more than 40 years of residential program experience. The program emphasis is on providing comprehensive, high quality, flexible learning to mid-career professionals. Graduates earn a Master of Public Health degree, (MPH with a concentration in Management or in Dental Public Health), or a Master of Healthcare Administration (MHA) from the School of Public Health, University of North Carolina at Chapel Hill through the Department of Health Policy and Administration.

Who are the students? Students in the EMP represent a wide array of health professionals who bring to the program the benefit of their aggregate expertise from years of practice experience in the field. Approximately half of the students have training in the clinical health sciences (medicine, dentistry, nursing, pharmacy, laboratory sciences, etc.) and half have previous education and/or experience in management. The educational methodology of the EMP maximizes the potential for group learning and the sharing of knowledge among professionals with diverse perspectives and experience.

A small number of dentists enrolled in the off-campus program, which did not have specific coursework for dentists in the beginning. By 1984, two dentists had completed the program and four were enrolled. During the spring semester of 1984, an elective course in DPH was offered for these dentists that consolidated content of the nine credits of DPH coursework in the residential DPH curriculum into one, three-credit-hour course. Based on the experience with this course and general interest of enrolled students, the decision was made by Dr. Schaefer, director of the Executive Master's Program, Moses Carey, coordinator of the program, and Gary Rozier, course director, to make courses available to dentists and dental hygienists on campus in the nonresidential program on a recurring basis. In 1986, dentists and dental hygienists in the nonresidential program were given the option of enrolling in the DPH tract or the management tract. The curriculum and course content for the DPH courses were identical to the course of study for the MPH degree offered on-campus.

Renamed the Regional Degree Program and then the Executive Master's Program in 1990, the off-campus program integrated the DPH courses into the schedule for the required MPH degree courses. Courses were taught over 2.5 years, including fall, spring, and summer sessions. Some DPH courses were taught in five-week summer sessions. Others were taught in short on-campus sessions at the beginning and end of the class with use of distance learning in between. These courses were usually about 7.5 days at the beginning of the course and 2.5 days at the end with weekly class meetings in between, usually held at night to accommodate working schedules. In the early years, weekly classes were held by telephone conference call. Like on-campus courses, students were provided reading materials, PowerPoint slides, and assignments for discussion.

Education Technology

The evolution of classroom technology

- Magic Lantern glass slides and projector
- Black boards, white boards
- Poster Boards
- Transparencies and overhead projectors
- Reel-to-reel tape and 35 mm slides
- 35 mm slides with carousel projector
- PowerPoint with computer
- Course pack and copy machine
- Teleconference
- Internet-based Learning Management Systems

Beginning in the 2000s, a succession of learning management systems (LMS) were used for teaching in the Executive Master's Program. FirstClass, one of the earliest Internet-based LMSs, was first used in the early 2000s. Then Blackboard was used from 2002 to 2010, after which the switch was made to Sakai. These LMSs allowed online synchronous class meetings, interactive discussions, posting of course syllabi, assignment of reading materials, access to documents on the Internet, and options for students to complete their work.

The Executive Master's Program provided the opportunity, if not necessity, to rely on educational technology. Use of Internet-based LMSs like Blackboard were part of a history of the progressive use of new and different technologies to support and supplement nontraditional learning.

The oldest of these technologies was the "magic lantern," an early type of image projector that used pictures on transparent glass plates and various light sources. They were widely used from the eighteenth century through the mid-twentieth century, when they were replaced by 35 mm photographic slides and the carousel projector. It is unlikely that magic lantern technology was ever used in the DPH program at UNC-CH, but the DPH files in the Department of Health Policy and Management contained about two dozen glass slides. They are from Dr. Fulton's collection, dating from his time at the Children's Bureau in 1945–58 to the early 1960s during his time at UNC-CH.

Dr. Hughes was famous for his artistic, hand-made poster boards, 22 x 28 inches in size, displaying health-care and epidemiologic data. Not only did he use them in class and short courses, but he periodically placed selected posters, like one on the adoption rates for water fluoridation, at strategic locations in the halls and on bulletin boards around Rosenau Hall, hoping to educate students, faculty, and staff about oral health.

Widely used in the 1970s for displaying data were overhead transparencies made using a copy machine. They were popular because they could be produced quickly, were inexpensive, and adaptable to many teaching styles. Hundreds of transparencies were produced and used in the Department and at scientific meetings until the early 2000s when they were replaced with more advanced methods of projecting information.

The Dental Health Center in San Francisco produce several educational modules consisting of reel-to-reel tapes and 35 mm slides. One module used for a few classes in the UNC-CH program was a four-unit course module on research with the following titles: (1) Introduction to Research Planning; (2) Research Planning—Why and What?; (3) The Characteristics and Functions of a Research Protocol; and (4) The Content of a Research Protocol. This module and teaching method never caught on at UNC-CH.

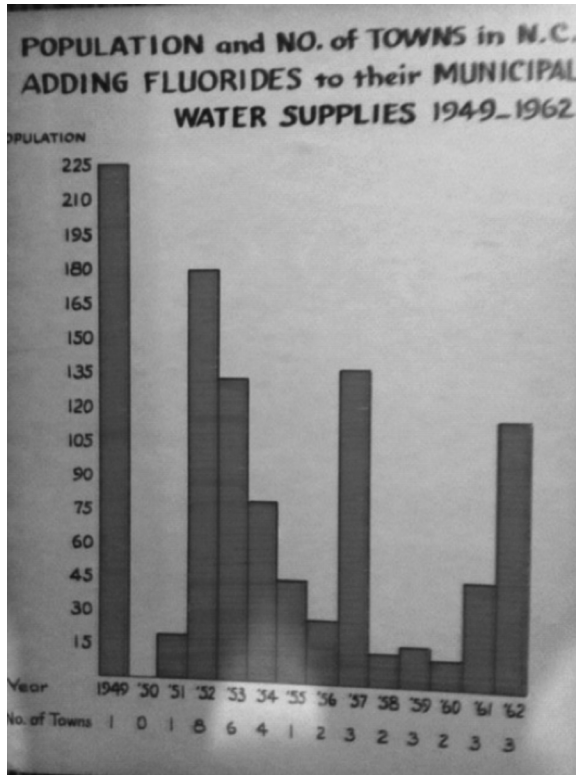


Fig. 20. John Hughes' Oral Epidemiology Poster.

The 35 mm slide and carousel projector were widely used in classes and professional meetings until the mid-2000s. Once digital photography became available, there was little need for projection with a carousel.

One of the most significant advances was Harvard Graphics and then PowerPoint, which facilitated the production of images that could be used with a 35 mm slide projector or the computer. Slides were produced by Medical Illustrations and Photography, a unit in the Medical School that provided art and photographic services for faculty and staff of the School of Medicine, North Carolina Memorial Hospital, and other university departments from 1953 until 2007, when the School of Medicine closed it because of declining demand after images could be produced and projected with a computer. The School of Dentistry had its own illustrations and photography unit for a while.

The structure of the Executive Master's Degree Program has gradually changed with the goal of reducing the length of time required for the degree from three to two years; reducing the amount of time on campus by eliminating summer sessions and



Fig. 21. Students Enrolled in Dental Public Health, 1993.

replacing them with three on-campus sessions per year (eight workdays, six weekend days); and elimination of the MPH degree. With these changes, the retirement of Dr. Rozier, and departmental policy that class size had to be at least six students for the course to be offered, the DPH tract in the Executive Master's Program was discontinued. The last MPH cohort was admitted to the dental public health tract in 2017. The MPH degree is now a school-wide degree taught online. Discussions are ongoing about how best to integrate oral health into that curriculum. About thirty-six students graduated from the program.

Additional Faculty in the Master's Program

The options for obtaining a degree added to the teaching load for MPH dental courses, mostly taught by Dr. Rozier in the 1980s and 1990s. The increase in the number of courses and students came mostly from the additional students in the dental tract of the Executive Master's Program. Faculty were recruited to teach some of these courses, included Drs. Jane Weintraub, Ronald Hunt, Samuel Arbes, and John Elter.

Dr. Jane Weintraub joined the UNC-CH faculty in 1988, with a joint appointment as an assistant professor in the Department of Dental Ecology in the School of Dentistry and the Department of Health Policy and Management in the School of Public Health. She taught the DPH course in program planning and oral health prevention strategies both in the Executive Master's Degree Program and the traditional residential MPH degree program.



Fig. 22. Professor Jane Weintraub, DDS, MPH.

She brought experience to the position from two other DPH graduate programs. Dr. Weintraub earned her DDS from the State University of New York at Stony Brook's School of Dental Medicine in 1979. She received her graduate training in public health and dental care administration from Harvard University and practiced dentistry in neighborhood health centers in Boston. In 1982, she began her career in academia at the Harvard School of Dental Medicine, followed by several years at the University of Michigan.

After seven years with UNC, Dr. Weintraub accepted an appointment at the University of California, San Francisco's School of Dentistry as the school's first endowed chair, becoming the Lee Hysan Professor of Dental Public Health and Oral Epidemiology. She served as the principal investigator and director of the Center to Address Disparities in Children's Oral Health, also known as CAN DO. She also served the UCSF School of Dentistry as the chair of the oral epidemiology and DPH division in the school's preventive and restorative dental sciences department until her departure.

Dr. Weintraub returned to UNC in 2011 as dean of the School of Dentistry. Her research in public health dentistry has helped shape scientific guidelines regarding sealants and fluoride that have become a part of mainstream dental and public-health practices. She is a past president of the American Association of Public Health Dentistry and the International Association of Dental Research's behavioral sciences and health services research group. She was one of the scientific editors and contributing

authors for the first Surgeon General's Report on Oral Health. She would go on to have one of the more distinguished careers in dental public health.

Ronald J. Hunt, DDS, MS, Dean for academic affairs at the UNC-CH School of Dentistry at the time he taught in the Dental Public Health Program, and later was dean of the Virginia Commonwealth University's School of Dentistry and associate dean of the College of Dental Medicine at Midwestern University. Dr. Hunt has a history of active service to the dental education and practice communities, serving as president of ADEA. Dr. Hunt also has been active in the American Association for Dental Research and was section officer in geriatric oral research. A board-certified public-health dentist, Dr. Hunt is a diplomate of the ABDPH. He received DDS and MS degrees in community dentistry and dental public health from the University of Iowa. He was a coinvestigator with Jim Beck on population-based surveys of the elderly in Iowa and North Carolina. He taught the Dental Public Health Practice course in the mid-1990s.

John R. Elter, DMD, PhD and Samuel J. Arbes, DDS, PhD taught the course in dental epidemiology at different times. They had obtained their PhD degrees in epidemiology from UNC-CH in the late 1990s. Dr. Elter worked for the Durham VA Medical Center and Dr. Arbes worked for Rho Inc., a contract research organization (CRO) in the Chapel Hill area that provides clinical research services for drug development.

James D. Bader, DDS, MPH taught Introduction to Dental Public Health, a course offered for credit in the School of Public Health. This "extra" offering of the course was at the request of dental students. Bader received his dentistry and public-health degrees from the University of Michigan in the early 1970s. He came to the UNC-CH School of Dentistry in 1984, after serving on the faculty at the University of Kentucky, and remained here for the remainder of his academic career conducting health services research. Dr. Bader was well-known for his sharp pen and quick mind, having sharpened his skills serving as the Editor-in-Chief of the *Journal of Dental Education* for many years.

PhD Programs in Epidemiology and Health Services Research

The Department of Epidemiology and its five faculty grew rapidly from its beginnings in the late 1950s, when John Hughes was its first doctoral student. Doctoral studies for dentists were not in great demand when the DPH program was getting started. Before 1990, only six dentists had earned a PhD from the School of Public Health. In the 1990s and early 2000s, the UNC-CH campus emerged as a vibrant place for education and research in oral epidemiology. Between 1991 and 2013, twenty-six dental professionals earned PhD degrees from UNC-CH in one of the public-health sciences.

The reasons why dentists came to be interested in studying epidemiology are complex, but several are among the more important. The National Center for Health Sta-

tistics chose not to include oral health in its series of health surveys in the late 1970s. To ensure that the nation would have the necessary oral-health information on which to plan, the National Institute of Dental and Cranofacial Research (NIDCR) intramural program implemented national surveys of schoolchildren and working adults. This experience of creating a national survey unit from the ground up caused a heightened awareness of the importance of epidemiological information in making decisions about research funding, promotion of oral-health policies and having experts whose sole responsibilities were planning and conducting national surveys.

Another contributing factor to the increased interest in doctoral-level training in epidemiology was that oral-health problems and their solutions were becoming more complex. Solutions required sophistication beyond that which could be obtained in a master's degree for most fields.

Faculty in the Departments of Epidemiology and Health Policy and Management in the School of Public Health and Dental Ecology in the School of Dentistry were actively engaged in a national effort to train dentists in public-health sciences. Doctoral programs in oral epidemiology at the University of Michigan's School of Public Health, the University of Washington, Harvard School of Dental Medicine, and the University of Connecticut's Dental School were funded by the National Institutes of Health. The efforts led to annual sessions of faculty and students organized in conjunctions with the American Association for Dental Research and the International Association for Dental Research. The training programs at the different universities produced dozens of scientific presentations at these meeting and subsequent publications.

PhD Program in Oral Epidemiology at UNC-CH

The NIDCR-funded training grant entitled *Institutional Research Training Grant in Oral Epidemiology, 1990–2005* (PI: Jim Beck, Dental Ecology), was offered under a partnership of the School of Dentistry's Department of Dental Ecology and the School of Public Health's Departments of Epidemiology and Health Policy and Management. Students fulfilled the requirements for the PhD degree in the Department of Epidemiology and supplemented these with required and elective coursework in DPH and oral epidemiology in Health Policy and Management or the School of Dentistry.

The goal of the oral epidemiology program as described in an informational brochure used in the early stages of the program was as follows:

To provide dental professionals with the ability to identify, analyze, and predict changes in oral diseases and condition so these conditions can be prevented or controlled. Graduates are given the academic foundation, advanced knowledge,

and skills necessary to conduct, interpret, and evaluate sophisticated epidemiologic investigations. Epidemiologic research methods are emphasized in the curriculum as well as the epidemiology of oral conditions. These methods are used to describe biologic processes, the natural history and distribution of disease in populations, to investigate agents and risk factors associated with disease prevalence and incidence, to conduct clinical trials or observational studies to evaluate new dental procedures and preventive methods to compare the outcomes of existing treatment or techniques.

Program requirements included core courses in biostatistics, fundamentals of epidemiology, epidemiologic research methods, dental public health, and oral epidemiology. Additional coursework and electives were available in the student's specific area of research interest and could be taken in the Schools of Medicine, Dentistry, or Public Health, or the College of Arts and Sciences. The DPH and oral epidemiology courses were the same ones taken by residential master's degree students and DPH residents, contributing to a great learning environment.

A smaller number of dentists continued to be trained after 2005, when the oral epidemiology training grant ended, through T32 (*Clinical Research Training in Oral Diseases for Future Academicians, 2005-2012*) and T90/R90 programs (*Training Program for the Next Generation of Oral Health Researchers (NextGen) 2011-2016*) with Dr. James Beck, Dental Ecology, as principal investigator. The primary objective of the T32 program was to train individuals interested in academic careers that focused on conducting clinical research in a multidisciplinary setting. Dentists enrolled in advanced clinical education programs participated in a two-year curriculum in clinical research or a PhD program in epidemiology or health services research. About fifteen dentists completed this program. In addition, students in other PhD programs with interests in oral health attended individual courses offered in this program.

The purpose of the T90/R90 training program is to develop a cohort of basic, clinical, and translational oral health research scholars who can function as interactive scientists to address the nation's healthcare needs in dental, oral, and craniofacial research. As designed, the program embraces the full spectrum of basic, translational, and clinical research, including fundamental mechanisms of human disease, therapeutic intervention, clinical trials, oral epidemiology, health services research and health policy. These grants support students for PhD and postdoctoral fellowships in Health Policy and Management and in Epidemiology.

PhD Program in Health Services Research

The Cecil G. Sheps Center was awarded an NRSA Research Training Grant Supplement in Dental Health Services Research for 1997–2000 (PI: James Bader, Operative

Dentistry). This training grant application, reviewed by the Agency for Healthcare Research and Quality (AHRQ) and funded by NIDCR, augmented the existing general institutional training grant funded by AHRQ and located in the Sheps Center for Health Services Research, which traditionally has enrolled dentists in the doctoral or post-doctoral degree program since it became a formally funded program in the early 1990s. The dental training funded by NIDCR formalized a distinct track for PhD studies and the preparation of dental health services researchers. Core dental faculty were Dr. Rozier, from the Department of Health Policy and Management in the School of Public Health, and Dr. Bader, from the Department of Operative Dentistry in the School of Dentistry and Sheps Center. Dentists in the Departments of Health Policy and Management, Epidemiology, or Health Behavior and Health Education could enroll in the PhD program.

Dual Training in Pediatric Dentistry and Public Health

In 1992, the Department of Pediatric Dentistry made the bold decision to establish a dual program in which residents would earn a master's or doctoral degree in public health in addition to their specialty training certificate. A Maternal and Child Health (MCH) Pediatric Dentistry Training Grant (1992–2007) was funded with William Vann, DDS, PhD, Graduate Program Director in Pediatric Dentistry and former chair of the department and principal investigator of the grant. The grant designated UNC-CH as an MCH Center for Leadership Training in Pediatric Dentistry. The purpose of the center was to produce clinician-leaders who could advocate for the improvement of the oral-health-care system in the United States. A thirty-six-month program resulted in an MPH degree, mostly in the School of Health Policy and Management, as well as specialty training in pediatric dentistry. A four- to five-year course of study led to a certificate in pediatric dentistry and a PhD in epidemiology or health services research.

The partnership between the School of Dentistry and the School of Public Health was strengthened by several key elements of the plan. Trainees with an interest in public health were recruited and mentor salary-support was allocated to faculty as a means of recruitment of mentors. Graduate students' research experiences were changed from a long-standing emphasis on biomedical and laboratory research to experiences in the public-health sciences. Applied research in public-health areas like pediatric health services research, outcomes-related research, and impact of oral-health policies were common. The plans also included financial support to develop more community clinical collaborations and real-life DPH activities.

Pediatric dentistry residents were encouraged to assume leadership positions in dentistry rather than traditional private dental practice upon graduation. A corner-

stone of efforts in the program was the Leadership Development Program (LDP) sponsored and overseen by the UNC Maternal and Child Health (MCH) training programs, a campus-wide consortium of five MCH training programs in developmental disabilities, nutrition, social work, public health, and pediatric dentistry. The LDP provided opportunities to develop interdisciplinary approaches to developing cultural competency in trainees.

According to the progress report for 1996–2007, strategies used in the center were highly successful in achieving goals outlined in the training grant—recruitment of trainees with the desired characteristics, research portfolio diversification, and establishment of community collaborations. Between 1996 when targeted recruitment began and 2007 when funding ended, fifteen dual trainees in public health and pediatric dentistry were enrolled—four at the PhD level, ten at the MPH level, and one post-PhD doctoral trainee. Prior to 1996, only one dentist had been trained in pediatric dentistry and dental public health since the inception of the department in 1955.

Dual trainees were highly productive. They amassed over thirty-five peer-reviewed articles emanating directly from their scholarly work during the training program. They published in competitive journals on important public-health topics such as access to care and other issues related to children most vulnerable to dental caries. Their research was recognized with many honors and awards from dentistry and public health. Included were the American Academy of Pediatric Dentistry (AAPD) OMNII Research Awards Competition recognizing the nations' top three graduate student research proposals, the Leverett Graduate Student Merit Award for Outstanding Achievement in Dental Public Health from the American Association of Public Health Dentistry, and the Anthony Westwater Jong Memorial Community Dental Health Award from the American Public Health Association.

Once training funds ended, at least one pediatric dental resident continued to be enrolled in MPH degree programs in the School of Public Health, or about three residents at any one time. About one third of thirty-nine alumni chose alternative careers to private practice, including one who served as State Medicaid Dental Director.

In 2019 a major reorganization of the School of Dentistry's departmental structure eliminated the Department of Dental Ecology. Public-health faculty in the department, several with joint appointments in the School of Public Health, were assigned to the renamed Department of Pediatric and Public Health Dentistry, with Dr. Jessica Lee as chair. This arrangement should increase opportunities for public health and pediatric dentistry to collaborate in education, research, and service.

Informal joint programs also were arranged periodically for residents in other specialty programs, specifically endodontics, orthodontics and periodontics. Although course credit could not be counted toward both degrees because these programs were

not official approved by the graduate school, the three-year residency programs provided enough flexibility in the curriculum to work toward an MPH degree.

Summary of Expansion Era in Graduate Education in Dental Public Health at UNC-CH

In this period, several new pathways were provided for obtaining a public-health degree with a DPH concentration. None of the programs were large or necessarily operated consistently or concurrently, but collectively, enrollment in the different programs during the 1980s and 1990s made the program one of the larger ones in the country. Almost all the students were required to take at a minimum the same six credit-hours of DPH coursework offered in the Department of Health Policy and Administration (“Introduction to Dental Public Health” and “Dental Public Health Practice”), plus for most the “Oral Epidemiology” course and doctoral-level seminar courses. An independent research project also was required for most students.

Beginning in the 1970s, the decade before the expansion programs began to take effect, into the 2010s, a total of 228 students were enrolled in the School of Public Health, of which 116 students (50.8 percent) were enrolled in the residential MPH-degree program and arrived to the program through traditional routes, 68 (29.8 percent) in the Executive Master’s Program, 16 (7.0 percent) in the dual pediatric dentist program, 15 (6.5 percent) in the Army and USPHS, and 28 (12.2 percent) in a PhD degree program. To these UNC-CH students can be added the residents in the N.C. Dental Public Health Residency Program, whose research projects were partially supervised by faculty at the UNC-CH School of Public Health. Even with the expansion of the opportunities to enroll in degree programs in the School of Public Health, the total number of students in non-research degree programs declined by 29.1 percent between the 1980s and 1990s, and by 19.6 percent between the 1990s and 2000s.

The Research Era: A Change in Emphasis for the Dental Public Health Program (2000–2014)

Born in Skipton, North Yorkshire, England, Dr. Peggy Leatt qualified as a State Registered Nurse in England. She obtained her BScN, MHSA, and PhD in sociology from the University of Alberta. She served as chair of the Department of Health Policy, Management, and Evaluation (HPME) at the University of Toronto from 1988 to 1998. In 1998, she became CEO of the Ontario Health Services Restructuring Commission and was responsible for reports that recommended changes in the Ontario health system. In 2002, Peggy moved to the University of North Carolina at Chapel Hill (UNC-CH) where she was chair of the Department of Health Policy and Manage-

ment (HPM) between 2003 and 2013 and Associate Dean for Academic Affairs in the Gillings School of Global Public Health between 2005 and 2010.

Dr. Leatt was an effective mentor of junior faculty, committed to teaching and to giving practitioners the opportunity to learn new skills and competencies through nonresidential degree and certificate programs. But she was hired with a directive from the dean to increase funded research in the Department of Health Policy and Management. Dr. Jain had been hired more than thirty years before with the same directive. She established a Research Committee chaired by Dr. Rozier (2006–2012), who was experienced in DPR research and had been director of the PhD Program in Health Services Research in the Department from 1992 to 1997.

The challenge faced by the research committee and department led by Dr. Leatt was how to implement strategies that would help overcome long-standing barriers to faculty research. Three of the chronic obstacles were a heavy commitment to teaching (more than 300 courses in the department), the lack of individual faculty incentives to write grants seeking funding, and the lack of depth in potentially fundable areas. For administrative reasons among others, faculty usually submitted their grants through research centers on campus, thus forfeiting most of the overhead to the unit processing the grant. Faculty in the department represent many disciplines and research perspectives. Even with the lack of depth in some areas, this diverse background was a major strength of the department. It provided opportunities for the conduct of high-quality, large-impact research, particularly multidisciplinary, team-based, and translational research. With the methodological and substantive talent of HPM faculty, they were in high demand by research centers.

In 2007, the department identified nine applied areas of ongoing research activity by faculty (aging, community preparedness, global health, health disparities, health-care management, health policy and politics, mental health, quality and outcomes research, and insurance and safety). The primary question was whether the research agenda should concentrate on a more limited number of areas such as cancer, comparative effectiveness, or health-care reform. The department decided against that strategy, because solutions to today's societal problems require team-based, multi-disciplinary and applied research. Faculty also have discipline- and methodology-specific expertise that lends itself well to collaborative research (see Table 6.3). As another source of motivation and transparency, the department established norms for tenure and promotion for the different ranks based on a quartile system of accountability.

Departmental funding for research increased by more than fourfold during Dr. Leatt's term as chair. The department made major strides in dental health research along with cancer outcomes, mental health, and rural health. Peggy retired in Chapel Hill from UNC-CH in 2013.

Table 6.3. Research areas in health policy and management, 2007

Aging: Adults, health & life course, intergenerational health issues & long-term care
Community Preparedness: disaster mitigation and response; first-responders
Global Health: health problems transcending national boundaries
Health Disparities: inequalities by race, ethnicity, gender, geography, economics
Health Care Management: governance, finance, organizational behavior
Health Policy & Politics: public opinion, media, the policy process
Mental Health: organization, financing, utilization, quality, and outcomes of mental health services & politics
Quality & Outcomes Research: access to services; quality of services; clinical outcomes; patient safety
Insurance & the Safety Net: private and public health insurance, design of incentives, charity care, local health departments

 Research in Health Policy and Management

Methods Areas	Applied Areas
• Applied statistics	• Access to care
• Business communication	• Aging and long-term care
• Comparative effectiveness	• Cancer
• Clinical research trials	• Community preparedness & disaster management
• Decision sciences	• Maternal and child health
• Dissemination research	• Global health
• Evidence-based medicine	• Health disparities
• Health economics	• Health system reform
• Healthcare finance	• Healthcare utilization and costs
• Healthcare leadership	• Hospital financial performance
• Healthcare management	• Mental health and substance abuse
• Health politics and policy	• Nutrition
• Human resources management in health care	• Oral health
• Information systems	• Pharmacoeconomics
• Integrated research methods	• Public insurance & safety net programs
• Organization design and behavior	• Rural health
• Outcomes research	• Workforce
• Prevention	
• Public health policy	
• Quality of Care	
• Regulation and innovation	
• Research Ethics	
• Strategic planning	
• Technology Assessment	

Dental Public Health in the Era of Research

Dr. Rozier continued to coordinate the DPH program in the Department of Health Policy and Management for the next decade, but beginning in the 2000s DPH courses were offered less frequently as he concentrated more on the DPH research agenda and the department's mission.

Primary emphasis in the department shifted from the long-standing goal of training DPH practitioners to educating researchers and maintaining a large research agenda within the department. In the 2000s, master's-level courses in DPH were not only offered less often but for classes of students with a wider diversity of experiences and degree programs. For example, the 2005 introductory course in dental public health enrolled 9 students, of whom 1 was a dental student, 2 were dental hygienists in graduate school, 2 were dentists jointly enrolled in public health and clinical dental specialty programs, 1 was a dentist in a special program in the dental school, 2 were dentists in the Executive Master's Program, and 1 was an undergraduate student majoring in public health. Courses typically enrolled PhD students, visiting scholars, even private dental practitioners on occasion.

The change toward fewer courses was not solely a voluntary decision made at a single point in time but occurred gradually over a few years in response to a decrease in demand for training in dental public health practice. A similar trend occurred at the University of Michigan, one of the other schools with a long-standing DPH program. By 1995 that dental program had shifted almost entirely from educating mid-career dentists with management experience to the education of doctoral students for research careers. In another few years, administration of the Michigan program would move to the School of Dentistry, and then be eliminated entirely (*Endeavor* 1995).

The DPH research agenda for the Department of Health Policy and Management, described in the next chapter, yielded millions of dollars and employed dozens of research assistants and field staff, mostly PhD students in Health Services Research, which plays an important role in the education of doctoral students. Research contributed to an understanding of interventions to help control oral diseases, particularly in children.

Dr. Rozier was principal investigator or co-principal investigator for contracts and grants for over \$9 million between 2000 and 2013, an outstanding achievement for a dental health services researcher. When NIH released information on funding levels for 2001, it became apparent that Dr. Rozier was listed as principal investigator for NIH-funded research totaling more than that of one half of the dental schools in the United States. Dr. Rozier's total funding from all sources, which included NIDCR, CDC, CMS, HRSA, and private foundations, was greater than the NIH funding received by 60 percent of the dental schools in the United States. In addition to his research, important research in public health dentistry was being conducted by others at UNC-CH.

The effects of expansion of programs assigned to Phase II of this history of graduate programs in the School of Public Health, particularly EMP (Executive Master's

Number of Students by Degree Program and Decade

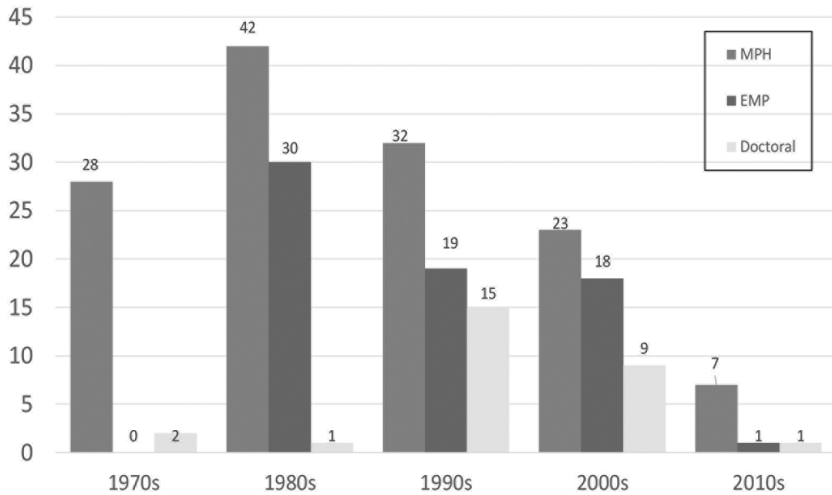


Fig. 23. School of Public Health Enrollment by Decade.

Program) students in the 1980s and doctoral students in the 1990s and 2000s is evident in figure 25. The total number of students enrolled in the three degree programs was about the same in the 1980s ($n=73$) and 1990s ($n=66$). However, the percentage enrolling in the EMP quickly became 41 percent of degree students in 1980, being offered for the first time in 1986. The same percentage was 28 percent and 36 percent in the 1990s and 2000s, respectively.

Few dentists enrolled in doctoral programs in the School of Public Health in 1970s and 1980s. The percentage of all degree students who enrolled in PhD programs was about 23 percent in 1990 and 18 percent in 2000.

The ratio of master's students to doctoral students was 3.4:1 in the 1990s and 4.5:1 in the 2000s. The absolute number of masters and doctoral students and their ratio depends on many factors related to the departmental resources and research enterprise available to support them financially and scientifically.

Doctoral Dissertations with Dental Content in the School of Public Health

Appendix 6.3 contains a list of students, the title of their dissertation and year of publication for dissertations by the thirty-three doctoral students who have studied in the UNC-CH School of Public Health. A few of the students were awarded DrPH degrees, but most were PhD degrees. The first dissertation was completed in 1962, twenty-three years after the school was founded; soon after that, the Department of Epidemiology

was admitted to the Graduate School and approved to award the PhD degree. In the next fifteen years, there would be only four more dissertations on dental topics, three in the Department of Epidemiology and one in the Department of Biostatistics. The largest number (15) were completed in the 1990s, during the funding of Dr. Beck's oral epidemiology training grant. Between 2001 and 2016, a dozen dissertations were approved by the UNC-CH Graduate School. A few more before then could be considered health services research dissertations, but eight of the last ten are in that category.

The distinction between epidemiological and health services research is often an arbitrary one. The difference often is made based on the department in which the work originates, the research design, and analytical methods used in the study.

The topics in the list of dissertations represent an array of research questions and study variables. Oral health diseases and conditions included as outcomes are periodontal diseases (5 studies), dental caries (5 studies), cleft lip and palate (2 studies), oral cancer (3 studies), and tooth loss (1 study).

Etiologic epidemiological research investigated the effects of tobacco and alcohol use on oral cancer and cleft lip, nitrous oxide and amalgam on reproductive health, healthy lifestyles and social relationships on perceived dental status, and dental treatment on risk for subsequent disease or tooth loss.

The health services research dissertations on the list mostly investigated the effects of social programs including Medicaid, the Children's Health Insurance Program, the Women and Children's Supplemental Food Program (WIC), Early Head Start, social determinants, and the integration of dental service and medical services on dental use, expenditures, and other outcomes.

Several non-dental faculty were active in chairing committees or serving as committee members. Sally Stearns (PhD), Professor of Health Policy and Management and an economist, and John Priesser (PhD), Research Professor of Biostatistics, were particularly active in that regard.

Quality of Doctoral Students' Research

Two measures typically are used to evaluate the performance of doctoral students—recognition with competitive awards and the quality of their publications. Also important but harder to measure is the public-health impact of their publications.

Awards and other recognition for graduate students (almost 20 students in the third era since 2000) are as follows:

- Leverett Graduate Student Merit Award for Outstanding Achievement in Dental Public Health, American Association of Public Health Dentistry, which recognizes postgraduate students' projects in national competition with all U.S. graduate programs in public health

- Anthony Westwater Jong Memorial Community Dental Public Health Post-Professional Award, American Association of Public Health Dentistry
- Behavioral, Epidemiologic and Health Services Research Outstanding Student Abstract Award, International Association of Dental Research
- UNC-CH Jean G. Yates Health Policy Dissertation Award
- UNC-CH Graduate Education Advancement Board (GEAB) Impact Award

Another measure of the quality of doctoral students' research is their publication record and the potential impact of those publications on health policies and the public's health. The journals in which their work is published span a broad range of topics in public health, dentistry, medicine, pediatrics, and research methods. Some of these high-impact journals are:

- *American Journal of Public Health*
- *Health Services Research*
- *Journal of the American Dental Association*
- *JDR Clinical and Translational Research*
- *Journal of Public Health Dentistry*
- *Maternal and child Health Journal*
- *Medical Care*
- *Pediatrics*
- *Quality of Life Research*

Summary of Research Era

The DPH degree program has gone through three major phases in the almost five decades since it was started. In the initial years, the foundations for the program were laid by several highly committed public-health practitioners and with the support of federal funds. In the second phase, the program expanded with the creation of several opportunities for dental professionals to obtain master's and doctoral degrees in epidemiology and health services research. The number of students swelled to the largest ever. In reaction to the downward trend in demand for DPH education and the need for scientists in public health to help solve the health-care system's complex problems, master's-level courses in DPH were offered less frequently and the dental research agenda in health services research was expanded with federal and foundation grants.

Thirteen students, mostly in the Department of Health Policy and Management, completed PhD degrees in the third period reviewed in this chapter. Most students in the previous era had received their PhD degree in the Department of Epidemiology. A small number of master's theses and many master's papers, which are not formally

registered with the Graduate School, were completed as part of degree programs in the School of Public Health.

Graduate students were incorporated into faculty research and were integral to the success of many of these projects. They were first authors on papers key to study aims. Most of these are highlighted in the next chapter on the oral health research agenda in the School of Public Health.

References Chapter 6

- American Association of Public Health Dentistry. 1982. *Position statement of Executive Council. Proposed Revision of Criteria for Recognition of Specialty Areas of Dental Practice*. August 1982.
- Block LE. 1975. "Educational Programs in Dental Public Health at Schools of Public Health as of Fall 1973." *Journal of Public Health Dentistry* 35, no. 3: 195–205.
- Cameron CM. 1960. Correspondence to Dean McGavran, Oct 26, 1960. Box #1, Rozier archives "letters and documents of importance", Carrboro NC.
- Chapel Hill [N.C.] News*, March 26, 1962.
- Committee on Professional Education, American Public Health Association. 1967. "Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 57, no. 4: 682–91.
- Endeavor*. 1995. "Fostering Oral Health through Practice, Teaching, and Research: The Evolution of Dental Public Health." Fall/Winter: 2–14, 35–36.
- Formicola AJ, Bailit HL, Weintraub JA, Fried JL, and Polverini PJ. 2018. "Advancing Dental Education in the 21st Century: Phase 2 Report on Strategic Analysis and Recommendations." *Journal of Dental Education* 82, no. 10: eS1–eS32.
- Fulton, JT, and WHO. 1951. *Experiment in Dental Care. Results of New Zealand's Use of School Dental Nurses*. World Health Organization Monograph Series No. 4. Available online: <https://apps.who.int/iris/handle/10665/40719>.
- Fulton, JT. 1951. "Dental Caries in New Zealand and the United States." *American Journal of Public Health* 41, no. 1: 76–79.
- Hollinshead BS, director. 1961. *The Survey of Dentistry. The Final Report*. Commission on the Survey of Dentistry in the United States. Washington, D.C.: American Council on Education.
- Hughes JT. 1978. "Behavioral objectives for dental public health." *Journal of Public Health Dentistry* 38: 100–107.
- Kaste LM, Sadler ZE, Hayes KL, Narendran S, Niessen LC, and Weintraub JA. 1998. "Academic Dental Public Health Diplomates: Their Distribution and Recommendations Concerning the Predoctoral Dental Public Health Faculty." *Journal of Public Health Dentistry* 58, suppl. 1: 94–100.
- Korstad RR. 1990. *Dreaming of a Time: The School of Public Health, the University of North Carolina at Chapel Hill, 1939–1989*. Chapel Hill, N.C.: University of North Carolina.
- Lotzkar S. 1985. "Analysis of the Need for Training, Employment, and Specialization in Dental Public Health." *Journal of Public Health Dentistry* 45, no. 2: 106–13.

- Massler M. 1956. "The Basis for an Index of Periodontal Disease". *The Practice of Dental Public Health*, 44–55. Michigan.
- Mayes WF. 1975. *The University of North Carolina School of Public Health Relates to the Needs of a Changing Society. A Selective and Interpretive Account with Emphasis on the Decade of the Sixties*. Chapel Hill, N.C.: University of North Carolina, School of Public Health.
- Meskin LH, and Block LE. 1975. "The Effect of the New Federalism on Education for Dental Public Health." *Journal of Public Health Dentistry* 35, no. 3: 192–94.
- Rozier RG archives Box 2.
- Rozier RG. 1997. "Gaps in the Front Lines of Dental Public Health: HRSA Helps with the Need for Dental Public Health Specialists." *Journal of Public Health Dentistry* 57, no. 3: 131–32.
- Second National Conference on Public Health Training. 1963. Reported in: "Educational Qualifications of Public Health Dentists." *American Journal of Public Health* 57, no. 4 (1967): 682–91.
- Simon-Rusinowitz L. 1988. "A Marketing Strategy for the Dental Public Health Profession: What Is It? Why Is It Needed?" *Journal of Public Health Dentistry* 48, no. 1: 45–51.
- Striffler DF. 1963. "Education of Public Health Dentists in the United States and Canada." *Journal of the American Dental Association* 66: 758–62.
- Weyant RJ. 2002. "Report of Recommendations from the National Dental Public Health Workshop, February 10–12, 2002, Bethesda, MD." *Journal of Public Health Dentistry* 31 63, no. 4: 258–62.

Oral Health Research in the Gillings School of Global Public Health

This chapter chronicles the research agenda in dental public health in the UNC-CH School of Public Health from the first NIH-funded dental project in 1960 to the last one during the period included in the history. Broad categories of research themes in the list of projects conducted by faculty in the Gillings School of Global Public Health are surveillance and other descriptive studies, effectiveness of public-health interventions, and methodological studies.

Research undertaken by individual faculty in any discipline is often the product of many complex factors. The primary factor should be the significance of the problem and the interests and training of the investigator in the problem. The availability of colleagues with training in appropriate disciplines who can fill out a research team with complementary and needed skills is important. A very practical factor contributing to research success is a funding source. Finally, the implementation of a successful research agenda requires a supportive environment. It should be evident in this history that DPH research had the strong and enduring support of the university, school and department administrations, and many collaborators throughout its history.

Demands on knowledge, skills, and competencies needed in DPH practice have increased. Thus, the border between research and core public-health functions like evaluation have blurred. Collaboration between practice and science results in the best evidence for program effects, particularly when interventions are novel and lack strong evidence. North Carolina had one of the stronger collaborations in the nation during this history with complimentary division of tasks needed to implement projects that could meet both public-health practice and academic standards.

Elements Common to Public-Health Practice and Public Health Research

- Uses systematic methods
- Based on scientific evidence
- Might use epidemiological study design
- Might involve selection of participants
- Might involve collection & assessment of personally identifiable & protected health information
- Might involve statistical analysis of data
- Might result in publication of findings in peer reviewed literature
- Might contribute to generalizable knowledge
- Might involve hypothesis testing

Source: Otto et al., *AJPH* 2014.

Public-health research and public-health practice can overlap, particularly in a school of public health, which often has a very practice-oriented mission with very practice-oriented faculty. A review of research as attempted in this chapter requires a clear definition of research. Otto et al. (2014) suggest that the major distinction between practice and research is the *a priori* purpose of the activity. Public-health practice undertakes activities to benefit the community, often with a government regulation promoting the activity as an agency expectation. The purpose of research, on the other hand, is to generate knowledge that benefits those beyond the community.

Additional distinguishing characteristics listed by Otto et al. (2014) are as follows: who is performing or funding the work; which methods are employed for collecting and analyzing data; and whether and where the findings are published. An example might be a fluorosis prevalence survey conducted by the state health department funded by CDC. This survey would be considered practice if used primarily to identify subgroups with excessive fluoride intake so that interventions could be undertaken to reduce fluoride exposure. Such a survey could be considered research if investigators at the university are evaluating the accuracy of a new fluorosis index.

Another example would be use of information from the statewide dental caries surveillance system in kindergarten and fifth grades mentioned in chapter 6. This surveillance system had been the sole responsibility of the Oral Health Section in the North Carolina Department of Health and Human Resources. Its purpose is to identify areas of the state that should receive priority for interventions, case finding, referral and program evaluation. The use of these surveillance data by investigators at

the university for evaluation of the Into the Mouths of Babies (IMB) program, however, should be considered research according to Otto's criteria.

Evaluation is an important public-health function but determining cause and effect relationships between public health or policy interventions and outcomes often requires rigorous evaluation designs. The public-health environment in which interventions take place are usually complex, and isolating the effects of programs or policies on outcomes of interest can be challenging. This complexity of the world in which public health is practiced also leads to overlap of activities.

Collaboration between DPH programs and their academic partners in everyday DPH program activities provides the opportunity to develop and test new methods—measurement indices for dentofacial problems, fluorosis, or oral health-related quality of life for example—that can advance public-health practice. A healthy research agenda should contribute significantly to new methods in some aspect of the research process—data collection and management; measurement of health, disease and determinants; analysis techniques; or synthesis of scientific information.

Every few years, a health policy or research study provides information that shifts investigators' ways of thinking about things. Researchers are a lot like birds on a telephone wire. When one flies; the rest also fly and in the same direction. When one researcher is funded to take their research in a novel direction, other researchers will follow. They can be stimulated by an observation about disease affecting a subgroup of the population, an outbreak of a disease or an increase over time that is made obvious by epidemiological surveillance or the observations of astute practitioners. Examples include the emergence of inequities in dental disease, in which improvements in dental caries in most population groups stand in stark contrast to disease remaining in disadvantaged groups; the relative effectiveness of fluoride on smooth-surface caries and its justification for dental sealants compared to pit-and-fissure surfaces; an increase in the prevalence of enamel fluorosis; the prevalence and severity of periodontal disease; and the prevalence of dental caries in preschool-aged children. A consideration of the context of project implementation helps to classify an activity as research or practice.

Surveys of Oral-Health Status: A Guiding Light for Oral-Health Policy in North Carolina

North Carolina has a long history of collecting information on oral-health status. To date these efforts have generally been of three types: (1) household surveys of samples representative of the state's noninstitutional population; (2) surveys predominately of schoolchildren selected from classroom sampling frames representative of the state's school-aged population; and (3) the ongoing annual surveillance of all children in grades K and 5. As covered in the previous chapter, the Oral Health Section

pioneered the development of the surveillance system of ongoing, annual collection of oral-health status information in grades K and 5. Many other oral-health surveys representative of children in selected counties, cities, or schools have been undertaken as research projects or for other specific reasons. Although not representative of the entire state, these selected oral-health surveys are useful, in that they extend over a period of time since 1947, are numerous (about 40 different surveys and 35,000 examinations of baseline surveys alone), and were collected using roughly the same examination techniques and diagnostic criteria with adequate attention to examiner training and standardization. They have been of value in determining the effectiveness of various community interventions; the planning for dental health services; in formulating various policies related to public programs, manpower, education, and delivery of care, and helping to shape a research agenda that informed public health in North Carolina.

Three trends provided a rationale for surveillance: (1) the clustering of disease in a small number of individuals in high-risk communities; (2) growing disparities in levels of treatment for disease; and (3) the evolution of public-health surveillance, supported by information technology, which permits quick and efficient use of large amounts of information. Disease is concentrated among racial and ethnic minority children and those living in poor families, traditionally, those with the poorest access to care. In North Carolina, for example, 30 percent of kindergarten students have 95 percent of all DMFT and 16 percent have 88 percent of all untreated decay (Rozier, personal notes from Access to Care Committee). Caries prevalence can vary by as much as five-fold when aggregated by classroom or school (Amstutz and Rozier 1995). The first two trends support the need for prediction models of high-risk communities for both caries and lack of access; the third provides the methods and technical capabilities for community surveillance of oral events and risk factors.

Throughout the history of research in North Carolina, surveys of conditions other than oral-health status have been conducted. For example, surveys of dental and medical providers have provided assessments of their practice behaviors. These surveys generally were connected to specific studies like fluoride prescribing patterns, integration of preventive dentistry services into medical practices, or adoption and implementation of new technologies.

Four statewide oral-health surveys over four decades provide a framework and timeline for presenting information in this chapter. The surveys have the advantage of being based on scientifically sound sample frames; they were well-executed and yielded excellent response rates and quality data; examiners were well-trained with documented reliability; the same core measurement indices and scales were used; and all of them were based on large samples that allow analysis of subgroups. Each of these surveys are important for looking backward as well as forward. Combined, the four points in time provide important observations of trends in dental diseases. The

disadvantage is that the last two data points include only school-aged children. Each of the four surveys led to substantial interventions or policy changes for the state. The cumulative impact of the four surveys and their contribution to determine trends in disease over a forty-year period was greater than any single survey could have been. They are cornerstones for research, plain and simple, and provided a guiding light for practitioners and policy makers.

The First Dental Public Health Research in the School of Public Health

In a handwritten note and attachment dated Sept 17, 1959, Dr. Fulton submitted a copy of a short proposal to Dean McGavran informing him about a possible dental study that would become a landmark investigation, the Natural History of Dental Disease (NHDD) (Fulton et al. 1965). Fulton had written the page-and-one-half proposal at the urging of Dr. Pearson on a telephone call that morning. Pearson wanted to submit a project idea to Dr. Norton, the state health director, for possible implementation.

Dr. Fulton highlighted the year-old dental unit in the Department of Epidemiology and the strong collaboration between the state health department and school of public health. The proposal stated, “It would seem ... that a joint study by these agencies of a representative sample of North Carolina households could produce, for the first time, sound data on the prevalence of dental diseases for an entire state population that would be of great benefit for all workers in public health.”

Fulton went on to write in his note that morning: “The Department of Epidemiology is interested in applying for a research grant to conduct such a study. It would be prepared to assume the responsibility for planning, executing, and analyzing the study, securing the necessary financing, and for the supervision of field work.”

The proposal was submitted to NIH on October 15, 1959, with Fulton as PI and Hughes as co-PI. Faculty and students in the Department of Epidemiology who would eventually spend some time on the research project over the next three years besides Fulton and Hughes were Al Tyroler and Ralph Patrick, among others. The assigned Study Section (Public Health Research) met January 20–22, 1960, and the award letter was dated May 1, 1960 (D-1188).

The “pink sheets,” as the summary sheets of study section reviews were known at the time when they were actually “pink,” confirmed Dr. Fulton’s assessment of the significance of a statewide survey: “The Study Section felt the study was planned with scientific competence and care. It represents the first attempt to obtain a representative study of dental problems and of some of the factors which may affect dental problems. Moreover, in many instances where procedures might be questioned (e.g., the magnitude and importance of non-response in household examinations), pre-tests have already been carried out in the field” (from Summary Sheet in author’s possession).

A modest budget of only \$91,229 was awarded for three years.

Training for data collection was held August 15–25, 1960. Field work began in October 1960. Twenty-five dentists working for the state and local health departments participated in data collection, which was spread over twenty-seven months (October 1960–January 1963), a little longer than anticipated, so that it would not interfere substantially with assigned work responsibilities of the state and local public-health dentists participating in the survey.

The sample was designed, drawn, and designated by the Statistics Research Division of the Research Triangle Institute (RTI) in Durham, North Carolina. The area sampling methods identified 2,103 households with an expected four family members per household, or 8,000 individuals in total. RTI provided city and county maps that contained the exact location of the sampled units of an average of about four housing units. Large, detailed sketch maps of each sampling unit were furnished; they marked clearly the specific households where examinations were to be conducted. RTI field workers located the units in the field and plotted the household sites.

A remarkable 96.1 percent of sampled households accepted and 98.5 percent of individuals in these households were examined. The sample of 7,236 individuals provided a cross-section of people in North Carolina; the youngest being three weeks old and the oldest being ninety-six years old, with representatives of all socioeconomic strata. For most dentists, data collection was an invaluable experience outside the clinic, which provided important and often first insights into the lives of a broad spectrum of North Carolinians, but particularly the living conditions for their low-income patient populations at a time before the social programs of the mid-1960s had been implemented. Detailed worksheets kept by dentists in the field provided important qualitative notes about the survey.

Evolution of Data Collection, Processing, and Analysis Technology

Investigators at UNC-CH and dental staff in the state health department completed thousands of clinical survey forms in the 1950s, 1960s, and 1970s, most capturing results of clinical examinations for dental caries in school children. The forms were much the same; about 5.5 by 8.5 inches with 28 or 32 squares in which codes for tooth and/or surface status were entered with pen or pencil. Usually, individual tooth or surface information was summarized on the lower portion of the card and either tabulated by hand or by machine for aggregate estimates, making reporting findings, particularly by age or race, time-consuming to produce and prone to mistakes.

A transition between paper forms and direct data entry in oral-health surveys was the optical scan form. In the 1986–87 oral-health survey of schoolchildren in North Carolina, information was recorded on a marksense clinical examination form designed for the survey. Forms were created and scanned by the Optical Character Recognition

Data Entry Service at the University of North Carolina using a Cognitronics 801 optical character reader, which writes data directly onto a magnetic tape in computer-readable form. While the technology supposedly saved time and resources, investigators for this North Carolina survey found that the tape output required a lot of editing. Compared to its most common use in the academic setting, scoring of academic tests, the accuracy was likely compromised because of the extreme amount of detail required on the form used in the 1986–87 survey that needed to be scanned to tape.

These surveys most often did not include information on child subjects or their parents beyond basic information, such as grade level, age, race, sex, and intervention group if the context was an evaluation study such as for water fluoridation. Key information about social determinants was usually missing from these studies.

The *Natural History of Dental Disease* project expanded the boundaries for sample design and data collection for dental studies, as well as for data analysis. The study bridged a transition from mechanical tabulation of surveys to use of computers. Multiple cards were punched for everyone to be read by the computer, which meant that the completed catalogue for the study numbered 50,000 paper-punch cards. The code book alone for the dataset was 173 pages 9 by 14.5 inches in size. Investigators wrote in a renewal application with what must have been some degree of hyperbole that “the magnitude of the survey means that the data must be processed by multiple computers (Unless we are willing to take 20 years for completion!).”

The software available to the investigators in the *NHDD* study did not easily permit an analysis of fully specified multivariate models to control for confounding or effect modifiers. Control of confounders was accomplished with a little-used statistical technique known as ORDAC (“ORD” represents “ordinal,” and “AC” represents “age corrected”) that eliminated the need for many of the assumptions required of regression techniques. For her dissertation Diane Makuc (1980) would later use both 1960–62 and 1976–77 data to estimate regression models, taking into account the complex sample designs.

Experience with CAPI-CARI Technology for Parent In-Person Interviews

In-person interviews were conducted with parents of Early Head Start (EHS) children in the ZOE study by eighteen interviewers trained in structured interviewing techniques, five of whom were bilingual in English and Spanish (Born et al. 2016). The interviews were 60 to 90 minutes in length and consisted of about 400 items at baseline and 300 items at follow-up. A range of topics was covered in the interview, including oral-health-related knowledge and values, behaviors and outcome expectancy, dental visits, family dental home, social support, oral-health literacy, and oral-health-related quality of life. It also included sociodemographic characteristics and

several items designed to obtain individual- and family-level information on federal and program enrollment criteria used by each EHS program. Interviews were conducted in English or Spanish according to caregivers' preferences, in the EHS center, home, or other convenient community location.

The length of the interview was of concern because of possible interviewer fatigue, which could affect the accuracy of data recording. Researchers also needed to use cue cards for a portion of the interview where subjects had to read dental-associated words and identify other similar words for an oral-health literacy assessment, so in-person interviews, not self-completed questionnaires were indicated. To help ensure quality of data, all interviews were conducted using Computer Assisted Personal Interviewing (CAPI) and Computer Assisted Recorded Interviewing (CARI) software developed specifically for the ZOE study. CAPI, commonly used in telephone surveys, was installed on laptop computers so that survey staff could conduct interviews in the multiple venues required of the forty-one-county project, most of which did not have Internet access. The CARI technology likewise was a laptop software application, in which the computer served as an audio recorder. The combined CAPI-CARI system, which resulted in direct data entry and a recording of the entire interviewer-subject interaction at both telephone screening and face-to-face interview, was fully integrated into an electronic subject-management system.

The software was developed by TeleSage, a small private company founded by two former employees of Microsoft: Benjamin Brodey, MD, MPH, a graduate of MIT and Harvard Medical School, and Milo Fryling, a programmer with many years of experience at Microsoft. TeleSage is located adjacent to the UNC-CH campus on Franklin Street.

Field staff uploaded completed interviews to the central subject-management system within twenty-four hours of the interview, so the research team had immediate access to interview data and audio files. The audio files were used in the central office to monitor the quality of interviews in the field and to determine if interviewers adhered to the structured interview protocol, such as how to ask questions and how to probe to get accurate answers.

CAPI with audio recording capability has been used for years in centralized survey research for telephone call monitoring (Couper et al. 1992). CARI was originally developed by RTI and first used successfully in the early 2000s in field surveys (Biemer et al. 2001). Many dental telephone surveys, particularly large national or state-level surveys with a dental module such as the Behavioral Risk Factor Surveillance System have been conducted using this technology. CAPI technology with a laptop computer in field settings has been used less often in dentistry and has not had the option to record interviews. By the 2010s, technological advances in laptop computers and software had made it feasible to digitally record interviews directly onto the hard disk of an interviewer's computer using the microphone in the laptop.

Use of CAPI technology had several advantages. It eliminated the need for paper-and-pencil surveys and the data-entry step involved in those surveys. The CARI technology provided a mechanism for quality control of interviewers and a determination of whether they adhered to the protocol of how to ask questions and how to probe to get accurate answers. It also allowed for verification of data almost immediately once the interview was uploaded.

Workforce Trends: A Backdrop to Historical Events

The supply-demand balance of the dental workforce in North Carolina is an important consideration for academic institutions in the state, particularly the School of Dentistry and School of Public Health, which are both affected by trends in private practice and are concerned with policies that in turn affect trends. Differences in opinion about the balance between supply and demand has been a simmering backdrop to most of the research done at UNC-CH, which occasionally boils over into a major policy issue. Over time, the number of dentists and its relationship to demand oscillates slowly from a surplus of dentists to a shortage. Although every community needs the services of public health, a shortage of dentists or hygienists provides a strong rationale for the need for public-health preventive programs to reduce the amount of disease in the state. One of the problems with this reasoning is that the need for dentists for a particular geographic area is so difficult to quantify.

The capacity of the dental workforce in North Carolina to meet the demand for care seems to resemble a slowly moving pendulum in search of its equilibrium, not to be quickly diverted from its arc by public policy. At the risk of extreme oversimplification, it appears that the long-term relationship of supply and demand and thus the need for dentists in North Carolina has followed roughly thirty-year cycles. Selecting benchmark years based on major publications suggests that in North Carolina the pendulum swung from a shortage in 1950, to a surplus in 1980, back to a shortage in 2010. Circumstantial data from national sources would suggest the pendulum is swinging back toward a surplus.

The first major assessment of dental workforce needs in North Carolina was the O'Rourke Report (1948), a study sponsored by the NC Dental Society. It sought to determine the gap between needs and resources and the major steps that would be necessary to maintain an adequate supply of dentists, including the possibility of establishing a dental school in the state. In a 1926 publication, William J. Gies had concluded, "The logical place for a dental health center and dental school in the Southeastern states is at Duke University, Durham North Carolina." The O'Rourke Report concluded that North Carolina was clearly undersupplied, with only 26.4 dentists per 100,000 people and had an inadequate supply of dentists. The report estimated the

Dentist Workforce Capacity Cycles

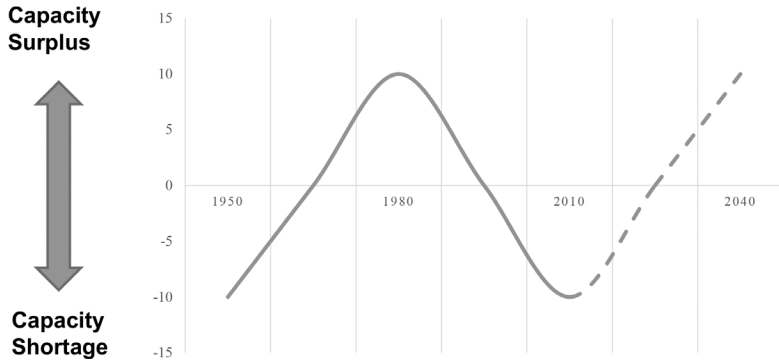


Fig. 24. N.C. Dentist Workforce.

problem would become even more serious in the future, due to N.C. residents' lack of opportunities to study dentistry. He estimated that at least 52 new dentists, or about 5 percent of the current workforce, would be needed each year to meet future needs. The report recommended that "the state needs a school which can be charged with the responsibility for undergraduate training in dentistry, but one which can become a coordinated part of the state resources for meeting public dental needs."

The next benchmark publication came about three decades later, when the N.C. Dental Society and collaborators conducted the Dental Manpower Study, referred to previously. This comprehensive assessment of oral-health status, treatment needs, demand, supply, and productivity for the state concluded, "The dental care system in NC is considerably underutilized in each of the six Health Service Areas due to the low level of demand for dental care." Furthermore, it noted that, "The supply of dental manpower in North Carolina is presently adequate and the rate of increase should be reduced in order to avert a decline in productivity and rising costs for dental health care."

Between two and three decades later, John Stamm provided an assessment that was opposite from the previous one. He wrote, "A severe shortage of dentists has emerged in North Carolina. In the United States, North Carolina currently ranks 47th of the 50 states in terms of the dentist-to-population ratio." He concluded that there was "an urgent need for dentist workforce expansion in NC based upon the existing dentist shortage, the current misdistribution of dentists, and the very strong NC population growth projected out to 2030 by the United States Census Bureau."

A commentary by Weintraub and colleagues (2016) on trends in factors that might impact dental workforce in North Carolina concluded that the “need for dentists is increasing as the population grows, and underserved areas persist.” They did not express an opinion as to whether the current supply or projected supply can meet this growing need for dentists. However, the Health Resources and Services Administration, the federal agency responsible for workforce estimates, concluded that North Carolina had a shortage of 270 dentists in 2012, which was projected to grow to 459 in 2025. They ranked North Carolina tenth in the size of the gap between the projected number of dentists (5,311) and the number needed (5,500) in 2025.

If the pendulum continues to swing as before, the present cycle would suggest that we are in a transition period. Eklund and Bailit (2017) have developed an extensive argument to support the conclusion that by 2040 we will have an excess of dentists in the United States. They boldly conclude that “even if every person in the United States were to visit a dentist every year, the dentist surplus would be over 25%.” Among the many reasons they provide in support of their position that a large surplus of dentists is likely to exist in 2040 are the following major ones: First, improvements in dental caries rates in birth cohorts starting in the 1970s have reduced the need for restorative treatment in young adults and will continue to affect practice patterns as these cohorts age. Second, more conservative strategies for treating dental caries that require less time will become more widespread. The consequence of these first two trends is a marked drop in the per capita use of most restorative dental services and number of hours required to treat the average dental patient. Third, changes in the dental delivery system, such as an increase in the number of group practices, will continue so that more patients will receive care from each dentist. Further, observations from an analysis of insurance data is that over two-thirds of all dental visits mainly involve the time of allied dental personnel. Consequently, about 40 percent of dentists report excess capacity.

Using Information from the Natural History of Dental Diseases to Underpin the Ten-Year Preventive Dentistry Plan for North Carolina: 1973–83

On February 4, 1974, at Winstead Elementary School in Wilson, North Carolina, the N.C. Dental Society and collaborators unveiled a ten-year preventive dentistry plan for North Carolina schoolchildren. Dr. Jim Harrell, president-elect of the N.C. Dental Society, and others were present to demonstrate their enthusiastic endorsement of the dental health plan and its implementation. The plan was the culmination of several years of growing interest in preventive dentistry within the dental profession and funding by the North Carolina General Assembly.

Three years before, at the annual meeting of the N.C. Dental Society, newly installed president Dr. William Hand had appointed a Task Force for Community Preventive Dental Health Education (later renamed the Preventive Dentistry Committee). This task force was charged with developing a statewide preventive dentistry program. It was to consider all possible approaches for providing the best program for the citizens of North Carolina, whether those involved use of dental offices, dental training facilities, facilities and services of public health dentistry, or public schools and community resources. The task force decided that the approach that would benefit the greatest number of citizens of North Carolina was one that concentrated on fluoridation—both community and school water fluoridation, as well as self-applications— and dental health education in the schools with an emphasis on newly promoted dental plaque control techniques.

As the 1973 Legislative Session in which a request for funds for the program would be made approached, Drs. James W. Bawden (Dean, University of North Carolina School of Dentistry) and Dr. E.A. Pearson Jr. (Chief, Dental Health Section), advised the Preventive Dentistry Committee to employ a consultant to document the dental needs in North Carolina and to devise a plan to deal with them. Dr. Frank E. Law of Bethesda, Maryland, was employed by the dental society to conduct the study. His report, the “Ten-Year Plan,” also known as the “Law Report,” became the basis for the statewide program and the focus of DPH activities in the state for the next decade.

The plan promised substantial reductions in dental disease in the next ten years if fully implemented. It contained significant and measurable goals presumed by most to be focused on dental caries, to achieve: (1) a 25 percent reduction in dental disease in the population twenty years of age and younger; and (2) a 40 percent reduction in dental disease in the population ten years of age and younger. (To these goals the Dental Health Section added a new objective in December 1980 based on findings from the 1976–77 epidemiological survey, to achieve a 15 percent reduction in periodontal disease in the population twenty years of age and younger.)

The Dental Health Section was the logical choice for administering the program called for in the plan, in that the section had a half-century of experience in school-based programs. By 1973, the section was already actively promoting prevention after years of running a treatment program. Seventy-five percent of the population was drinking community water containing the optimum amount of fluoride. Since 1968, thirty-three school fluoridators had been installed in rural schools. Two dental hygienists had been employed by the section and were pioneering school-based dental-health education programs in two counties. At the height of program development, the section employed four dental-health educators who were developing education materials for teachers, dental professionals, children and others.

The history of the N.C. Preventive Dentistry Program, including its origins, implementation, and evaluation, demonstrate the influence that epidemiological data can have on public policy. The 1960–62 Fulton-Hughes report had revealed in precise and representative numbers the oral-health problems in North Carolina’s population, and to a better extent than had ever been done in any other state. The prevalence of dental diseases and conditions made a compelling case for a major effort to prevent and control dental disease. The magnitude of the disease found in the population supported the conclusion that prevention was the most reasonable approach to address the problem in the environment of the 1970s. This conclusion by leaders of the dental profession was not an insignificant one.

Findings Natural History of Dental Diseases: 1960–63

- Estimated that there were over 12 million decayed and untreated permanent teeth in the mouths of North Carolinians.
- Children were affected at a very early age.
- Consequences of the widespread and severe nature of the disease were significant.
- One out of every four North Carolinians had lost all their permanent teeth; 3,000 of these toothless persons were between ages fifteen and nineteen.
- Two-thirds of the state’s population were receiving no regular dental care services at that time.

Dental disease in North Carolina’s population was described in the ten-year plan as a “problem which affects more of the school-age population of North Carolina than does any other health problem.” In the 1973 plan, Law estimated that over 12 million decayed and unfilled permanent teeth were in the mouths of North Carolina citizens. More than 650,000 (11 percent) of people of all ages had lost all their teeth, and of these 3,000 were between fifteen and nineteen years old, roughly the age of students when graduating from high school. The Law Report further estimated that North Carolinians spent over \$103 million each year for dental services; that two-thirds received no regular dental care; and that the dental workforce in the state at the time could not meet the existing demand for dental care. He estimated potential total savings of \$9,693,890 over the next decade assuming all decayed teeth were to receive care.



Fig. 25. Dr. Bruce Hawkins Screening for 1960-1962 Oral Health Survey.

In the spring of 1973, the General Assembly appropriated \$261,000 for the implementation of the ten-year plan. The program was pilot tested in ten counties chosen by the Steering Committee: Carteret, Chatham, Craven, Cumberland, Jackson, Madison, Moore, New Hanover, Pitt, Wilson. In another two years, 76 percent of those on public water supplies (2,406,146 people) were drinking fluoridated community water. Fluoridators had been installed in 87 rural schools serving 50,000 children. The sodium fluoride mouthrinse program was operating in 209 schools serving 89,000 children. One-fourth of the state's elementary school children were provided preventive dental-health education largely through the efforts of public-health dental hygienists.

The 1975 General Assembly provided funds for the continued expansion of the program. For fiscal year 1976, money was appropriated for expansion of the school fluoridation program (\$45,000). For fiscal year 1977, money was appropriated for the expansion of the education program (\$145,000), which allowed the employment of more dental hygienists and expansion of the education program into more counties.

The original appropriations funded about 10 percent of the plan, with the hope that subsequent appropriations from the General Assembly would fund another 10 percent every year until the entire state was covered. By 1985 the program covered 85 percent of the state, and the Oral Health Section anticipated that the plan would be fully in place by 1987–88 (Kate B. Reynolds Charitable Trust proposal, 1986 in author's possession). The ten-year plan would continue to expand and change to conform to scientific advances into the mid-1980s. The most important advance was the inclusion of dental sealants in the school-based program.

The plan called for monitoring and evaluation. It referenced *NHDD* as “the best data bank on the incidence of dental disease now extant.” It recommended that “research be conducted, 1973–76 to bring the information up-to-date” and to establish baseline data, and suggested that the study be repeated in 1983–1985 for comparison.

Unfortunately, the legislature did not fund an evaluation of the plan.

An early draft of the Law Report (1973) had forcefully recommended that “after a decade of application, this preventive dentistry program be evaluated by comparison with comparable data from the monograph *The Natural History of Dental Disease in North Carolina*.” The report further recommended that “the excellent study, *The Natural History of Dental Disease in North Carolina* be repeated, within the next decade, to update the information on dental conditions within the State.”

The Oral Health Section had undertaken an informal evaluation of the plan consisting of a few small uncontrolled studies of the effects of community water fluoridation, school water fluoridation, weekly mouthrinse with 0.2 percent NaF, dental sealants, and daily toothbrushing. (Levy et al. 1985). By 1983, there were 213 communities with fluoridated water supplies, 133 rural schools with fluoridated water supplies, and 1,013 schools using a fluoride mouthrinse. Pre-services or in-service workshops had been provided for more than 15,000 schoolteachers.

Drs. James Bawden, Gordon DeFriese (Director of the Center for Health Services Research), and others continued to pursue ways to fund a rigorous evaluation. Although the Preventive Dentistry Program appeared to be making inroads into exposing greater portions of the state population to fluorides and dental-health education, and the evidence of effectiveness from the small North Carolina studies suggested success, they were less-than-ideal studies. Outcome data were needed to ensure that the desired impact was taking place.

North Carolina Dental Society Workforce Committee

In the 1970s, the North Carolina Dental Society undertook a major effort to determine the dental manpower problem in the state. A twenty-two-member committee, the

Dental Manpower Study Committee was appointed in 1975 to systematically analyze the adequacy of the supply and distribution of dental-health manpower and to project future need and demand for dental care services in the state. Dental policies like Dental Health Professional Shortage Area determinations and dental school class size were being made based on the belief that insufficient demand existed for the current supply or the projected supply.

The committee also realized in its work that more sophisticated methods were needed than those available to them like the normative dentist to population ratio. The committee concluded that for “two essentially separate but interrelated purposes, a quantitative documentation of the epidemiology of dental disease was needed.” The need for data like that obtained in 1960–63 became the justification for seeking funds for a proposal submitted to the W. K. Kellogg Foundation. In his letter submitting the proposal, Dr. Harold E. Maxwell, President of the Dental Foundation of North Carolina, referred to the Preventive Dentistry Program for Children funded by the General Assembly as the “type of program [that] will help to reduce the prevalence of dental disease and at the same time relieve some of the pressure placed on the State to produce additional dental health manpower to service the needs of a largely rural population” (Maxwell, March 22, 1976, letter in author’s possession).

In response to dentist concerns about a dental surplus and dental school enrollment, UNC-CH chancellor Christopher Fordham appointed an Advisory Committee on Dental Manpower that was to examine relevant factors and make recommendations by October 1983 to the chancellor regarding class size in the predoctoral program of the UNC-CH School of Dentistry. The committee was made up of six citizens from various backgrounds.

W. K. Kellogg Foundation Funds Second Household Survey

The proposal to the Kellogg Foundation was successful. It funded a repeat of the 1960–63 statewide epidemiological survey as part of a comprehensive multifaceted, needs-based workforce study but with the understanding that results also would be used to inform the impact of the ten-year plan. The epidemiological data on need would be combined with information on the supply and distribution of dentists, dental hygienists, and assistants, and their productivity and capacity to meet the needs and the demand for dental care. Co-PIs for the project were Gordon DeFries, Jim Bawden, and John Hughes. Hughes would help ensure that the 1976–77 study was implemented as close as possible to methods used in the 1960–63 study.



Fig. 26. Dr. Gary Rozier Oral Health Screening, 1983.



Fig. 27. Survey Team for 1976-1977 Statewide Household Survey.

The sampling unit at RTI selected a representative area cluster sample of 1,528 households with an anticipated sample of 3,639 people living in them. A two-week training course was held for field surveyors the summer of 1976 and data collection completed during the summer and fall of 1976–77. The individual response rate in acceptance households, like the 1960–1963 survey, was remarkable at 94.9 percent ($n=3,454$) (Hughes et al., 1982). A photo of the survey team appears in Figure 27.

The sample was not designed to provide estimates for any of the counties. The excellent response rate, the use of analysis techniques that provide corrected estimates of oral-health status, and analyses that do not include units of analysis that are too small provided representative estimates.

Periodontal Disease “A Personal and National Tragedy”: Combating the State’s Presumed Number One Dental Public Health Problem in the 1980s

The 1976–77 study was of interest to state and national dental leaders because of its three major contributions. First, it provided information on need for dental care for the workforce study, which was taking a comprehensive and rarely used approach. Second, it provided a baseline for evaluating the N.C. Preventive Dentistry Program for children ten years hence. Third, it provided for the first time ever comparable data at two points in time which could be used to determine changing disease patterns in a state population. Two or more comparable cross-sectional surveys are much more valuable than one because of the opportunities it provides to evaluate trends, particularly in surveys of all ages. Trends in oral health observed in the North Carolina survey results led to an initiative directed toward periodontal disease, referred to by the American Association of Public Health Dentistry as a “Personal and National Tragedy” (AAPHD 1983).

The comparison of the two surveys roughly fifteen years apart, showed opposite trends in dental caries and periodontal disease. For children and young adults, the prevalence of DMFT was 17 percent lower in 1976 than in 1960. The comparison found 45 percent fewer untreated teeth and 30 percent fewer missing teeth in 1976–77. Both trends were revealed for the first time in a large, representative sample of an entire state population in the United States. This finding provided the first evidence in the United States of a trend toward fewer cavities in the permanent teeth of children and young adults (Rozier et al. 1982).

Prevalence of Periodontal Disease, 1976–77

- 2 out of 4 Whites and 3 out of 4 non-Whites were affected.
- About 732,000 North Carolinians needed periodontal treatment, which would require over 500,000 hours of dentists' time.
- At the time of the study, only 97,000 hours of care were being provided.
- Less than 2 percent of practice time was devoted to care of periodontal disease by dentists or hygienists.
- Tooth loss remained a serious problem. Approximately 930,000 North Carolinians were edentulous in one of both arches.

Periodontal disease, on the other hand, was widespread and revealed an alarming increase, particularly in Black males. The increases were two- to three-fold, judged to be large enough that they could not be due to measurement error. In age ranges 40–49, 50–59, 60–69, and 70+ and over, the percent with periodontitis increased by 11.9, 22.3, 36.3, 50.4 absolute percentage points, respectively, leaving a substantial number affected. For example, most 60–69 years of age (57.9 percent) and 70 years of age and older (87.2 percent) had periodontitis.

Findings from the household survey resulted in substantial attention and had more impact on state-level policy-making than perhaps any other epidemiological study in North Carolina, maybe in any other state. Even though it is difficult to know if the findings were the genesis of all this attention or if these findings and their attention in the state were simply riding a wave of growing interest in dentistry. Nevertheless, no state other than North Carolina had a policy that identified periodontal disease as its major oral-health problem to be addressed in the 1980s.

A dental society committee concluded, “The North Carolina Dental Society, in partnership with the UNC School of Dentistry, needs to undertake an aggressive effort to bring the problem of periodontal disease in North Carolina under more effective control. Prevention of the disease should have the highest priority. The effort could involve revisions in the dental school curriculum, continuing clinical education programs for practicing dentists and dental hygienist, and a broad public health education program for citizens of the state” (N.C. Dental Society 1979).

Response to Findings about Periodontal Disease

In response to findings of the N.C. Dental Manpower Study about trends in dental caries and periodontal disease, several activities were initiated by the N.C. Dental Society with funding from the Dental Foundation (Hutchens 1981). The NC Dental Society undertook a campaign known as Project '80 to disseminate knowledge about what it referred to as the state's number-one health problem to key policy-makers, including management teams at the Department of Human Resources, UNC-CH Dental Alumni Association, local boards of health, and board members of the N.C. Health Systems Agencies. The N.C. State Board of Dental Examiners tested for clinical competence in periodontal disease diagnosis and treatment on the state licensure examination for the first time.

A series of continuing dental education courses for practicing general dentists and auxiliaries were taught by dental school faculty. Five courses trained 135 participating dentists. Post-course evaluations indicated that the course was well-received but could not be used to determine any effect on practice patterns related to periodontal disease.

As a follow-up to the Dental Manpower Study, the Dental Foundation of North Carolina supported a one-year project to examine the issues involved in controlling periodontal disease in the state and to propose a comprehensive plan for improving the situation. A twenty-three-member advisory committee chaired by Dr. Stanley Fleming, past president of the Old North State Dental Society, was formed in January 1982 to develop the plan. Codirectors of the project were Dr. Rozier, Dr. Hutchens, Rebekah Bowden, and Edna Hensey.

The twelve-month project yielded recommendations for a comprehensive periodontal intervention to address providers' behaviors as well as improve the knowledge and behaviors of the public. From 1986 to 1989, after an unsuccessful review of the proposal by the RWJ Foundation, the Sheps Center for Health Services Research was funded by NIDCR to implement the provider component of the proposed intervention, with Jim Bader as PI and Rozier and McFall as co-PIs. A two-county, quasi-experimental controlled trial in which twenty-one experimental practices received performance feedback, a tutorial, problem-solving, goal-setting and technical assistance; fifteen control practices had no intervention. Baseline (3,000 records) and follow-up record audits were done at one and two years. The moderately intensive continuing dental education resulted in substantial improvement in recording of gingival bleeding, calculus, and probing depths, but post-intervention rates of about 30 percent represented incomplete adoption of recommended behaviors.

Interest in studying public-health strategies targeted at the prevention and control of periodontal disease waned among public-health and health-services research communities as new strategies with greater potential impact on disease were implemented. Research at UNC-CH shifted to biological questions about the impact of periodontal disease on health outcomes, such as cardiovascular conditions and pregnancy outcomes

and potential genetic determinants. Although the prevalence of periodontal disease remained high in older adults and minorities, only a small percentage have severe forms of the disease. The decline in tobacco use likely resulted in improvements in the prevalence of periodontal disease. Other countervailing trends in determinants would suggest little change in the prevalence of periodontal disease in the future, but the lack of an obvious trend over the last two decades makes projections uncertain (Rozier et al. 2017).

Dental Sealant Initiatives

In his welcoming remarks to the NIH Consensus Development Conference on Dental Sealants, Dr. Harold Loe, director of the National Institute of Dental Research drew attention to problems and the conditions required for sealants' placement. Four years later, the NIH Consensus Development Conference on Dental Sealants chaired by Jim Bawden from UNC-CH concluded that "the placement of sealants is a highly effective means of preventing pit and fissure caries...It is currently underused in both private and public health care delivery systems...intensive efforts should be undertaken to increase sealant use" (National Institutes of Health 1984).

Over the ensuing years, states undertook ongoing efforts to promote the use of sealants that would complement national efforts. Efforts in North Carolina during the 1980s and 1990s were designed to build on those at the national level (Bader et al. 1987).

Initiatives to Promote Dental Sealant Use in North Carolina

When writing one of the drafts for the ten-year plan, Dr. Law had concluded that the evidence for the effectiveness of dental sealants used in school-based programs was not strong enough for them to be deployed in the North Carolina Preventive Dentistry Program. In a letter to Pearson, in which he submitted a draft of the ten-year plan, Law wrote: "Under specific clinic and research conditions decay has been prevented for up to three years in the majority of cases. However, there is considerable question, at this time, regarding the applicability and value of this technique under field conditions" (Draft sent EA Pearson Jr., December 12, 1972; letter in author's possession).

But the scientific communities' assessment of dental sealants changed as materials improved, as a strong epidemiological justification for their use in clinical practice was advanced, and as experience was gained in their use. By the late 1970s, experimentation in DPH was underway in North Carolina. In 1979, sealants were used in the New Hanover County DPH clinic and were found to be effective in terms of retention and cost effectiveness (Miller and Brunnelle 1983).

Yet several barriers to dentists' use in private practice and public health school-based programs continued to slow adoption of the technology. For example, a survey of 31 out of 36 pediatric dentists practicing in North Carolina in 1980 found only 0.7

percent of all procedures and 1.3 percent of time were devoted to placement of dental sealant on permanent teeth (Dilley et al. 1982). A prevailing concern of practicing dentists was that decay would be sealed in the tooth and progression would advance undetected until the tooth was severely damaged. Initiatives undertaken in the state were designed to address this and other concerns held by clinicians.

An initiative to promote dental sealants cosponsored by the N.C. Dental Society, the Oral Health Section of the North Carolina Department of Human Resources, and the UNC-CH School of Dentistry began in North Carolina in the summer of 1984. The initiative included a leadership conference, a publicity campaign in the professional and public media, and a series of regional and local continuing education presentations (Bader et al. 1987). Reasons for dentists' reluctance to use sealants included in presentations at the NIH Consensus Development Conference and the consensus statement itself were addressed in the North Carolina campaign. A public education campaign included newspaper stories about the benefits of sealants and their increasing use in the state.

Use of sealants in dental public health programs gained support as they continued to be promoted in the 1980s and 1990s (*JPHD* 1995). In 1993, a five-part sealant initiative began with emphasis on: (1) school-based sealant demonstration projects, (2) sealant educational exhibits, (3) media campaign, (4) public-private sealant projects, and (5) the "Ask Us About Sealants" point of purchase campaign. In 1998, the Dental Health Section held a year-long observance of its eightieth anniversary called "Seal the State in '98," which featured a statewide sealant initiative to prevent decay through increased utilization of dental sealants, which included a National "Seal the State in '98" Symposium. Community-based sealant projects conducted in all 100 counties of the state in which 39,387 sealants were placed in 8,828 children. Almost 195,300 educational contacts were made, mostly school-aged children. Twenty statewide organizations plus county and community organizations contributed their time and financial support to the initiative. Over 8,000 people volunteered their services.

Statewide information on the prevalence of dental sealants in North Carolina was needed to establish a baseline against which progress could be measured. National and state-level goals had been established that at least 50 percent of children should have sealants by the year 2000. An immediate need for information was to know if the North Carolina Preventive Dentistry Program for Children was having an impact compared to the 1976–77 survey results.

Planning for Subsequent Surveys

An ad hoc committee considered the need for a follow-up survey to the 1976–77 Hughes-Rozier survey. Input was obtained from Bawden (the committee chair) and many others at UNC-CH, the state health department (Barker, Bader, Dudney, DeFriese, Graves, Satterfield, Murphy, Hawkins, Young, O'Neil, Levy, and Gillings),

and RTI over the next several months beginning in October 1984. Many complex issues were considered for purposes of planning oral health and related surveys.

According to the committee minutes, the advantages of a school-based survey over a household survey are that the school-based survey would:

1. Provide for the first-time information on a sample large enough to allow definitive analyses of important subgroups. Analyses of trends in children were limited because resources and efforts in the household surveys were directed toward all ages.
2. Provide oral-health information currently not available on a representative sample of school children such as DMFT surface data needed for rationalization/evaluating sealant initiatives, gingival status and dental treatment needs.
3. Sample school children, the group toward which most public programs were directed, and thus could better justify costly efforts.
4. Would be much simpler than a house survey and associated expenses much less.
5. Would be easier to obtain funds because expenses would be considerably less.
6. Would use methods such as sample selection that were more developed and simpler to implement.

The disadvantages of a school survey were listed as follows:

1. It would not provide information on preschool children and information on adults, and thus a fierce debate about the extent of periodontal disease problem would go unaddressed.
2. The ability to collect reliable data concerning socioeconomic data, behavioral variables and exposure to interventions such as fluoride would be limited.

The committee recommended exploring a creative sample design that would include a cross-sectional survey of households and individuals included in the 1976–77 survey, which would provide longitudinal information on oral-health status, and additional households from the same clusters but not included in the previous survey with perhaps some new clusters. But James Chromy and Frank Potter, sampling experts from RTI, advised that the cross-sectional and longitudinal survey use independent samples. In the end, funds were more obtainable for a school survey than a household survey, the logistics were much easier, and the priority was for information on children so that dental caries initiatives could be evaluated.

The 1986–87 School Survey: The First Statewide School Survey— Sealants; Fluorosis; Changes in School Programs

The initial periodontal disease proposal developed during the year-long planning grant from the Dental Foundation of North Carolina was submitted to the Kate B.

Reynolds Foundation but not approved for funding. In May 1985, Dudney, Young, Brownfield (the new assistant director for the Dental Health Section), and Rozier met with Vance Frye, executive director of the Kate V. Reynolds Health Care Trust, to discuss funding for an oral-health survey of the North Carolina school population. Mr. Frye made several interesting comments during the meeting. He said that the periodontal proposal submitted earlier as part of the community periodontal research effort and reviewed by the foundation had gotten the board's attention, particularly the description of the problem. This review made the board aware of dental issues, so they were more likely to fund a dental proposal.

Findings of the 1986–87 Survey on Dental Caries & Sealants in Children

- Majority had never had a cavity in permanent teeth
- Caries declared a disease of posterior permanent teeth with pits & fissures
- Substantial variation in caries prevalence by community
- Increased rate in decline in caries first observed in 1976
- Dental caries prevalence equal to the national average
- Sealant use limited to a small percentage of children
- For every tooth sealed, about three more needed to be sealed

The Oral Health Section was funded, with the School of Public Health as the primary scientific consultant for dental content and the State Center for Health Statistics as the primary consultant for sample design and implementation for the 1986–87 survey.

A proportionate sample of 330 classes representing 41,000 classes in grades K–12 statewide with 1,084,055 students was selected from strata defined by the Dept. of Health and Human Resources according to region, urbanism, percent non-White for county, and grade. As with the other statewide clinical surveys, the response rate was good, with 6,650 of 8,026 students participating (RR=82.9%)—a testimony to the network of mostly dental hygienists spread throughout the state who had working relationships with their communities.

The primary goals of the survey were stated in straightforward descriptive epidemiology terms: to describe the oral-health status of children in N.C. public schools, the prevalence of dental sealants, and periodontal status, and the variation of these conditions according to sociodemographic variables. However, the 1986–87 survey and the others preceding or following it provided opportunities to inform other important issues.

At around this time, four epidemiological trends were being followed closely because of their broad implications for public-health programs that added interest to the survey. First was the downward trend in dental caries prevalence and its presumptive cause being the N.C. Preventive Dentistry Program, a premise that needed to be validated. An assessment of forty-year trends could help shed some light on secular trends. Second was the distribution of caries according to tooth surface type and whether a rationale for sealants was strongly indicated by a decrease in smooth-surface decay and remaining pit-and-fissure decay. An assessment of the current prevalence would serve as a baseline for sealant initiatives. The 1986-87 survey would be the first statewide, surface-level survey in North Carolina. Third was the distribution of caries according to risk groups. Evidence was needed on the question of whether children at risk of severe caries could benefit from tradition and new interventions to the same extent as children with lower risks for dental caries. Finally, a concern about the prevalence of enamel fluorosis was emerging. An increase in the prevalence of fluorosis could be a sign that children were ingesting too much fluoride and could jeopardize fluoride programs. The dental profession and the public alike were beginning to express some concern about fluorosis. The survey would establish baselines for incipient caries and enamel fluorosis.

Trends Needing Close Monitoring

1. Prevalence of dental caries
2. Surface type affected P/F vs. smooth surface caries
3. High-risk individuals and community groups
4. Prevalence and severity of enamel fluorosis

Baseline for North Carolina Sealant Initiative

The survey was perhaps the first survey representative of an entire state population of schoolchildren, providing important information for planning continuation and expansion of the sealant program in North Carolina. The procedure was used infrequently for a small number of patients. The survey found an overall sealant prevalence of 12 percent for children ages 6–17 in 1986–87. The mean number of decayed and filled surfaces for 6- to 11-year-olds and 12- to 17-year-olds on those surfaces with pits and fissures was 0.97 and 4.70 per child, respectively. The mean number of sealed surfaces was 0.44 and 0.51 per child for these same ages. Approximately two to six times more surfaces were found to be decayed and filled than sealed. This ratio was as large as 12 for non-White males 12–17 years of age. These prevalence estimates and

ratios of diseased to sealed surfaces highlighted the need for dental sealants, and their potential to contribute to further improvements in dental caries in children with more widespread use.

Targeting Caries Prevention to High-Risk Groups

In the early 1970s, dental caries was identified as a United States Presidential special health initiative along with cancer and heart disease, highlighting the concern of policy-makers for its serious outcomes. The president's budget of 1971 awarded \$5 million to the National Institute of Dental Research to help fund the National Caries Program (NCP). The continuing special budget allocations to the NCP in the 1970s provided the largest source of money in history to fund school-based preventive dental research. During the 1970s and until 1984 when the program was eliminated, the National Institute of Dental Research heavily promoted school-based programs. A centerpiece was seventeen demonstration programs implementing school-based programs around the country.

In this environment, the possibility that public-health programs should target high-risk populations was first raised by Bohannon and his research group, after a community trial in ten sites with more than 25,000 subjects completed in the early 1980s yielded unexpected results (Disney et al. 1990). They found that use of school-based fluoride mouthrinse was not as effective as they had expected, leaving the fate of school-based programs in doubt. This stance led to vigorous debate about fluoride mouthrinse use in school programs, particularly between Bohannon and NIDCR investigators, the latter of whom were promoting its adoption. The debate was healthy, because it shaped the perspective for DPH programs and research to this day. It led to the UNC Caries Risk Assessment Study that developed individual caries prediction models for dental caries in children.

Concerns about disparities continued to grow, particularly after the U.S. surgeon general released a report in 2000 highlighting the variations in prevalence among population groups. Evidence was building for several years that the issue of targeting high-risk individuals needed attention because providing services to the entire population could lead to wasted resources if a substantial portion of a population was at low-risk and had little disease to prevent. A more logical approach would be to target preventive and treatment services to high-risk individuals, schools, and communities. But these groups needed to be identifiable and interventions effective when used with these groups at elevated risk of dental caries.

Searching for “Community” Risk Predictors for Dental Caries

A secondary analysis of the 1986–87 statewide survey data by Amstutz and Rozier (1995) found substantial variation in dental caries prevalence from classroom to

classroom. Factors that could be associated with this variation were explored using average classroom caries scores as a surrogate for the larger community. In all, 172 classrooms (3,400 students) in grades K–6 were available for analysis. For grades K–3 (108 classrooms), population density, parental education, and coastal residence were negatively associated with caries scores, while age, and medical and dental Medicaid expenditures were positive. For grades 4–6 (64 classrooms), age and ratio of filled surfaces to decayed and filled surfaces (fs-dfs ratio) were positively associated with caries scores, while population density, population-dentist ratio, and years of natural fluoride exposure were negative. When compared to individual models, these aggregate models explained a substantial portion of the variation in caries prevalence, 31 percent for grades K–3 and 51 percent for grades 4–6. Results suggested that risk-assessment models based on community rather than individual variables is feasible.

Four studies explored the potential for sealants and fluorides to prevent caries in high-risk children and to help reduce oral health disparities (Chianca 1996; Weintraub et al. 2001; Divaris et al. 2012; Matsuo et al. 2020).

Madison County Study (1990–95): Does a Child’s Individual Caries Risk Modify Sealant Effectiveness?

Although the risk profile of schools and communities varied, and preliminary investigations suggested that high-risk communities and schools could be identified, evidence for the effectiveness of preventive interventions targeted toward them was not strong. Some research in England even suggested that current public-health interventions were not effective in high-risk individuals and only served to widen the gap in disparities. Research in North Carolina during the 1990s and 2000s explored the potential to reduce risk for caries and thus the prevalence of disease in children at elevated risk.

The Oral Health Section and the Gillings School of Global Public Health took part in a W. K. Kellogg Foundation–funded Community-Oriented Primary Care project in Madison and Mitchell Counties. Located in the western part of the state, these counties are among the poorest in the state. The purpose of this project was to evaluate the effects of sealants on caries increments in permanent teeth of children, and determine if any sealant effect is modified by person- or tooth-surface-level caries risk. Pediatric dental caries was among the most frequent of problems mentioned by those attending forty-one focus groups held in various locations throughout Madison County, the intervention county.

In 1989, principal investigator Dr. Suzanne Landis, an epidemiologist and physician in Asheville, along with Rozier, King, and others in the Oral Health Section and School of Public Health designed a prospective non-randomized cluster trial to compare five-year caries increments in second-grade students who received sealants

at baseline and two-year follow-up in Madison County (BL n = 166; 106 all 3 years) compared to Mitchell County without sealants (BL n=141, 89 all 3 years). Almost all (88.5 percent) of the second-grade students in the two counties were enrolled in the study at BL. Results supported targeted use of sealants in high-risk children in school-based oral-health programs. Odds of sealed surfaces becoming carious after five years was 4.7 times less likely than for non-sealed surfaces in persons classified as high-risk (defined as any caries in primary dentition).

Do Sealants Yield Cost Savings in Medicaid Programs? (Project 1992–94; Claims 1984–92)

By the early 1990s, the promotion of sealants was beginning to impact the provision of sealants in North Carolina. In reimbursement claims submitted by dentists in the North Carolina Medicaid Program, sealants had become more common than single-surface amalgams. Because of their frequent use by dentists in this public program, it was important to understand expenditures and oral-health status outcomes resulting from sealant placement. No other Medicaid program had investigated this issue at the time.

N.C. Medicaid added dental sealants as a benefit in 1985, when only twenty-four other states included them. Jane Weintraub, Sally Stearns, and Gary Rozier undertook an AHRQ-funded study to evaluate sealants' effects on Medicaid covered charges and treatment outcomes (Weintraub et al., 2001). The study analyzed trends in aggregate monthly restorative treatment before and after the sealant benefit to determine program effects, patterns of provider sealant behaviors, and a cohort analysis to determine individual child effects. A retrospective cohort analysis of 15,438 children enrolled in North Carolina Medicaid from 1985 to 1992 was used to compare the likelihood of restorative treatments and associated cumulative Medicaid expenditures for teeth with or without dental sealants. Sealants were found to exhibit expenditure savings in Medicaid high-risk children in this study of children receiving care in North Carolina Medicaid.

The 2003–4 School Survey

Two other studies determined the potential for school-based fluoride mouthrinse programs (Divaris et al. 2012) and community water fluoridation (Matsuo et al. 2020) to be effective in school children with elevated risk for dental caries. Data from the 2003–4 survey were used for these purposes.

The primary aims of the 2003–4 CDC-funded statewide school survey were to evaluate: (1) the joint and individual effects of the N.C. Preventive Dentistry Program's two fluoride components (fluoridation and school-based rinse) on dental

caries experience and their contribution to reductions in disparities in dental caries; and (2) trends in dental disease among schoolchildren in the state over the past forty years using results from this survey and the other three representative surveys.

The survey also would establish a statewide baseline for early carious lesions, enamel fluorosis and all clinical and nonclinical variables for the Hispanic populations for the first time in the state.

CDC Fluoride Quiz

1. All children older than 6 months should receive a fluoride supplement every day. (21.4%)
2. Parents should start brushing their child's teeth with toothpaste that contains fluoride at age 3. (6.1%)
3. Children younger than 6 years should use enough toothpaste with fluoride to cover the toothbrush. (33.0%)
4. Young children should always use fluoride mouthrinses after brushing. (20.2%)

NOTE: Percent answering correctly in parentheses.

The study included a self-completed questionnaire by the parents of all children to provide important covariates for some analyses and to substantiate information for program activities. For example, knowledge about fluoride was poor, with only about one-half of respondents being able to answer correctly any of the four questions used in a quiz developed by the CDC Division of Oral Health. These questions were developed to test the public's understanding of recommendations for the safe and effective use of fluorides published in "Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States" (CDC 2001).

The 2003–4 survey was based on a sample of 400 classrooms selected from sixteen strata designed to oversample Latino and grades 9–12 students. Response rates were good, with 357 of 398 classrooms participating in the survey (RR=89 percent). About 5,400 of the 7,669 sampled schoolchildren received a clinical examination (RR=70 percent) and 5,942 parents returned completed questionnaires (RR=77.4 percent), either in English or Spanish as appropriate. These paper-based questionnaires provided extensive information, some of which had never been collected in North Carolina, that provided in-depth analyses for important public-health questions.

Do School-based Fluoride Mouthrinse Programs Work in Schools with Children Who Lack Access to Care?

The aims of this study by Divaris et al. (2012) were to estimate the caries-preventive effects of a school-based weekly fluoride mouthrinse program and to determine whether its effectiveness differed by school-level caries risk. Clinical and parent-reported data for 1,363 children in grades 1–5 from the 2003–4 sample of North Carolina schoolchildren were analyzed. Children's caries experience was measured using criteria for both cavitated and non-cavitated lesions. Individuals' participation in the fluoride mouthrinse program was quantified as number of years. To estimate caries risk, children were matched with N.C. kindergarten-surveillance data representing school-level mean untreated decay (low-risk school: < 1 and high-risk school: ≥ 1 untreated carious teeth).

Information in 2003–4 Statewide Survey

Dental caries experience

Non-cavitated and cavitated lesions
Treatment

Other clinical conditions

Sealants
Fluorosis
Incisal tooth trauma
Orthodontic treatment status

Parent Questionnaire Domains

(8 pages; 34 questions)
Sociodemographic characteristics
Self-reported child health
Dental opinions, values and knowledge
Access to dental care
Preventive exposure
Fluoridated toothpaste and brushing frequency
Fluoride tablets
Fluoride mouthrinse (home & school)
Fluoridated drinking water
Sealants

A trend toward a larger caries-preventive benefit among children in high-risk schools compared with those in low-risk schools was observed (i.e., 55 percent vs. 10 percent caries reduction for five to six years of fluoride mouthrinse participation compared to none). Results indicate that children in high-risk schools, as identified by school-level surveillance data, may experience substantial caries-preventive benefits from long-term use of fluoride mouthrinse.

Does Community Water Fluoridation Reduce Inequalities in Dental Caries Prevalence?

Matsuo et al. (2020) examined whether community water fluoridation (CWF) reduced dental caries disparities in permanent teeth of ten- to nineteen-year-old schoolchildren in North Carolina. Their study analyzed cross-sectional data for 2,075 students in K–12 schoolchildren examined in the 2003–4 survey of children in North Carolina public schools. Among the children without any CWF exposure in their lifetime, statistically significant caries disparities by parental educational attainment were observed. Compared to the children of parents with more than a high school education, the relative risk for those with a parent with a high school education was 1.16 (95 percent CI = 1.01, 1.33) and those with less than a high school education was 1.27 (95 percent CI = 1.02, 1.60). Socioeconomic disparities in dental caries were not observed among ten- to nineteen-year-old schoolchildren with lifetime CWF exposure. This study provided evidence that socioeconomic disparities in dental caries are reduced among ten- to nineteen-year-old schoolchildren with lifetime exposure to community water fluoridation.

These three studies provide evidence that dental sealants, fluoride mouthrinse, and community water fluoridation are effective in preventing dental caries when used in children in high-risk communities.

Oops! Applying the Brakes

With the welcomed but hard-earned news in the late 1970s about the decline in dental caries prevalence came a word of caution from the epidemiological and practice communities (Leverett 1986). Early water fluoridation studies by Dean and others had led to the conclusion that only about one out of ten people drinking community water fluoridated at about 1 ppm would have enamel fluorosis, and that it would be very mild. A 1991 Public Health Service report on the benefits and risks of fluoride found that the prevalence of fluorosis had increased to approximately 22 percent in communities with optimally fluoridated water supplies (CDC 1991).

Lalumandier Asheville Fluorosis Study

Lalumandier, Rozier, Satterfield, and King (1995) spent several Saturdays in a pediatric dental office in Asheville, North Carolina, examining patients ($n=708$) for enamel fluorosis. The group was there doing a study on behalf of the N.C. Department of Health to determine the prevalence and severity of fluorosis in this practice and the source of fluoride should it appear that children were ingesting more than the recommended amounts. They were there at the invitation of the dentist who owned the practice, who was concerned about the complaints he was getting from his patients' parents about the aesthetic appearance of their children's teeth. Although not representative of the city or county, patients were selected using a method to ensure that they were representative of the dental practice and this practice enrolled large numbers of patients from a wide geographic area.

The four examiners were trained and calibrated in the use of the Tooth Surface Index of Fluorosis (TSIF), a seven-point scale, by Dr. H. Horowitz from National Institute of Dental and Craniofacial Research and the primary investigator who developed the index. Information on fluoride exposures and other explanatory variables were obtained through parent interviews and mail questionnaires. Parent-reported fluoridation status of each study subjects' exposure to drinking water was confirmed by fluoride assay of community drinking-water samples provided by parents.

Nearly 78 percent of subjects had a positive TSIF score of > 0 (36.3% > 1 ; and 18.9% > 2). For subjects drinking fluoride-deficient water, fluorosis (1 or more positive TSIF scores) was associated with dietary fluoride supplement frequency and age of the child when brushing was initiated. For subjects drinking fluoridated water, fluorosis was associated with age of the child when brushing was initiated.

The data demonstrated a strong association between the severity of fluorosis and parents' satisfaction with their child's tooth color. While 73.9 percent of parents of children without any fluorosis were satisfied with tooth color, only 24.2 percent of parents of children with severe fluorosis were satisfied with the color of their children's teeth. Likewise, 4.6 percent of the sample had severe fluorosis, more than five times the rate reported by the 1991 USPHS report on the risks and benefits of fluorides.

A Larger North Carolina Study on the Impact of Fluorosis and Dental Caries on OHRQoL

The 2003–4 school survey provided an update on the prevalence of dental caries and for the first time in North Carolina assessed the statewide prevalence and severity of enamel fluorosis. In a secondary analysis of the survey data, Onoriobe et al. (2014) provided statewide prevalence estimates for enamel fluorosis and the impact of enamel fluorosis and dental caries on oral health-related quality of life (OHRQoL) in North Carolina schoolchildren and their families.



Fig. 28. Top photo: Fluorosis (low prevalence) and no effect on quality of life. Bottom photo: Caries (high prevalence) and affects quality of life.

Dental caries was more prevalent than enamel fluorosis. Of the 5,484 students examined, 71.8 percent had no fluorosis; 2.4 percent, questionable to very mild fluorosis; and 3.7 percent, mild, moderate, or severe fluorosis. Caries categories created for this study were: none (43.1 percent), low (28.6 percent), and moderate-to-high (28.2 percent). No associations between fluorosis categories and OHRQoL scales met statistical or minimal important differences (MID) thresholds, or differences that were detectable by and important to the parent. Differences in OHRQoL scores for the no-caries compared to the moderate-to-high caries groups exceeded MID estimates, meaning caries had a negative impact on parents.

This study provided important conclusions about fluorosis, dental caries, and the associations between the two. First, the prevalence and severity of dental caries is worse than the prevalence of enamel fluorosis. Second, a child's caries experience negatively affects OHRQoL, while fluorosis has little to no impact in this population.

The cumulative evidence provided by the studies on interventions according to risk conducted using the surveys is encouraging for dental caries and school-based preventive dentistry programs at this point in the study of dental disease. Epidemiological evidence suggests a highly polarized distribution of dental caries. Because of this distribution,

interventions should consider limiting public-health services to high-risk populations if resources are scarce and choices must be made about who gets services and who doesn't. Classroom fluoride mouthrinse programs, dental sealants in schools or linked with dental clinics, and CWF all seem to be effective in addressing "hot spots" of disease.

Fifteen-Year Trends in Dental Sealants

It was about fifteen years before the 2003–4 school survey that estimates for statewide, baseline sealant prevalence estimates were obtained for the first time in North Carolina. In the mid-1980s, when that was done, sealant use was not pervasive, falling far short of national and state goals. Generally, prevalence of sealants reflected regular use of dental care, with traditional groups in greatest need for dental services being the least likely to use dental care and the least likely of have received sealants.

The prevalence of dental sealants in 2003–4 compared to 1986–87 showed substantial progress in the state, exceeding the goal of 50 percent of adolescents having one or more sealants. The percentage had increased from about 12 percent in twelve- to seventeen-year-olds to 56.9 percent in 2003–4.

Forty-Year Trends in Dental Caries

Although sample frames differ, the four major epidemiological surveys conducted in North Carolina can be used to compare dental caries prevalence for primary and permanent teeth in children 5–17 years of age. This comparison provides important information about trends in dental disease statewide over about 40 years (Rozier and King 2005). The number of decayed, missing, and filled permanent teeth (DMFT index) declined by 82 percent in White adolescents between 1960–62 and 2003–4, from 7.6 teeth per person to 1.9. Along with the decline in dental caries experience, the proportion with untreated also declined, and by a substantial amount.

Major Conclusions about Dental Caries in Permanent Teeth, 2003–4

- Substantial improvement in three decades starting in the 1970s
- Distribution on different tooth surfaces has changed so that it is now a molar disease in permanent teeth
- Distribution in the population has changed so that a smaller percentage of individuals are moderately-to-severely affected
- Wide population and geographic disparities exist in disease occurrence and its treatment

Trends in primary tooth decay were not as favorable as for permanent teeth. After years of decline, trend lines in the prevalence of caries in primary teeth leveled off in some groups and appeared to have increased in others. The increase is particularly striking for children whose caregivers have less than a high school education. This increase was confirmed with annual surveillance data for kindergarten students and national survey data. Although changes in absolute amounts were small, the trend in this unexpected direction after years of improvement caught the attention of policy-makers and efforts turned toward interventions that might be successful against tooth decay in preschool-aged children. The dental community was as surprised about the increase in primary teeth as it was when the downward trend was first detected in the 1970s. For several years in the 1990s and 2000s, the research portfolio in DPH would focus on this population group both nationally and in North Carolina, which would lead the way in one of the more promising strategies, the integration of oral health into medical practice for young children.

Reasons for Decline in Dental Caries Prevalence—Cohort Effects

Rozier and King (2005) have compared the different lifetime experiences of the first and last cohort of children. Adolescents in the first cohort of children ages 12–17 who had dental examinations for dental caries in 1960–63 were born and lived mostly in the 1950s, and the last cohort examined in 2003–4 lived roughly forty years later in the 1990s. The dental experiences of the two cohorts differed substantially, with the younger cohort benefiting from the many advances made in dentistry during the four decades. Trends in exposures to preventive dentistry, the availability of dental care, the demand for these services by the public and self-care practices were all positive. In the 1950s only 15 percent of North Carolina's population was drinking fluoridated water; by 1990, the percentage had increased to 80 percent of the population served by municipal drinking-water systems. No other preventive programs with the impact of interventions like school-based dental sealants or mouthrinses existed in the 1950s. As just emphasized, dental sealants came into use over this period between the two cohorts. Private practice did not routinely provide fluoride treatments in the 1950s, and fluoridated toothpaste was just being introduced. In the 1950s, only one dentist for every 4,000 people practiced in the state. By the 1990s, the ratio had improved to one dentist for every 2,500 people. By the 1990s, almost everyone who brushed their teeth with toothpaste used fluoridated toothpaste.

Historical Criteria for Dental Caries

The definitions and diagnostic criteria for dental caries were the same in all four state-wide surveys in North Carolina. Attempts were made to train and calibrate examiners

to the same standard as much as possible. This strategy helps ensure that conclusions about trends in the prevalence of dental caries are reasonable. These criteria generally used in national surveys as well require that carious lesions be cavitated to be included in the “decayed” component of the DMFT Index.

While ensuring comparability, this strategy underestimates the amount of disease and sacrifices validity for reliability. Under some study purposes, it is more important to examine for incipient (non-cavitated) lesions to obtain an accurate count of disease than to have comparability with other surveys. The inclusion of incipient lesions in the 2003–4 survey will provide a baseline against which future surveys can be compared. Trends in incipient lesions should provide additional insights into the impact of preventive interventions.

A good example of the need for a more precise estimate of dental caries was evident in the North Carolina Dental Manpower Study in which “need” for dental treatment was required for the approach employed for workforce estimates. Dr. L. M. (Sonny) Long, a pediatric dental resident at UNC-CH at the time, recorded carious teeth using epidemiological criteria under simulated field survey conditions and subsequently under optimum clinical conditions on 270 children ages 3–12 (Long et al. 1979). He proposed that the true mean caries score can be estimated from the survey mean score by adding 1.5 teeth in the primary dentition and 2 teeth in the mixed dentition to the scores.

The first- ever assessment of the prevalence of non-cavitated lesions in a statewide population of school children, done in the 2003–4 survey, found that 65 percent of lesions are non-cavitated (age 6–11; 0.6 per child non-cavitated, 1.07 per child cavitated = 36 percent) (age 12–17; 1.72 per child non-cavitated, 2.52 per child cavitated = 41 percent). This large prevalence of incipient lesions has important implications for fluoride program because of the ability of fluoride to help prevent the progression of incipient dental carious lesions to frank cavitation. Fluoride might be “holding” down the progression of lesions so that the prevalence of cavitated lesions is lowered.

Origins of Integration of Preventive Oral Health Services into Primary Care and Early Childhood Education in North Carolina

Smart Smiles (October 1998–September 2001)

“Just tell us what to do to solve this problem and how much it will cost and we will get the money!”

These were the words of Doris Huffman, a prominent advocate for young children who was working in N.C. governor Jim Hunt’s administration in the 1990s. She had become aware of the serious problem with access to dental care faced by preschool-aged children in the western counties in North Carolina. At a two-day strategic planning session in August of 1996 at Lake Junaluska, coordinators of Smart Start programs in the twenty-nine counties included in the Appalachian Regional Commission

(ARC) concluded that “the single most important health issue affecting the children they serve was limited access to early dental care.” They decided that the oral-health problem of children would be given top priority in their programs. Initially the problem was defined as one of “access” to dental care. In 27 of the 29 ARC counties, there were two or fewer dental practices that accepted preschool-aged children as patients. Ms. Huffman had come to the dental profession for advice and challenged the North Carolina DPH community to help solve the dental problem.

Leaders in DPH, while stressing the importance of primary prevention, had no proven models for children in this age group to fall back on. Frustrated with the lack of specific recommendations, the Partnership for Children (which manages Smart Start, the early childhood education program in North Carolina) hired Thomas P. Davis Jr., MPH (unpublished student proposal, Sept 1997), a public-health consultant to prepare a review of available strategies for addressing oral-health problems and their evidence. He concluded that the best way to deal with the problem of access to dental care was to decrease the demand for dental health services for preschool-aged children through prevention of tooth decay. Fluoride was considered effective, but other than water fluoridation, no practical methods were available to get the fluoride to very young children who did not have dentist visits. But he likewise found no practical strategies for addressing the oral-health problems of preschool-aged children that need preventive and sometimes restorative and surgical care as early as one year of age.

With the lack of recommended strategies from the larger dental community, the Partnership for Children in collaboration with the Oral Health Section and the Ruth and Billy Graham Center secured a three-year grant from the Appalachian Regional Commission (ARC) under Section 302 authority to develop effective community-based interventions that would promote dental health among preschool-aged children and their families in the ARC counties. With this \$247,119 one-year grant approved on September 15, 1998, and the possibility of renewal, Huffman on behalf of the Partnership for Children came back to the DPH community and said, “Now will you help us?!”

Thus began what would become perhaps one of the most elaborate and successful collaborations to ever address a health problem in North Carolina. The development and refinement of the medical model for delivering preventive oral-health services would occupy practitioners, policy-makers, and researchers from the late 1990s to the date of this writing, two decades into the twenty-first century. A partnership consisting of representatives from close to a dozen organizations, which brought to the problem expertise in disciplines as diverse as medicine, dentistry, community organization, health education, public health, child health and development, social services and program evaluation. The primary focus of the research agenda in the 2000s was on the prevention and treatment of early childhood caries (ECC). The rationale that evolved in the mid-to-late 1990s was one of the stronger ones developed to support any of the DPH programs in the state.

Start Dates for North Carolina ECC Initiatives

1997: Smart Smiles

2000: Into the Mouths of Babes

2006: Carolina Dental Home

2007: Referral Guidelines (PORRT)

2008: Early Health Start Initiative (ZOE)

2011: CHIPRA Connect the Docs

Like the beginning of the N.C. Preventive Dentistry Program for Children more than twenty-five years before, events were aligned that would permit an innovative solution to the problem of ECC, with core public-health values emphasizing access to preventive oral-health services at an early age. ECC was receiving increasing attention both nationally and in North Carolina. Dental caries was increasing based on the new kindergarten surveillance system established by the state health department, which provided an early warning sign that the prevalence of dental caries was rising, a trend later confirmed by national data. In an important move for early childhood programs, the FDA approved the use of fluoride varnish in the United States for off-label use (Bawden 1998). As a result, a focus in dental policy shifted to preschool-aged children, a long-ignored group of children, resulting in several new initiatives in North Carolina.

During the first few months after ARC funding, the initiative was named “Smart Smiles” (after Smart Start) and a statewide advisory committee was established to guide the planning and implementation process. Smart Start staff explored different strategies for addressing the ECC problem in each region of Smart Smiles. Five dental hygienists, called Community Development Coordinators (Lisa Browning, Melanie Durham, Pat Hedrick, Jessica Norris, and Diana Rothweiler [Henderson County funded separately]) began work in May 1999, developing community interventions for the project counties (Avery, Burke, Cherokee, Graham, Henderson, Macon, McDowell, Mitchell, Polk, Rutherford, and Yancey). Training materials, tracking forms, and dental health promotional materials were developed to be used throughout the service areas.

Fluoride varnish was strongly supported by dentists involved in the initiative. Bawden reviewed the evidence of effectiveness for important decision-makers. He provided training and consultation on clinical procedures for the hygienists and dentists in the Smart Smiles counties, and in the process told the story of fluoride varnish and why it was the first fluoride product that could be used in children as young as nine months old. The advisory committee decided that preschool-aged children were

to get the fluoride applications in designated locations that could be set up throughout the counties, but initially these plans were thwarted. Coordinators soon learned that fluoride application required supervision by a licensed dental professional, impractical in the “pop-up community clinics” they had planned. They also realized that community dental clinics would not provide the regular access needed for frequent application of fluoride to the teeth of very young children, because parents were unlikely to keep appointments. In exploring their options, it became obvious that one location that would consistently provide access to very young children was physician’s offices and community health clinics. Piggybacking onto regular medical well-child visits would not require reliance on parents to take their child to a dental office for services. So, an idea was born that would prove to work. It was one that endured in North Carolina and ultimately was adopted nationwide by every state Medicaid program and even some private insurance companies!

The general goals of the Smart Smiles initiative were to increase access to preventive dental services (thus reducing the prevalence of ECC), and ultimately reducing treatment demands on the dental care system that was in short supply and stretched to its limit. Relieving some of the demand on a dental care system unable to provide all the care needed would for the rest of the century remain the goal of the Into the Mouths of Babies (IMB) parent project and the expansion projects in which specific guidelines were developed for appropriate referrals before four years of age. In suggesting that preventive dental services be shared between medical and dental providers as described in subsequent projects herein, demand on dental offices could be further reduced.

The intervention in the primary care setting included screening, risk assessment, and referrals for oral problems, fluoride varnish application, and counseling of caregivers on oral-health childcare practices provided by medical practitioners in their private pediatric offices, family medicine offices, or local health department clinics. Providers were trained by project hygienists. An important component of the Smart Smiles strategy was community outreach by project hygienists to families with high-risk children to ensure broad coverage in the community. The hygienists functioned much like the Community Dental Health Coordinator national program of the American Dental Association, which was launched in 2006 shortly before the North Carolina ZOE project in 2008. Both initiatives were designed to provide community-based prevention, care coordination, and patient navigation to connect people who typically do not receive care from a dentist in underserved areas, although ZOE focused less on care coordination than on comprehensive Early Head Start performance standards such as classroom brushing programs.

Non-dental healthcare providers found that the recommended preventive oral-health services were easily integrated into their medical practices. They were generally accepting of the training, treatment, and administrative processes. Nevertheless, adop-

tion was slow in medical offices in the targeted counties and barriers, other than lack of reimbursement, not well understood because of the lack of systematic investigation of provider adoption and implementation. The one-year progress report for the Smart Smiles grant (September 1999) indicated that fluoride varnish had been applied to fourteen children in the project area. Parents were particularly prone to miss their follow-up appointments in clinics in community settings established for the project. As of December 31, 1999, approximately fifteen months into the Smart Smiles project, fluoride varnish had been applied to only 98 children in the project area: 61 were on Medicaid, 6 were enrolled in WIC, and 31 children received donated services as non-Medicaid. A key reason for the slow uptake was the lack of reimbursement for the services.

When Smart Smiles officially ended and became part of the statewide program, fourteen private practices (Banner Elk, Linville [2 sites], Bakersville, Burnsville, Morganton, Forest City, Marion, Murphy [2 sites], Rutherford, Robbinsville, [3 sites]) and eight county health departments were participating (Avery, Burke, Cherokee, Graham, McDowell Mitchell, Polk, Yancey).

Medicaid Pilot for Medical-Dental Integration (December 1999–May 2000)

During the second year of the ARC Smart Smiles grant, support was building in North Carolina for an oral health benefit for medical providers in the Medicaid program.

In 1998, the North Carolina General Assembly had asked the N.C. Department of Health and Human Services to study and recommend strategies to increase access to dental services for Medicaid recipients. Secretary David H. Bruton asked the N.C. Institute of Medicine to convene a task force to study this issue. The Task Force on Dental Care Access was comprised of twenty-two members led by Lt. Governor Dennis Wicker and Sherwood Smith Jr., chairman and CEO of Carolina Power and Light Company. In April 1999, the N.C. Institute of Medicine submitted its report to the General Assembly (NC IOM 2005).

Recommendation #17 from the Task Force was as follows: “The NC Dental Society, the NC Academy of Pediatric Dentistry, the Old North State Dental Society, the NC Pediatric Society and the NC Academy of Family Physicians should jointly review and promote practice guidelines for routine dental care and prevention of oral diseases as well as guidelines for referring children for special dental care, so as to provide all children with early identification and treatment of oral health problems and to ensure that their care givers are provided the information necessary to keep their children’s teeth healthy.”

Recommendation #18 was: “The Division of Medical Assistance should develop a new service package and payment method to cover early caries screening, education, and the administration of fluoride varnishes provided by physicians and physician extenders to children between the ages of 9 and 36 months.”

Collaboration among Smart Smiles staff, Drs. Betty King Sutton (Dental Director for Medicaid), Michael W. Roberts, and Jim Bawden, faculty in the School of Dentistry, and others led to a recommended package of oral-health services to be provided during well-baby visits before 3 years of age (screening, counseling, fluoride varnish application) and related guidelines. Bawden promoted the project at a meeting of the N.C. Society of Pediatrics, among other professional groups.

The Division of Medical Assistance budgeted about \$1 million to help support a pilot project. The N.C. Department of Health and Human Services adapted the Smart Smiles concept to its Medicaid program in collaboration with Smart Smiles, UNC's Department of Pediatric Dentistry, the Dental Health Section and the Office of Rural Health.

Physicians and nurses in Smart Smiles practices who had already been trained were incorporated into the new program initiative. The dental health coordinators in Smart Smiles were certified by Medicaid to provide oral health training to qualified licensed medical staff participating in Smart Smiles. From October 1999 to September 2000, Smart Smiles staff trained 180 public and private medical practitioners in the eleven-county Smart Smiles area. The Medicaid initiative began as a pilot in the fall of 1999 with a new name, "Into the Mouths of Babes" (IMB) to distinguish it from Smart Smiles. A network of medical practices committed to working with Medicaid to test new initiatives and provide feedback on ways in which the initiative could be adapted for statewide implementation agreed to test the preventive oral health package and provide feedback. Bawden provided training over a period of six months beginning in the fall 1999. Courses were held in fifteen locations with practitioners from sixty-six medical offices. These practices were part of an existing network of medical practices commitment to providing care to low-income populations and testing new approaches.

Training consisted of the clinical aspects of screening and applying fluoride varnish, the content of a parent counseling session, and billing instructions and other Medicaid procedural issues. Much of the success of these courses and subsequent adoption by practices resulted from Bawden's command of the scientific literature and prestige as an educator and researcher. During the training he thoroughly reviewed the small number of studies on the use of fluoride varnish in young children. He used his basic science knowledge on tooth-enamel mineralization, gained from years of laboratory research on fluorides, to convince physicians that "fluoride was fluoride" and that "enamel was enamel", so there was no reason to believe that a product so effective on permanent teeth would not be just as effective on primary teeth when applied at a very young age.

Both Smart Smiles and IMB were based on similar concepts and presumptions about the prevention of ECC Caries, but the differences between the two programs resulted mostly from the need to make the IMB initiative fit with Medicaid requirements. The age requirements were slightly different. Smart Smiles designated a range

of 6 to 36 months of age; IMB, did not specify a lower age restriction in order to provide flexibility for treating teeth as soon as they erupted and accommodate variation in tooth eruption times. IMB allowed up to six visits during the first three years of life (later that became 3.5 years), and Smart Smiles recommended visits every 6 months to 36 months, more in line with dental guidelines. Finally, Medicaid policy paid physicians \$35–\$43 per visit, while Smart Smiles providers had been asked to provide services with no reimbursement. Providers were required to complete an AMA-approved continuing medical education (CME) course before providing services. Unlike Smart Smiles, no outreach or community oral-health promotion was available for families in the IMB initiative.

As with the creation of most new, untested models without a prototype, necessary decisions were made by multiple stakeholders along the way. One example is the decision by Medicaid director Dick Perusi to approve the concept and allocate resources for reimbursements of preventive services. In a meeting with Sutton, Bawden, and Rozier, Perusi expressed three primary concerns about options being explored: (1) Does the evidence support the effectiveness of fluoride varnish in preventing dental caries when used in young children? (2) Will physicians provide the services? (3) Will dentists object to physicians providing oral health services? (Perusi 1999)

In response to the first concern, the evidence for effectiveness that Bawden (1999) had included in his manuscript and circulated among targeted groups was reviewed and accepted as strong enough evidence to support its effectiveness. In response to the second question, attendees at the meeting were able to say that medical offices were already providing the services in Smart Smiles and had found that oral health services could easily be incorporated into their practices. Finally, Bawden responded to the last concern with his usual directness: “Dentists can do it if they don’t want physicians doing it!” The significance of Perusi’s decision in support of Medicaid including the preventive oral-health package as a reimbursable service cannot be overestimated. Without the state and federal financial resources accompanying the Medicaid program, IMB would have likely fallen far short of its actual performance or might have not been implemented at all.

The Statewide Initiative: “Into the Mouths of Babes” (2001–)

The Medicaid pilot expanded statewide through funding from the Center for Medicare and Medicaid Services (formerly the Health Care Financing Administration), the Health Resources and Services Administration, and the Centers for Disease Control and Prevention. Reimbursement was provided for initial and periodic medical visits in which dental services are delivered to Medicaid-enrolled children from birth to three years of age. Medicaid requires that physicians successfully complete a CME course

offered by the N.C. Society of Pediatrics and the N.C. Academy of Family Physicians before they are eligible for reimbursement.

The IMB initiative officially began on February 1, 2001, with an announcement in the Medicaid provider bulletin. With this announcement, training was opened to all medical providers in the state approved to provide care to Medicaid enrolled children.

A PowerPoint slide (in author's possession) with quarterly statistics for visits shows a total of almost 6,000 visits in 2000, the year before official reimbursement began. Between December 1999 when enrollment began in the statewide program and September 2001, more than 3,000 medical visits for children 9 to 36 months of age had taken place in which the preventive oral health services were provided.

Support for the Innovation: “Healthy Teeth and Kids”

An obvious concern about a program reimbursing non-dental providers for services that dentists usually provide and a strategy that had never been tested, even on a small scale other than Smart Smiles, but much less in an entire state population was whether dentists would support the idea or not. In the fall of 1999, the N.C. Academy of Pediatric Dentistry endorsed the IMB project and reaffirmed its support in the fall of 2001. The N.C. Dental Society passed a resolution of support at its annual session in May 2000. The UNC School of Dentistry, the Old North State Dental Society, and the Oral Health Section all provided letters of support for the project for grant applications among other needs.

The N.C. Society of Pediatrics and the N.C. Academy of Family Physicians were strong supporters of the initiative. The pediatrics society provided office space for project coordinator Kelly Close in the beginning, and then the academy provided this space.

The lead editorial in the *News & Observer* in the summer of 1999 acknowledged the wisdom in the decision by Dr. David Bruton, Secretary of the North Carolina Department of Health and Human Services, to start paying physicians to regularly paint young children's teeth with fluoride. It read, “Healthy teeth, and kids. The head of the state's health bureaucracy shows good judgment in moving to help poor children obtain preventive dental care from doctors. Next? More complete care, from dentists” (*News and Observer*, July 18, 1999).

Support outside of North Carolina was not as quick to come, however. At its annual meeting in 2001, the ADA's House of Delegates passed the following resolution: “Resolved, that it be policy of the American Dental Association that topical application of fluoride varnish is a part of comprehensive dental care that requires

an examination and supervision by a licensed dentist.” (Trans.2001:430-432. House Resolution 73-2001 ADA House of Delegates)

The *Journal of the American Dental Association* published an editorial with the provocative title “Look who’s practicing dentistry,” referring to the North Carolina program in which physicians were screening for oral problems and applying fluoride varnish, two “clinical” procedures for which medical personnel were being paid (Meskin 2001).

The development of Smart Smiles and then IMB, as with any “big idea,” involved measured pilot-testing, many complex steps, and support by a large, multidisciplinary partnership over an extended period of time. Appendix 7.1 provides a detailed timeline for the 1995–2001 period, the initial years of development from a regional idea to a statewide initiative.

Evaluation of “Into the Mouths of Babes”

Because the effects of the Smart Smiles and IMB interventions on oral health were unknown, a thorough evaluation of its impact on an array of outcomes was undertaken. UNC-CH assumed the primary role for implementing the evaluation of the initiatives. The research agenda was guided by the Early Childhood Oral Health Collaborative (ECOHC), the advisory committee for the fluoride varnish program, later to expand to include a comprehensive list of early childhood programs in North Carolina. This committee regularly made recommendations about questions that needed to be addressed to improve access to and quality of services for young children, reviewed results of studies, judged face validity of the results, made recommendations about program changes based on research findings, and provided advice about dissemination of results.

The ECOHC grew out of the initial workgroup for Smart Smiles and has continued to advise the many partners working to reduce dental caries in North Carolina’s young children. Its primary goal is to promote the development and implementation of comprehensive, evidenced-based programs for improving the oral health of North Carolina’s youngest and most vulnerable citizens to help eliminate disparities in oral health.

The agenda and related research were funded by multiple agencies. A research team of faculty, master’s students, doctoral students and dental public health residents were focused on this agenda for almost two decades. The activities were guided by a series of sequential questions, which provided a roadmap for studying the integration of oral-health services into pediatric medical care in North Carolina.

Questions Addressed in UNC-CH Research Agenda for Integration of Oral Health into Primary Care

1. Will physicians provide preventive dental services (PDS) (screening, referral, counseling, fluoride)?
2. What is the best way to encourage adoption of PDS among medical practices?
3. What is the quality of PDS provided in medical practices?
4. What are the patterns of preventive dental visits in medical practices?
5. Does the IMB Program increase access to PDS?
6. Does the IMB Program increase visits to dental offices?
7. Does the IMB Program reduce the need for dental treatment services?
8. Does the IMB Program result in cost savings to Medicaid?
9. Does the IMB Program improve oral health status and oral health-related quality of life?
10. How should professional oral health services and community resources be integrated to improve oral health?

The initial questions were whether physicians would provide preventive oral-health services and what would be the best way to train them to provide quality services. In the fall of 2001 Medicaid and UNC-CH received funding from four federal agencies for two separate evaluation projects. Statewide implementation of what was referred to as “Into the Mouths of Babes” with a full-time coordinator (Kelly Close) was supported by a grant from HCFA (now CMS), HRSA, and CDC with Betty Sutton in Medicaid and later Jeffery Simms in the Office of Rural Health as PI. The research component was contracted out to UNC-CH.

A prospective, randomized controlled trial of three CME interventions delivered in 121 medical practices that provided services to large numbers of Medicaid children ages 0–3 was undertaken to investigate the first question (Slade et al., 2007). Outcome measures were computed from reimbursement claims submitted to N.C. Division of Medical Assistance.

Medical providers in all practices were surveyed at baseline and at twelve months to determine the effects of the different CME interventions on their knowledge, opinions about oral health, their confidence in providing preventive dental services, and self-reported participation. A survey of a sample of parents in these practices was

done to determine the effects of physicians' services on their dental knowledge, value placed on the oral health of their children, care of their children, and their ratings of the quality of preventive dental care their children received.

Group A practices ($n = 39$) received didactic training and course materials in oral health screening, referral, counseling and application of fluoride varnish. Group B practices ($n = 41$) received the same as Group A and were offered weekly conference calls providing advice and support. Group C practices ($n = 41$) received the same as Group B and were offered in-office visit providing hands-on advice and support. In all groups, physicians were reimbursed \$38–43 per preventive dental visit.

Preventive dental visits per 100 well child visits did not differ significantly among CME groups: Group A = 9.4; Group B = 12.9; and Group C = 8.5. Twenty or more preventive dental visits were provided by 38–49 percent of practices in the three study groups. A relatively high proportion of medical practices appear capable of adopting these preventive dental services within a one-year period regardless of the methods used to train primary health care providers.

The initial grant for the RCT of CME effects was for eighteen months. However, the project officer for the grant encouraged the IMB project team to continue with IMB implementation and engage with Early Head Start to address oral health concerns. In March 2005, the Oral Health Section created a permanent position (77 percent state, 23 percent federal financial participation) for the trainer and coordinator of the IMB program so that she could continue when grant funds were exhausted.

Evaluation of Smart Smiles

The UNC-CH Gillings School of Global Public Health in collaboration with the Oral Health Section, NC Department of Health and Human Resources, was awarded a grant from NIH to evaluate outcomes, with Gary Rozier as PI and Rebecca King as co-PI. The evaluation explored the effects of the program on caries experience, untreated dental caries, dental treatment, and costs among those children who are enrolled in the North Carolina Medicaid program.

An initial twenty-county quasi-experimental design matched each of the ten Smart Smiles intervention counties with a comparison county based on its sociodemographic characteristics, dentist supply, dental caries status of kindergarten students, geographic proximity, and the percentage of the county population drinking fluoridated water. However, the integrity of the design was compromised when the IMB program expanded statewide. The design was changed to enroll as many children of the eligible age living in the twenty counties as possible and then use multiple sources to determine if they had used Smart Smiles or IMB services.

Parent-child dyads were recruited from low-income, English-speaking parents of three-year-old children from three sources: (1) patients who had received preventive dental ser-

Mean d_{2-3} f Surfaces by number of Smart Smiles Visits

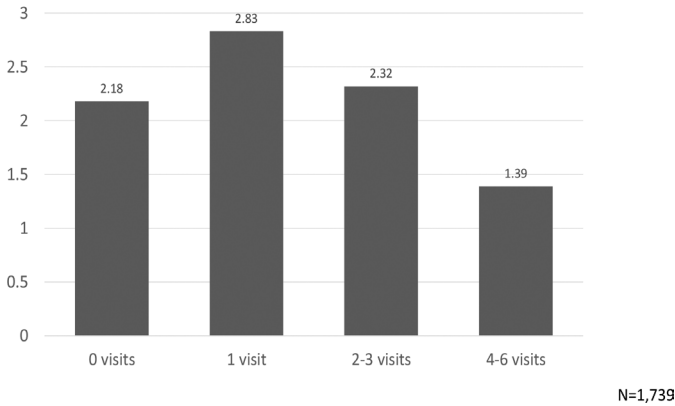


Fig. 29. Smart Smiles Outcomes.

vices as part of Smart Smiles; (2) community sites such as physician's offices, local health departments and WIC clinics; and (3) Medicaid enrollment files. For the third source, Medicaid mailed information about the study to all families residing in the twenty counties who had a child enrolled in Medicaid and had his or her third birthday during the month with a request that they contact the research team if they were interested in participating.

A single dentist conducted clinical examinations on 2,147 children in convenient locations arranged by field coordinators, such as daycare centers or local health departments. Smart Smiles/IMB visits were validated for all subjects by linking individuals in the examiner's clinical database to visit encounter forms completed by physicians in medical offices during well-child visits or to the Medicaid claims files using Medicaid enrollment identification numbers or name.

The evaluation assessed the amount of dental caries experience associated with preventive oral health visits in medical offices. The difference between those with four to six medical visits with preventive oral-health services and those with 0 visits was 0.79 df surfaces per child, a reduction of 36.2 percent, a figure very close to the reduction in caries-related treatments from IMB visits using Medicaid reimbursement files.

Early Childhood Caries, Dentist Visits and Oral-Health-Related Quality of Life in Smart Smiles

One of the aims for the evaluation of Smart Smiles was to study the association of dental problems and oral-health-related quality of life. This aim required development of a quality of life scale appropriate for the Smart Smiles study population. Work resulted in the Early Childhood Oral Health Impact Scale (ECOHS) which has been used

successfully for several UNC-CH studies and elsewhere (Pahel et al. 2007). Almost 150 publications using the scale were listed in PubMed between 2007, when the development paper was published, and 2018. ECOHIS has been translated into several languages and appears to be the instrument most widely used for the study of the impact of caries on preschool children and their families.

ECC was found to be strongly associated with ECOHIS in the Smart Smiles population. The high prevalence of disease in this population and the need for treatment, often extensive treatment, led to a question about the extent to which treatment modifies the relationship between caries experience and ECOHIS scores. Some treatment among those with low caries experience compared to those without any treatment resulted in a small but non-significant improvement in the mean ECOHIS scores per person from 4.39 to 3.38. Treatment among those with moderate-to-severe levels of dental caries experience compared to those without treatment resulted in a statistically significant increase in the mean ECOHIS score from 5.18 impacts per person to 12.19 per person, an increase of 235 percent in deterioration of quality of life. These results emphasize the importance of quality care for very young children with dental disease.

Improving the Quality of Preventive Oral-Health Services in Into the Mouths of Babes

Almost two decades of experience with the North Carolina model for integration of preventive oral health services into medical care for young children suggests that it is effective in reducing inequities in access to preventive oral-health services. Further, it is sustainable largely because it is embedded in the Medicaid program.

A policy brief entitled “North Carolina’s Dental Varnish Project Works” lists some of the important findings from the research done at UNC-CH: (1) IMB has contributed to a statewide decline in dental caries rates since 2004 and helped to reduce the gap in tooth decay between children from low- and other-income families at the community level. (2) On average, children receiving four or more IMB visits before 3 years of age show a 17.7 percent reduction in tooth decay. (3) For children receiving four or more IMB visits before 3 years of age, there was a 21 percent reduction in hospitalizations for dental treatment. (4) Greater distance to obtain care is not a barrier to preventive oral-health visits in the medical office for young Medicaid-insured children, but it is for dental office visits. (5) Parents rate highly the oral preventive care their child receives in the medical office. (6) IMB reduces the need for dental treatment services as well as increases dental access when medical providers refer children for care. (7) North Carolina ranked third nationally in percent of Medicaid-insured children 0–5 years of age receiving oral preventive care from a medical or dental provider. (8) IMB is cost-effective if Medicaid pays \$2,331 to avoid a hospitalization for dental treatment and the related negative impacts on quality of life. Average hospitalization costs in one study were \$3,223.

Enhancements to Into the Mouths of Babes

The initial IMB initiative was enhanced with sequential projects that strengthened the initial approach to the prevention of dental caries based in physicians' offices, while incrementally expanding it to include additional community resources and approaches to the problem. Separately funded initiatives between 2006 and 2011 were: (1) Carolina Dental Home; (2) Priority Oral Health Risk Assessment (PORRT) Initiative; (3) CHIPRA Connect the Docs; and (4) Zero Out Early Childhood Caries Early Head Start Project (ZOE).

Although the application of fluoride varnish received most of the attention in the beginning, particularly among the public and popular press, an equally important component of the IMB visit was risk assessment, screening, and referral. Initially, the under supply of dentists and their lack of availability prevented attention to this problem, but with time, the number of pediatric dentists increased, and more general dentists were trained to treat young children. Yet, like the effectiveness of fluoride varnish in medical offices at the beginning, the effectiveness of physicians screening and referral for dental problems in pediatric patients was unknown. Therefore, formal evaluation studies were undertaken to measure the performance of the IMB program on early entry of children into the dental care system as access to dentists began to ease some.

The Referral Problem

Risk Assessment and Outcomes, Follow-up Period

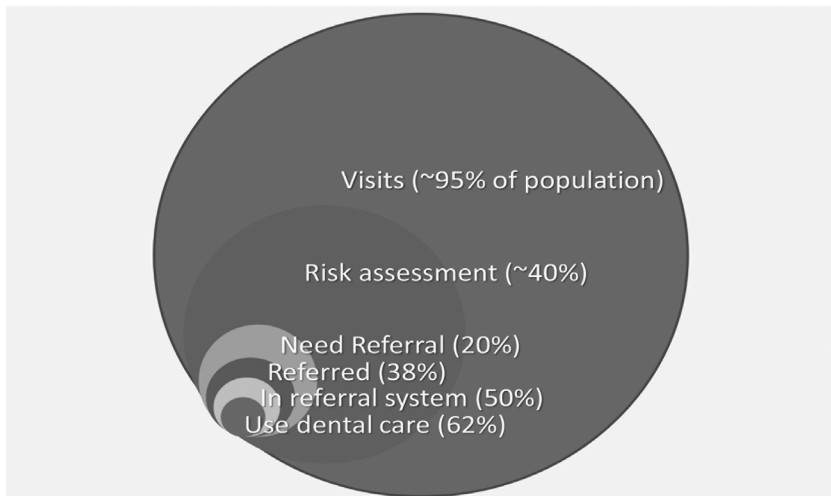
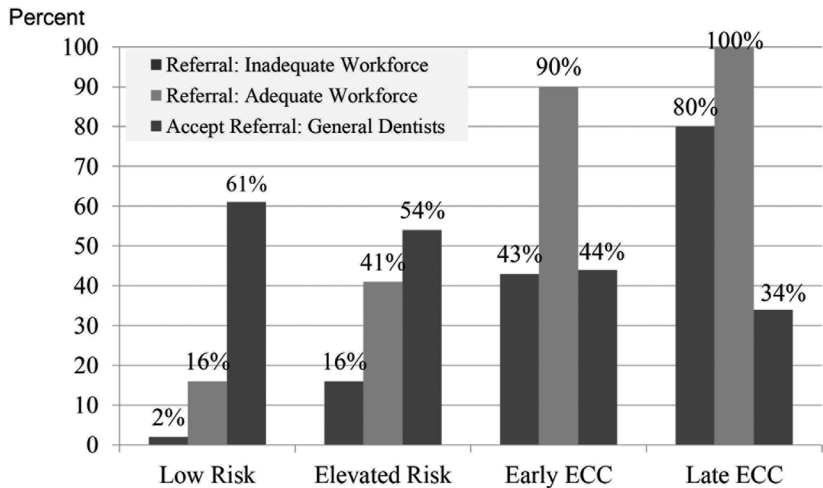


Fig. 30. Quality of Referral Studies.

Physician Referral and General Dentist Acceptance, by Risk Status



Close et al. 2011
Long et al. 2013

Fig. 31. Referral Practices According to Risk Assessment.

By the mid-2000s, the referral activities of medical providers were a focus of early childhood activities in North Carolina. Screening, risk assessment, and referral were recognized as deficits in the provision of preventive oral-health services in IMB visits. More than a dozen distinct studies out of the Gillings School of Global Public Health explored the problem and evaluated interventions designed to improve the quality of referral activities—their performance and effectiveness in linking children with a dentist. These studies used encounter forms completed by the medical providers, reimbursement claims, written questionnaires and interviews of dentists, medical personnel, parents of young children, and direct observation of provider-patient/parent interactions to understand the challenging problem from every perspective.

The results of studies on screening, risk assessment and referral conveyed a consistent story about barriers to the performance of physicians' referral activities, both perceived and real.

Studies conducted in North Carolina found that physicians can identify dental caries with a high degree of accuracy (93 percent). They also are more likely to refer patients with tooth decay than those without, but overall rates are low. Two studies using clinical vignettes, one of 53 medical providers, the other of a statewide sample of 219 medical providers found that they under refer by about 40 percent (Zhu et al. 2019a; Zhu et al. 2019b).

For most pediatric conditions, physicians refer patients with diseases or conditions for which they are not trained or do or do not feel confident to treat. Specialty referrals are used in these situations. Likely, physicians consider dentists to be specialists and dental problems as needing a specialty referral. They believe that they can counsel on behavioral risk factors, many of which are the same as for other health conditions. Unfortunately, dentists' acceptance of referrals does not accommodate this referral pattern. They are less likely to accept patients with disease and more likely to accept those with low risk (Close et al., 2011; Long et al. 2013).

Targeting the Referral Problem

The original goal of the IMB program was to reduce some of the demand for dental care by young children through primary prevention of ECC, mostly with fluoride varnish applications but also parent counseling. A second strategy that evolved as time passed was to develop and disseminate screening and referral guidelines that provided clear recommendations on patients that did not need to be referred before 3 years of age when the dentist supply was limited, and patients for which referral was critical. Although the one-year-old visit to a dentist was recommended by professional organizations at the time, it was an unrealistic goal for North Carolina. It was not possible to place every child in a dental home, particularly young, Medicaid-insured children.

Three projects were designed to ensure that physicians could perform a risk assessment and refer patients before 3 years of age. They were submitted by the Oral Health Section with several consultants, including faculty from UNC-CH.

The primary model used to address the referral problem was originally proposed in an unsuccessful grant application submitted to the Robert Wood Johnson Foundation in June 18, 2002, in response to a call for applications entitled "State Action for Oral Health Access." A major effort led by Dr. Ronald Venezie, a pediatric dentist with the Oral Health Section and co-chair Dr. Allen Dobson Jr. (Director of Graduate Medical education, Cabarrus Family Medicine Residency Inc. and Senior Consultant for Health Policy/Network Development, Carolina Access II/III Program, N.C. Department of Health and Human Services) prepared the application for submission and for a day-long site visit by representatives of the Robert Wood Johnson Foundation and the Center for Health Care Strategies.

The goal of the proposed project was to build on the IMB program by linking IMB practices with dental practices and other community social services to increase access to dental care for young children. A critical advancement in the model was the "glue" (learning collaboratives and case managers) that would hold together the infrastructure for the integrated system at the local level.

A key to physicians and dentists working together to ensure access to dental care for children is the availability of reliable and valid risk assessment and referral guidelines that providers generally have agreed to. As originally proposed in the Robert Wood

Johnson Foundation application, children younger than 3 years of age found to have elevated risk or untreated disease upon screening by a physician in an IMB visit would be referred to a pediatric dentist with the possibility of a general dentist caring for the patient as they got older. The physicians could provide preventive service allowed by the IMB program for everyone else, which would be a large percentage of patients.

Carolina Dental Home

The opportunity to refine and test the broad concepts proposed in the Robert Wood Johnson Foundation application came with a project named the Carolina Dental Home. The Oral Health Section secured funds for this demonstration project from HRSA. The Carolina Dental Home project developed a structured instrument, named the Priority Oral Risk Assessment and Referral Tool (PORRT), to guide physicians' dental referrals for IMB in patients ages 0–3. The guidelines were developed at working meetings attended by local physicians and dentists, nearly every provider who provided care for pediatric patients in the project counties (Craven, Jones, Pamlico and Carteret Counties). Risk factors were used to determine overall person-level oral-health risk status. Associated referral guidelines were developed through a review of the evidence for risk factors and a consensus of Carolina Dental Home participants.

According to the resulting draft PORRT guidelines, lower-risk children were to receive oral preventive services in their medical home until they are referred to a dentist at 3 years of age. Moderate-risk children with non-cavitated lesions but nothing more severe were to be referred to general dentists who had been trained to provide care for infants and toddlers, while those who had cavitated lesions and needed restorative or surgical treatment were to be referred to a pediatric dentist.

The guidelines were pilot tested by eleven physicians in three medical practices in Carolina Dental Home project counties. Analysis of completed PORRT forms for about 5,000 visits for patients less than 42 months of age found that about 5 percent needed to see a pediatric dentist based on having cavitated lesions or being a special health care needs patient (a major risk factor); about 20 percent would need to see a general dentist based on having non-cavitated lesions or special health care needs; and about 75 percent could remain with the physician up to three years of age based on having no disease and <3 risk factors when dental workforce shortages exist in a community and the physician was willing to provide preventive oral-health services.

The Carolina Dental Home initiative was limited to a small geographic area in Eastern North Carolina, and the project had no funds to evaluate the PORRT instrument. The Oral Health Section again secured funds from HRSA for the Targeted State MCH Oral Health Service System Grants Program to further develop the PORRT and conduct an educational intervention with medical offices that would help expand use of the decision tool statewide.

PORRT and CHIPRA (Connect the Docs)

Soon after the HRSA-funded PORRT project began, the North Carolina Division of Medical Assistance and the Office of Rural Health and Community Care (ORHCC) were awarded one of ten state Quality Demonstration Grants funded through the Children's Health Insurance Program Reauthorization Act of 2009 (CHIPRA). North Carolina received funds to work on three of the five categories specified in the Congressional statute creating the National CHIPRA quality demonstration program. The grant activities in North Carolina as identified in the statute were to: (Section A) experiment with and evaluate the use of new and existing measures of quality for children; (Section C) evaluate provider-based models to improve the delivery of care; and (Section D) demonstrate the impact of model pediatric Electronic Health Records (EHRs) (AHRQ).

The objectives for the PORRT dental initiative were to: (1) increase oral health risk assessment by primary care providers through use of an oral health risk assessment and referral tool (i.e., PORRT); (2) increase dental fluoride varnish rates; and (3) engage primary-care providers in increasing families' awareness of the dental home and linking children to a home.

Primary goals articulated in the PORRT grant were like the ones in the CHIPRA grant in some key areas, so it seemed logical to combine the two initiatives where they overlapped. Each component of the CHIPRA grant (i.e., performance measurement, provider-based models, and pediatric EHRs) offered opportunities for addressing the goals and objectives outlined in the PORRT initiative. Because of the overlap in project goals and the commitment of the medical community to including oral health in the broader CHIPRA quality demonstration grant activities, the PORRT initiative was incorporated into the CHIPRA activity. This collaboration provided the PORRT initiative with human resources knowledgeable and experienced in quality improvement in medical offices; resources devoted to oral health that otherwise would not have been available; access to a large, statewide network of medical providers committed to serving high-risk pediatric populations and supported by an established data analysis unit; and the opportunity to incorporate oral health into ongoing quality improvements for pediatric health care and thus increase the likelihood that efforts would be sustained beyond the grant. This enhanced, expanded and integrated initiative was renamed "Connecting the Docs" to reflect the original intent of the PORRT screening and referral tool being promoted, and the importance of medical-dental collaboration in today's health-care environment.

A Pediatric Oral Health Workgroup formed to guide the medical-dental collaboration with Dr. Marian F. Earls (Lead Pediatric Consultant, Community Care of North Carolina), Kern E. Eason, Kelly Close, Mark Casey, and others on statewide

dissemination of PORRT and increasing adoption of IMB services (Eason et al., 2017). The accomplishments of the collaboration included the following:

1. Development of a toolkit to support IMB and enhance screening, risk assessment, and referrals (i.e., PORRT) for use in the statewide intervention. A professional writer and producer, Melanie Raskin with more than thirty years in public relations and communications, produced the toolkit—a mix of print and video production.
2. Two oral-health quality performance measures (fluoride varnish and dental home) were among the twenty-four measures that CHIPRA staff developed and tracked as part of the CHIPRA project.
3. CHIPRA Pediatric Quality Improvement (QI) coordinators were trained in IMB procedures so that they could interpret practice-level oral-health performance measures, provide education in quality improvement methods, coach practices on selected Quality Measures including medical clinic visits with fluoride varnish applications and dental office visits.
4. An Oral Health Maintenance of Certification (MOC) course entitled “Promoting Dental Homes for Young children through Screening, Varnishing and Referrals” was developed and offered free of charge to pediatricians and family physicians for required CME credits and practice quality improvement activities.

Endorsement and Dissemination of the Medical Model Through the Years

UNC-CH played an active role in developing the model and was the center of evaluation and dissemination efforts for the policy change. Presentations at scientific and policy forums included the American Public Health Association, AcademyHealth ARM, the National Oral Health Conference, the American Society of Health Economists, the International Association for Dental Research, American Academy of 21st Century (Peds-21) Symposium Series, the NIH Disparities Summit, the USPHS Scientific and Training Symposium, state Medicaid medical directors quality committee, and the National Summit on Children’s Oral Health sponsored by the American Academy of Pediatrics, which served as a precursor for an update of the surgeon general’s 2000 Report on Oral Health.

Representatives of ECOHC presented the project concepts and evaluation results, mostly invited, at many conferences including the Surgeon General’s Face of the Child conference on children and oral health in 2000 in Washington, D.C., in which close to 800 people were in attendance; a broad-based Kansas coalition concerned with children’s oral health arranged a day-long workshop devoted entirely to the Smart Smiles

and Into the Mouths of Babes projects; and the approach was highlighted at a meeting of the American Academy of Pediatrics and the American Academy of Pediatric Dentistry as a prototype for ways in which medicine and dentistry can work together to further oral health of young children.

Dr. Mark Casey, Director of the Dental Medicaid Program, provided testimony on the North Carolina initiatives at the U.S. House of Representatives Committee on Oversight and Government Reform, Domestic Policy Subcommittee Hearing, held on September 23, 2008. The topic of the hearings was “Necessary Reforms to Pediatric Health Care under Medicaid.” The IMB program was featured as one of four case studies written for a report commissioned by the National Academy of Medicine on integration of medicine and dentistry.

The IMB model is supported by “best practices” published by the Association of State and Territorial Dental Directors, which recommends this approach to state health departments nationally, the American Academy of Pediatrics in its policy statement, the American Dental Association, the National Academy for State Health Policy, the National Governors’ Association, and the Pew Foundation in its guidance to funded programs. The North Carolina program was listed as a “best practices” model for adoption nationwide in the National Quality Assurance Initiative being conducted with Medicaid medical directors by CMS. The Canada–United States Chapter of the Alliance for a Cavity Free Future was launched at the 2015 annual meeting of the American Public Health Association with the initial goal of facilitating interprofessional collaboration and increasing the number of medical offices that routinely provide preventive oral-health services, including fluoride varnish.

Preventive oral-health services are considered essential services for the well-child visit by the American Academy of Pediatrics (AAP 2022) and the United States Preventive Services Task Force (Moyer 2014). Medicaid reimbursement for fluoride varnish applied to teeth of young children by medical providers is now available in all 50 states as well as from some private insurers (Smiles For Life curriculum 2022).

Bawden’s Legacy

The early success of the program was attributed to several factors (Rozier et al. 2003). Some include the following: (1) support and commitment gained by extensive documentation of dental problems; (2) development of strong and diverse collaborative relationships with adequate resources to support activities; (3) conducting pilot tests and relying on information from them to design subsequent efforts; (4) targeting young, high-risk children with primary prevention that can provide a short-term solution to the high prevalence of disease and undersupply of dentists; (5) designing the intervention to help overcome major barriers to adoption such as available time and lack of referral sources; (6) use of fluoride varnish, which had stronger evidence

and being more practical than other possible fluoride interventions; (7) conduct of studies to address several questions by physicians about the initiative, and the promise of finding answers to their questions through research, continuous evaluation, and monitoring.

Perhaps the most important factor in physicians' acceptance was the individuals involved in the initiative who were extraordinarily committed to the prevention of dental caries in young children and the IMB program. They promoted the initiatives at every turn, when in the beginning many doubted that the strategy would be helpful in reducing dental caries in preschool children. Jim Bawden stands out as one of those individuals. In many respects, he was the scientific and political support for the two major preventive initiatives in the state separated by over two decades—the North Carolina Preventive Dentistry Program for Children initiated in the early 1970s and the Into the Mouths of Babes initiative in the late 1990s.

A frequent question asked about the North Carolina efforts is, who was the first one to suggest that physicians and nurses could provide preventive oral health services and get paid for it? The idea can't be attributed to any one person or event. But Bawden said it best! When denying that the idea originated with him, he said "major credit [for the Smart Smiles initiative] goes to the Smart Start directors and interested citizens in our mountain counties. They are the instigators and driving force behind a preventive initiative that may serve as a model for the entire country" (Bawden 1999). Most would or could add Dr. Bawden's name to this statement.

Summary of Connect the Docs

Experience with the PORRT form in which information on infants and toddlers was recorded suggests that risk factors can be obtained by physicians and their staff during well-child visits. Some of these consequential risk factors for ECC are highly prevalent in young children enrolled in Medicaid. We conclude, therefore, that knowledge of a child's future dental health care needs can and should be obtained by physicians using information on elevated risk for ECC collected at the well-child visit.

Mail surveys of physicians and dentists added important information about screening, risk assessment and referral behaviors and associated barriers in practice that can be used by those considering such initiatives in other states. They show that most all physicians can assign the correct caries risk classification for infants and toddlers. However, a large percentage are not adherent to referral guidelines. The percent who are adherent can be increased with training if an adequate supply of dentists is available in the community. Research suggests that physicians base their

referral decisions about dental care mostly on clinical presence of actual disease, and that their detection of modifiable risk factors in these patients is only weakly associated with referral activities. Almost every child from low-income families seen in medical practices has at least one risk factor. So, referring all children will not improve access to care in the presence of excess demand for dental care and would continue to overwhelm the system and lead to frustration on the part of providers and the public.

These studies provided information for training and quality improvement initiatives, which suggest the need to focus on referral of children at elevated risk or with incipient disease among other barriers. This research also demonstrates the need for multi-component educational interventions, which in most respects are time and resource intense.

Early Head Start (EHS) Initiative (ZOE)

The IMB program was expanded to include EHS primarily because of the encouragement of the IMB project officer, but this expansion of IMB into EHS was a logical one. Populations targeted by EHS and IMB services are mostly the same—of similar ages and elevated risk for dental disease. Furthermore, most EHS children are enrolled in Medicaid, thus qualifying them for IMB benefits. So, it seemed that IMB services could be extended to more children ages 0–4 through the EHS program.

The goal of the EHS initiative, called “ZOE” for Zero out Early Childhood Caries, was to improve the oral health of preschool-aged children by: (1) providing a comprehensive dental health education intervention for EHS staff who in turn would provide dental health promotion and education for children and their families; and (2) linking children enrolled in EHS with medical providers in their communities who were trained to provide preventive dental services. Children and their parents in the EHS programs in North Carolina had close geographic proximity to about seventy-five sites where medical providers were offering IMB services.

Substantial preliminary qualitative and quantitative information was collected about the North Carolina EHS programs, their staff, and enrolled children and their families in 2005 and 2006 as part of the UNC-CH School of Public Health’s ongoing evaluation of the North Carolina’s Into the Mouths of Babies program. Some of these data are summarized in Table 7.1.

Results from these research activities with EHS programs indicated among other things that oral health information and resources were needed in the EHS programs to help understand IMB, to design educational interventions for EHS and to pilot test instruments and measurement scales to be used in studies later funded by NIH.

Table 7.1. Information Collected as Part of NC Early Head Start Preliminary Studies

Focus groups	Staff surveys	Health Coordinator interviews	Parent surveys
NC Early Head Start Programs (Includes Cherokee EHS, American Indian)			
9 groups	480 EHS staff	18 health coordinators	795 parents of EHS children
• 31 EHS staff	• 341 teachers	• 100% response	• 64.6% Response
• 22 parents	• 102 other staff		• Reliability study of questionnaires:
• 13 pregnant women	• 20 health coordinators		167 parents in 4 programs with test-retest
	• 18 program directors		
	100% program response		
	98.8% staff response		
East Coast Migrant Head Start Programs			
	120 staff	9 health coordinators	
	• 81 teachers	90% response	
	• 22 other staff		
	• 9 health coordinators		
	• 9 program directors		
	100% program response		
	96.8% staff response		

ZOE Evaluation Study Objectives

The collection of qualitative and quantitative data about EHS in North Carolina, and the educational intervention itself were funded by the DMS, HSRSA, CDC grants and the North Carolina Department of Health and Human Services. The “evaluation study” was funded by NIH. The specific objectives of the evaluation of ZOE were to determine the effectiveness of EHS programs enhanced by training in oral health, motivational interviewing, and performance standards on increasing dental use, reducing dental caries experience, and improving oral health-related quality of life (OHRQoL) among enrolled children birth to three years of age. Two additional goals were to determine if parents' dental home modified the effectiveness of EHS services on dental outcomes in EHS children; and if parents' level of oral health literacy modified the effectiveness of EHS services on dental outcomes.

The “treatment” being evaluated was the EHS program with “enhanced teacher awareness of early education oral health performance standards” arising from two sources: (1) federal performance standards for EHS programs, and (2) early education and childcare guidelines. Brief training was designed to yield optimal implementation of the EHS performance standards for oral health. A “best case scenario” for the effect of oral-health activities in EHS program services in combination with IMB services in medical offices on oral health outcomes after a brief but practical intervention in

EHS was to be determined. The emphasis of this evaluation was on EHS as a comprehensive early education program, rather than an oral-health intervention alone. In this conceptual approach, EHS provides a vehicle to improve the oral health of a specific subset of disadvantaged children in North Carolina.

Training of EHS Staff

EHS teachers and staff were trained in brief workshops at EHS program sites in the fall of 2006 before enrolling study cohorts for the evaluation. The N.C. Oral Health Section's preschool coordinator, Kelly Close, who provided most of the IMB oral-health training to medical providers across the state, provided all the basic oral-health training for teachers and staff. About 400 teachers and staff were trained in oral health strategies for early education and childcare settings, as well as guidelines for the use of oral health strategies.

At least two EHS staff members from each EHS program were trained by motivational interviewing experts. With this additional training, supported by an Administrative Supplement from NIH, the EHS treatment was deployed with full implementation of the EHS performance standards for oral health.

The ZOE Evaluation Study

The evaluation of ZOE was designed as a non-randomized, pre-test/post-test nested cohort control group cluster trial. Twenty-four of the 25 EHS programs in the state participated in the study. Infants and toddlers younger than 19 months of age newly enrolled in EHS in two sequential school years beginning in 2010 were recruited to the study. Comparison parent-child dyads were selected from families enrolled in Medicaid and living in the same neighborhoods (ZIP codes) where enrolled EHS children lived. Our goal was to select control subjects who were like the EHS children already enrolled in ZOE, all of whom were Medicaid recipients younger than 19 months of age at the time of enrollment.

Selection of Matched Control Subjects

A quota sample of children from Medicaid enrollment files (5 controls:1 EHS subject) were selected from strata formed by child age groups (0–6, 7–12, 13–18 months) and language (Spanish and English, to control for ethnicity) within each ZIP code for home residences of all EHS parent-child dyads already enrolled. One child per family was selected. Control parents were recruited to the study using a process similar to EHS subjects except that the initial recruitment letter and two follow-up letters were mailed from the Medicaid program to ensure confidentiality. To reach our targeted enrollment of three

controls per EHS parent-family dyad, Medicaid mailed the initial and two follow-up recruitment letters and brochures to 11,795 enrollees matched on child age and parent language in the forty-one study counties. Parents responding by phone, email or return letter were screened by phone for study eligibility using nine enrollment criteria: child younger than 19 months; potential interviewee is the primary caregiver and older than 18 years of age; a resident of the study county with no plans to move; never had a child in EHS, never participated themselves in the EHS prenatal program, never worked or volunteered for EHS, and speaks English or Spanish fluently. Face-to-face interviews were conducted in the homes or in convenient community locations. The design yielded matched pairs where the matching group for an EHS program is a group of children selected from the neighborhood (ZIP code-unit) in which the EHS child resides.

Data Collection

In-person interviews with caregivers were conducted by eighteen interviewers trained in structured interviewing techniques, five of whom were bilingual in English and Spanish. Baseline and follow-up interviews consisted of 400 and 300 items, respectively, lasted approximately sixty minutes, and covered a range of oral health related-domains, such as dental knowledge, dental values, dental visits, social support, oral health literacy, and oral health-related quality of life. All interview data were recorded via direct data entry and audio recording into a Computer Assisted Personal Interviewing and Computer Assisted Recorded Interviewing software developed for the study and described in more detail in an earlier section of this chapter.

Clinical examinations were performed by a single examiner who was a board-certified pediatric dentist and faculty member at the UNC-CH Adams School of Dentistry. Examinations were conducted using portable dental equipment at EHS centers or convenient community locations. All primary tooth surfaces were scored for dental caries using d1d2-3mfs criteria and entered directly into an Access database developed for the study. Teeth were dried with compressed air, and examined using a mirror, explorer, and external dental light.

Enrollment Results

The ZOE study enrolled 1,567 parent/child dyads that participated in the baseline interviews between 2009 and 2011. Forty-one percent of these children (636) were enrolled in EHS, and 59 percent (931 children) were Medicaid-eligible but not enrolled in EHS, serving as age-matched controls.

After twenty-four months, the follow-up interview rates were 75 percent for both EHS and non-EHS groups. Clinical assessments on three-year-old children were

performed on 335 children of the 1,182 parent-child dyads available at follow-up. Approximately 50 percent of EHS children and 15 percent of non-EHS children received a dental exam at age three.

Key Findings from the ZOE Study

1. EHS had a pronounced effect on use of dentists' services overall and for preventive services. At three years of age, EHS children were 22 percentage points (81% vs. 59%; $p < 0.001$) more likely to have ever had a dentist visit than non-EHS children.
2. The frequency of oral health-related quality of life impacts from oral health problems was greater in non-EHS than EHS groups for all but three of the items in the 13-item ECOHIS scale. The overall mean severity score was greater in non-EHS than EHS parent-child dyads (2.63 vs. 2.09 per person). The prevalence score for ECOHIS was different at a statistically significant level (non-EHS = 40.6% vs. EHS 36.7%).
3. The effect of EHS enrollment on oral health-related quality of life was detected mostly in those parents with moderate to high oral health literacy.
4. EHS had a small but statistically significant positive effect on the establishment of a dental home. Thus, children enrolled in EHS programs had greater access to dental care at the end of EHS enrollment. That care was more continuous, compassionate and culturally competent than care received by non-EHS Medicaid children enrolled into the study as community controls.
5. A descriptive analysis of mean $d_{2-3}mfs$ scores per child found lower scores in EHS-enrolled children than non-EHS children, but the differences are small, inconsistent and are likely to be affected by confounders not controlled for in the analysis.
6. An equal and very high percentage (81%) of EHS and non-EHS children received fluoride services between baseline and follow-up in this longitudinal study. But the type of provider who provided fluoride differed between groups. EHS children had greater odds of receiving preventive services from dentists than non-EHS children. A greater percentage of non-EHS children had fluoride visits in medical offices than EHS. The combined effect of integration of preventive oral health services into Medicaid medical benefits and practices combined with existing dental resources in the community greatly improves access to professional topical fluoride applications.

ZOE Initiative Follow-on Activities

The Oral Health Section continued its development and implementation of early childcare oral health interventions when the NIH ZOE evaluation grant ended. The Duke Endowment provided funding to the Oral Health Section for “Brushing Is Fun—Start by Age One,” a three-year project to promote daily brushing with fluoridated toothpaste in day-care centers. This effort was later joined by the Blue Cross Blue Shield Foundation of North Carolina. The work resulted in: changes in childcare regulations enforced by the NC Environmental Child Care Sanitation Program so that daily brushing would be facilitated; development and testing of the first-ever detailed brushing guidelines for child-care settings in the United States; production of videos to supplement the adoption and implementation of the toothbrushing guidelines; iPhone applications to support safe brushing practices; and a website providing timely and appropriate information to support the “Brushing Is Fun” initiative (www.Toothtalk.org). UNC-CH School of Public Health faculty continued to be involved through membership on the working and advisory ECOHC committees, but little research was undertaken in these projects.

SUMMARY OF CHAPTER 7

This review identified a number of DPH research projects involving UNC-CH faculty. The frequency of these projects resulted in continuous funding for the sixty years since the first project was funded by NIH in 1960. Studies are targeted toward the entire state population, school children, Head Start and Early Head Start, migrant and seasonal farmworkers, the prison population, the National Guard, children enrolled in Medicaid and SCHIP, dental and medical providers and their auxiliaries, parents and others responsible for children’s health, such as Early Head Start staff and public-school teachers. Research designs used in these studies are descriptive epidemiological and health services research, quasi-experimental designs and randomized controlled trials. Interventions include dental sealants, fluoride, Early Head Start programs, methods to promote integration of oral health into medical practice, and change of provider behaviors.

The research addresses a host of questions directed toward several oral health outcomes. Dental caries and its treatment were a constant target of inquiry. School-based preventive dentistry programs were initiated in the 1970s. Periodontal diseases became the focus of attention in the 1980s. Sealants were emphasized mostly in the 1990s, along with growing concerns about fluoride exposure and a focus on fluorosis. Research turned to the prevention of Early Childhood Caries in the 2000s. The IMB and ZOE initiatives targeting ECC in the 2000s are given more attention than some other initiatives because they were a major part of the research agenda. The research

agenda was funded by NIH, CDC, CMS (HCFA), HRSA, Kellogg, Kate B. Reynolds Health Care Trust, Dental Foundation of North Carolina, and AHRQ.

It is clear on review of research conducted by the dental program in the School of Public Health that it has been based on a strong foundation of public service and collaboration with dental public health practice. Harry Bruce, John Fulton, Frank Law, Charles Holmes, John Hughes and Gary Rozier all came to academics from a practice background, mostly federal or state dental public health programs. Staffing of the DPH unit in the School of Public Health at UNC-CH was similar to that of other schools of public health in the 1950s when faculty consisted largely of individuals who had worked in governments programs.

This chapter demonstrates once again what was acknowledged in previous chapters but perhaps only more emphatically here—that the program in dental public health at the UNC-CH Gillings School of Global Public Health and its success have been linked with DPH practice in North Carolina in an array of activities over an extended length of time. The Oral Health Section in the Department of Health and Human Resources and the Gillings School of Global Public Health shared many activities in many education, practice, and research projects. The research and teaching agendas at UNC-CH were amplified because of the close collaborations between the two agencies. The partnership was evident for the entire 80 years included in this history. It began with the Institute of Dental Public Health in the 1930s and continued with research projects into the 2000s. The success of this collaboration demonstrates, perhaps against prevailing thought in academia, that a research program undertaken mostly in a single state rather than in a national laboratory can be successful. The research conducted over the four to five decades listed in table 7.2 was all undertaken in North Carolina. Everyone was attentive in implementing this research agenda to ensuring that choices about research were informed by issues of national significance.

Research in the initial years of the DPH program concentrated on more traditional public health problems, while recognizing the importance of studying the impact of public policies. The oral-health status surveys provided cornerstones for many research activities. A considerable amount of text is devoted to two research initiatives and related activities: (1) the N.C. Preventive Dentistry Program, targeted toward school-aged children in grades K–12, and (2) Into the Mouths of Babes, targeted toward preschool populations birth to age 5. Both initiatives, the start of which were separated by about three decades, galvanized the interests and talents of health professionals, policymakers, scientists, and the public in two enduring partnerships, supported by national perspectives that lent extra legitimacy to the initiatives. The successes of the partnerships are told by the improvements in oral-health status among school-age children, with the promise of similar trends in young children as some recent and difficult to implement interventions mature.

Table 7.2. Research grants on oral health from 1963 to 2008

Study (Year)	Funding source	Purpose / Research Questions	Methods / Sample Design & Results	Notes, Additional Results
Fluoride Supplements for Elementary School Children (1963 – 1970)	NIH R01-DE03438-10	To determine: (1) the effectiveness of fluoride tablets in preventing dental caries in elementary students taken on school days attended; and (2) the effects of variations in dosage and frequency of ingestion on dental caries (2.2 mg NaF once a day; 1.1 mg NaF twice a day; 2.2 mg NaF twice a day. Related study in Sunbury PA on effects or pre-school administration at home.	Before-after study design with baseline and annual examinations on a baseline of 7,113 subjects at 6 study sites: Claysburg & Sunbury, PA; Pittsboro, NC; Boone & Raleigh Counties, WV; Union County NC.	Frank Law original PI and based in Dept. of Health Administration. John Hughes was name PI when Law retired.
Family Patterns of Dental Diseases (1963)		Dental caries scores of family members vary less than do the scores of persons of similar age, race, sex and geographical location from the general population; Family dental caries scores are related to the social class of family members; Dental care of family members is associated with social class of the family.	Random sample of 102 white families out of 356 resident of Chapel Hill (university town) and Hillsboro (cotton mill town) in Orange County NC with child in school grades 1-6 during May 1959. Individuals=401.	Hughes doctoral dissertation and pre-test of methods for statewide National History of Dental Diseases study. Data collection in Summer 1959. Study published 1963.
Natural History of Dental Diseases in NC (1960-62)		To describe a human population, representative of an entire State, according to: (1) The life cycle of human teeth. (2) The prevalence of dental caries, periodontal disease, oral hygiene, malocclusions of the teeth. and (3) The variations in these dental conditions as a function of certain biologic, ecologic and social characteristics.	All but 2 families agreed to home exams and interviews. Area sampling of occupied households (n=2,103) with selection of all individuals (n=7,605) residing in these households. Individual RR in acceptance households=98.5%; (n=7,236).	1 st statewide survey in the Nation using probability sampling methods including all ages. Conducted concurrently with NCHS 1 st survey of oral health conditions.
National Institutes of Health			RTI provided city and county maps containing location of sampling units. Aerial photographs and automobile cruising also used to identify specific households.	

Natural History of Dental Diseases in NC 1976-77	To describe the state population according to: (1) prevalence of dental caries, periodontal disease, and oral hygiene status; and (2) the variations in these conditions as a function of certain biological, ecological, social and time characteristics.	Representative sample of NC household population using 3-stage, stratified design. 1,528 households with 3,639 people in sample.	One of first North American studies to document a decline in dental caries.
Kellogg Foundation		Individual RR in acceptance households = 94.9% (n=3,454).	Baseline for State-wide Preventive Dentistry Program funded by legislature in 1973.
Dental Foundation of North Carolina Planning Grant 1980-82 Rozier, Hutchens, McFall, Bowden	1-year planning grant to examine the issues involved in controlling periodontal disease in the state, to determine the feasibility of addressing the problem, and, if practical, to propose comprehensive strategies for improving the situation.	<p>(1) Developed the research design for evaluation of a demonstration project;</p> <p>(2) Designed, pilot tested and administered to 800 adult males a knowledge, attitude, and practice questionnaire on periodontal disease;</p> <p>(3) Designed and pilot tested in six dental offices instruments to determine how general dentists diagnose, treat, and/or refer patients who have periodontal disease; and to evaluate attitudes of dentists, hygienists, and assistants toward the disease and its treatment; and 4) Identified study sites and obtained professional support.</p>	The study was advised by a committee of 23 members representing dentistry, public health, medicine, health education, nutrition, and the public. Involved the Dental Health Section, the UNC Schools of Dentistry and Public Health, the UNC Health Services Research Center, the North Carolina Dental Society, and other organizations.
Geographic Distribution of Natural Fluoride in Water Supplies in Eastern NC 1978-1980	Determine F concentration of the 434 public school water supplies in the 33 counties in Eastern NC.	Follow-up in 17 counties with 1 or more schools with 0.7 ppm or greater.	Eastern NC was known to have high levels of fluoride in drinking water and fluorosis since studies by Klein.
PI Rozier	For schools with natural F greater than 0.7 ppm determine the F concentration of home water supplies for a sample of students attending the school.	1360 home water supplies sampled with maximum of 5.76 ppm fluoride	This study provided the first census of natural F content in school and home water supplies to be used in planning of public and private fluoride programs.
University of North Carolina Research Council			

<p>Pilot Pediatric Dentistry Workforce Study and follow-up to 1976 productivity study. (Productivity Study II) 1979-82</p> <p>UNC Health Services Research Center</p>	<p>Follow-up study to the NC Dental Manpower Study</p> <p>To pilot test the data collection instrument for possible use in a national study by the American Academy of Pediatric Dentistry</p>	<p>Record procedures in daily log.</p> <p>Survey of all pediatric dentists and sample of 250 general dentists in the state.</p>	<p>Conducted by the Dental Manpower Concerns Committee of the NC Dental Society</p>
<p>A Formative Evaluation of North Carolina's Statewide School-based Fluoride Mouthrinse Program</p> <p>N. Perry (master's student)</p> <p>1984-85</p>	<p>To describe accuracy of implementation, attitudes and beliefs of teachers, principals, superintendents and dental public health staff about the program.</p>	<p>Response Rates</p> <p>31 of 36 (86%) ped dentists</p> <p>167 of 226 (73.9%) for general dentists.</p> <p>4 different surveys completed by teachers (n=898; RR=93%), principals (n=370; RR=92%), superintendents (n=117; RR=99%) and dental public health staff (n=76; RR=100%).</p>	<p>Generally positive beliefs.</p> <p>56% of teachers adhered to NIDR guidelines of weeks per year and monitoring system.</p>
<p>35-year Trends in Dental Caries of Children in Non-Fluoridated Communities in NC (1986)</p>	<p>To examine trends in dental caries prevalence in white and black school children residing in fluoride-deficient areas within NC from 1948 – 1982.</p>	<p>Secondary analysis of studies selected if:</p> <p>(1) DMFT scores; (2) individual ages 6-17 years; (3) county specific; (4) no community preventive dentistry programs; (5) no natural fluoride in county, 27 studies; 24,330 individuals; 324 DMT scores.</p>	<p>Conclusions:</p> <p>1. DMFT declined in whites and blacks.</p> <p>2. Decline larger in whites than blacks.</p> <p>3. Effect of decline is shift in disease by racial groups, from white to black.</p>

Statewide Survey of Schoolchildren (1986-87) Kate B. Reynolds Health Care Trust

To describe: (1) the oral health status of children in NC public schools during the 1986-87 school year according to their dental caries experience as measured by the number of decayed, missing and filled teeth and surfaces in primary and permanent dentitions; the number of children, teeth and surfaces with dental sealants; and periodontal status as measured by the presence of gingival bleeding, calculus, and shallow and deep periodontal pockets; and (2) the variation of these conditions according to age, race, gender, degree of urbanism, geographic region of the state, and parental educational attainment.

Stratified cluster sample of 330 classes (with replacement) representing 41,000 classes statewide with 1,084,055 students.

Proportionate sample from strata defined by DHHR region, urbanism, percent nonwhite for county, and grade level.

6,650 of 8,026 students participated [RR=82.9%]

Survey data also collected for: (1) treatment needs; (2) self-reported tobacco use; and (3) Profit-Fields dentofacial pilot study.

Determine smokeless tobacco use, factors affecting its adoption.

Variation in Dental Caries by Community

Head Start Survey (1986-87)*

To determine caries prevalence & oral debris presence of a random sample of center-based children 3-5 years of age enrolled in NC's 43 Head Start programs; Describe the significance of background factors thought to be relate to dental caries prevalence; Provide information about caries prevalence of a select group of pre-school children that can be added as an addendum to the 1986-87 statewide school oral health survey.

A random sample of 24 classrooms with 465 children selected from all center-based children & their parents (n=487) classrooms with 9,833 children).
RR = ?? (n=394)

Large variation in caries prevalence among Head Start Centers supports McGavran's concepts for distinct communities.

Survey of NC Migrant Schoolchildren (1988)*

To describe the oral health status of children of migrant farmworkers in NC.

Random selection of 10 schools with 532 students from total of 52 schools with K-12 classrooms and 2292 students stratified by size. Child screening RR=68% (n=361)
Parent questionnaire RR=30%.

Same methods as 1986-87 statewide survey.

<p>Dental Manpower Needs for the NC Department of Corrections (1980-85)</p>	<p>To evaluate the oral health status & dental health needs of NC prison inmates & make projections of the dental manpower required to meet these needs.</p>	<p>Resident population: A probability sample of 2,335 inmates in 18 of 82 prison units; RR=89.7%. Admission population: All inmates (860) admitted at 9 intake centers during specified time period. RR=97.2%.</p>	<p>Tested Kellogg study methodology for projecting workforce needs. Components: (1) clinical survey of dental caries and periodontal disease experience; (2) clinical survey or treatment needs; (3) study of treatment needs determinations; (4) productive capacity of prison dental delivery system; (5) develop standards of care.</p>
<p>NC National Guard Survey (1981-82) Funded by 205th Medical Detachment, Durham, NC</p>	<p>To determine the prevalence of decayed, missing and filled teeth; periodontal disease, edentulousness and classification by type and nature of treatment needed by soldiers of the NC National Guard.</p>	<p>Total NC Army Reserve National Guard (n=11,860) was stratified by deployment status and rank and enlisted further stratified by sex. Sample of 1,215 soldiers selected according to size of strata. RR = 72% (n=875)</p>	<p>Pilot test of periodontal disease knowledge and attitudes questionnaire.</p>
<p>Professional Education and Patient Periodontal Health (1986-89) NIDCR R01 DE/HS07718-01 PI Bader</p>	<p>To evaluate a continuing dental education intervention designed to improve dentists' and hygienists' diagnostic record-keeping.</p>	<p>Quasi-experimental controlled trial in which 21 practices received performance feedback, tutorial, problem solving, goal-setting and technical assistance; 15 control practices no intervention. Baseline, 1- & 2-year record audits and clinical assessments of 3,000 records.</p>	<p>Moderately intensive CDE resulted in substantial improvement in recording of gingival bleeding, calculus and probing depths, but post-intervention rates of about 30% represent incomplete adoption of recommended behaviors.</p>

<p>Madison County Sealant Study (1990 - 1995) W. K. Kellogg Foundation</p>	<p>To evaluate the effects of sealants on caries increments in permanent teeth of children; and determine if any sealant effect is modified by person- or tooth surface-level caries risk.</p>	<p>A prospective non-randomized cluster trial compared 5-year caries increments in 2nd grade students who received sealants at BL and 2-year follow-up in Madison County (BL n = 166; 106 all 3 years) compared to Mitchell County (BL n=141 (89 all 3 years). 88.5% of all 2nd-grade students in the 2 counties were enrolled at BL.</p>	<p>Results provided information to support targeted use of sealants in high risk children in school-based oral health programs. Odds of sealed surfaces begin carious after 5 years was 4.7 time less than for non-sealed surfaces in persons classified as high risk (caries in primary dentition).</p>
<p>Strategies for Management of Dental Caries in Children (With Dental Sealants) (1992-1994) AHRQ: R01 HS06993</p>	<p>NC Medicaid added dental sealants as a benefit in 1985 when only 24 states included them. This study evaluated sealants' effects on Medicaid covered charges and treatment outcomes. The studies analyzed trends in aggregate monthly restorative treatment before and after the sealant benefit to determine program effects; patterns of provider sealant behaviors; and a cohort analysis to determine individual child effects.</p>	<p>1.04 million with any enrollment 1984 – 1992. 62,000 patients < 21 yrs. of age / year; 126,000 payed claims / year; 2.4 million procedures for 7 years. A retrospective cohort analysis of 15,438 children enrolled from 1985 to 1992 compared the likelihood of restorative treatments and associated cumulative Medicaid expenditures for teeth with or without dental sealants. Sealants exhibited expenditure savings in Medicaid high-risk children.</p>	<p>By 1992 sealants had become more common than single-surface amalgams. Important to understand expenditure savings and oral health status outcomes from sealant placement. This was the first Medicaid study at the time to address this issue.</p>
<p>The Use of Epidemiologic and Administrative Data to Investigate Dental Treatment Outcomes in North Carolina's Child Medicaid Program. (1984-92) V. A. Robison</p>	<p>Determine the relationship between oral health status and treatment in children not enrolled in Medicaid, children with dental visits before the survey, children with visits after the survey, and children enrolled in Medicaid who never used services.</p>	<p>Three databases were linked: (1) clinical records from a 1986/87 statewide epidemiologic survey, providing data on treatment need; (2) Medicaid dental claims from 1984 through 1992, providing data on treatment received; and (3) Medicaid enrollment files from 1984 through 1992. Of 8,026 subjects in the survey, 1,502 (19%) were linked with the Medicaid database. 570 with visits after survey</p>	<p>1986-87 statewide survey assessed dental treatment needs for permanent teeth (including sealants) in addition to oral health status making this innovative study possible. Only 29% needing care had all needs met. Sealants used infrequently for a minority of patients.</p>

<p>Development and Analysis of a Community-based Surveillance System (SIP #4-97) U48/CCU409660-05 1997 – 1999 Centers for Disease Control and Prevention</p>	<ol style="list-style-type: none"> 1. Conduct a descriptive analysis of the first year of OHS surveillance data (1996-97); 2. Develop community (school) risk prediction models for caries experience & untreated decay; 3. Test validity of prediction models 	<p>K prediction models with demographic, socioeconomic, preventive variables at school and county levels yields SN=64%; SP=75%.</p>
<p>Surveillance of Dental Caries and Access to Care (SIP 9-99) Centers for Disease Control and Prevention (1999-2001) U48/CCU409660</p>	<p>Enhance the usefulness of the statewide K / S surveillance system by development of community-based risk prediction models for caries prevalence and access to dental care (untreated caries). Improve the accuracy of the school-level risk estimates developed as part of the CDC-funded project ending 9/1999 by estimating risk using predictors from smaller geographic areas (census tracts) than is currently available (county or school); and determine access to dental care using similar information to predict clusters of children with untreated dental caries.</p>	<p>Individual ZIP codes linked to Census data.</p> <p>Continuation of previous CDC grant.</p> <p>Access to dental care for Medicaid recipients perceived as one of the greatest pediatric health care problems of all.</p>
<p>Development and Evaluation of Medical interventions for Early Childhood Caries (IMB) NC DHHR with subcontract to UNC. CMS, HCFA, CDC</p>	<p>Randomized controlled trial of physicians to evaluate adoption of oral health services and change in provider knowledge and attitudes. Affect of IMB on caries-related treatments, rates of hospitalization for dental care and costs of subsequent dental care over the 4 years of the grant.</p>	<p>More than a dozen papers generated.</p> <p>Funded as a short-term 18-month project but with anticipated additional extension of funding. CMS withdrew support for funding after the 18 months. CDC and HRSA made up the deficit with an emphasis on continued statewide implementation of IMB and EHS interventions after completion of the RCT.</p> <p>Slade original PI on subcontract with UNC-CH; then Rozier</p>

<p>Prevention of Early Childhood Caries in Medical Practice (Smart Smiles) (2001-2006) NIDCR R01 DE013949</p>	<p>To evaluate the effectiveness of an oral health educational intervention designed to increase proficiency of pediatric residents in oral health.</p>	<p>Pediatric residents at the UNC-CH participated in oral health education that included didactic sessions, hands-on instruction by pediatric dentists and residents, preventive dentistry prompts, and change strategies to introduce oral health into practice. Pediatric residents at ECU, who had a short practicum in oral health, and WFU, who had no specific oral health instruction, served as comparison groups. All residents completed questionnaires before and 12 months after instruction began at UNC-CH. Effects were tested for each school separately by repeated-measure analysis of variance.</p>	<p>Multifaceted instruction in oral health was effective in improving pediatric residents' knowledge about oral health, their confidence in providing oral health services, and the delivery of these services in their ambulatory care practices. Residents also adopted the use of fluoride varnish.</p>
<p>SIP# 1-01 Reducing Inequalities in Oral Health through Prevention (2003-04) U48/CCU415769 Centers for Disease Control & Prevention</p>	<p>The aims of this study were to evaluate the: (1) joint and individual effects of the NC Preventive Dentistry Program's two fluoride components (fluoridation vs. school-based rinse) on dental caries experience and their contribution to reductions in disparities in dental caries; (2) carry-over effects of school-based services on the cumulative caries experience of children in school grades 6 – 12; and (3) Trends in dental disease among schoolchildren in the state over the past 40 years.</p>	<p>A sample of 400 classrooms selected from 16 strata designed to oversample Latino and grades 9-12 students. 357 of 398 classrooms participated in the survey (RR=89%). About 5,400 of the 7,669 sampled schoolchildren received a clinical examination (RR=70%) and 5,942 parents returned completed questionnaires (RR=77.4%).</p>	<p>Sterritt Sealants Fluorosis???? Uvo fluorosis study OHRQoL</p>

Pilot Studies of Early Head	A cross-sectional survey was undertaken of EHS staff having contact with families in EHS programs in North Carolina (NC) to learn about these programs and how they might link with IMB practices and services.	A cross-sectional survey of staff in 18 programs statewide enrolled approximately 1,300 children 0-3 years of age. 795 of the 1,239 eligible subjects completed paper questionnaire (RR=64.2%).	11-page, 66-item, self-complete questionnaire for parents. The themes questioned in the questionnaire included: parent and child oral health status; knowledge about fluoride, dental care during pregnancy and caring for baby teeth; oral health practices; and the role of EHS in oral health. English and Spanish language questionnaires.
Start (2005 - 2006) Grant No. 11-P-91251/4-02 CMS, HRSA, and CDC and Grant No. R01 DE018236 from the NIDCR.	A self-completed questionnaire solicited their opinions about whether physicians and nurses can "provide preventive dental care" and "identify dental problems" in infants and toddlers.	Questionnaires were completed by 476 staff (98 percent response) in 18 programs (100 percent response).	Of 24,403 children in the study, more children with physician identified ECC received a referral (32.9%) compared to those without ECC (1.2%). Among children with ECC, those receiving a dental referral visited a dentist earlier than those who were not referred (Hazard Ratio=3.1, 95% CI [2.40, 4.04]). Physicians made dental referrals for only a third of the children they identified with ECC. Dental referrals were associated with subsequent dental visits for some, but not all children with identified dental needs.
Referral for Dental Care from a Medical Office-based Preventive Dental Program 2006-08	The purpose is to evaluate the overall effectiveness of dental referral by physicians participating in IMB in promoting use of dentists' services.	Use of enrollment and claims files for NC Medicaid Oct 1999 – Dec 2004 from previous NIH-funded study.	
NIDCR 1 R03 DE017350-01 Sally Stearns PI	Specific aims: (1) To determine the frequency with which children who receive dental screening and risk assessment services as part of an IMB visit are referred and its predictors; (2) To determine the rates of dental care utilization among children who received or did not receive a physician referral for dental care; and (3) To compare rates of and time to use of dental care at the child and medical practice level among children in practices participating in IMB with children from practices not participating in IMB.	Intent-to-treat analysis; survival analysis techniques; propensity score techniques.	

<p>Development & Dissemination of Oral Health Risk Assessment and Referral (PORRT) Guidelines.</p>	<p>Follow-up to Carolina Dental Home Project.</p>
<p>2007-2011 HRSA</p>	<p>2006-2009</p>
<p>PI: Rebecca King Subcontract with UNC for data collection and analysis</p>	
<p>Prevention of Dental Caries in Early Head Start Children. (ZOE)</p>	<p>ToothTalk and Brushing is Fun follow-up projects by the Oral Health Section funded by the KBR Foundation and Duke Endowment.</p>
<p>2008 – 2014 The EHS intervention was funded by a HRSA Grant No: 1 H47MC4112-01-00] and is based on findings from our assessments of staff and parents, which were funded by grants from CMS, HRSA and CDC [Grant No. ORS 2974-00].</p>	<p>The ZOE study was designed as a non-randomized, pretest-posttest nested cohort control group cluster trial. We recruited 24 of the 25 EHS programs in the state and selected 1,567 infants and toddlers younger than 19 months of age newly enrolled in two sequential school years beginning in 2010. Comparison parent-child dyads were selected from Medicaid files from families living in the same neighborhoods (ZIP codes) where enrolled EHS children lived. 1,567 parent/child dyads that participated in the baseline interviews between 2009 and 2011 and comprised our study population. Forty-one percent of these children (636) were enrolled in EHS, and 59% (931 children) were Medicaid-eligible but not enrolled in EHS, were age-matched controls.</p>

Prevention of Dental Caries in Early Head Start Children. (Administrative Supplement) 2008

The funds supported: (1) an enhancement of the educational intervention that targets communication between EHS staff and parents (Brief/Motivational Interviewing-BMI); (2) improvement in the quality of data collected by way of parent interviews; and (3) improvement in the organizational structure of this large statewide project involving 17 Early Head Start Programs in 27 counties spread from the coast to the mountains.

MI training was provided for 176 EHS staff by MI experts in every EHS program in North Carolina. Knowledge of MI and skills was self-assessed before and after training. Participants had improved HRQ-scores, but lacked adherence to MI. EHS staff were not always able to demonstrate practical skill application of MI in their daily routines working with EHS families

Funds provided by the Affordable Care Act.

Edna Hensey with the Oral Health Section developed an 8-module Early Head Start Oral Health Curriculum that was pilot tested January 23, 2007 with 53 staff members of the Guilford Children Development Head Start Program and the Guilford County Health Department.

All collaborations are not mentioned, only ones with substantial involvement of UNC-CH.

*Primarily a DPH residency project but included because it was part of the research agenda at the time and protocol might have been developed during the MPH degree.

UNC-CH involvement in partnership with State Dental Public Health Program.

Primary unit managing the grant or contract was in the SPH.

Research connected to that not done in the SPH is included in the narrative but not the table to complete the story. Such strong partnerships that it is difficult to write the history without including these projects.

- Studies with involvement of dental faculty in HPM (PI, Co-PI, major consultant role, e.g. calibration, design, data management, analysis, etc.
- Studies (if part of faculty research) done by student supervised by faculty in HPM
- Not all the studies have been published in the scientific literature. But they were used to make sound decisions about public health programs
- Most of the studies are a collaboration among many people. The SPH was primarily responsible for the evaluation.
- Master's paper but important information about NC programs

Criteria for inclusion is not hard and fast—my judgement about what would be considered of interesting and relevant to preserving NC dental public health history. Master's papers should be available so aren't needed in most cases.

References Chapter 7

- Agency for Healthcare Research and Quality. "State at a Glance: North Carolina." <https://www.ahrq.gov/policymakers/chipra/demoeval/demostates/nc.html>.
- American Academy of Pediatrics. 2022. "Recommendations for Preventive Pediatric Health Care." Available at: https://www.aap.org/en-us/Documents/periodicity_schedule.pdf.
- American Association of Public Health Dentistry. 1983. "Periodontal Disease in America: A Personal and National Tragedy. A Position Paper Prepared for the American Association of Public Health Dentists by the AAPHD Subcommittee on Preventive Periodontics, October 24, 1981." *Journal of Public Health Dentistry* 43, no. 2: 106–17.
- American Dental Association. 2001, House of Delegates Resolution 73-2001, Trans. 2001: 430–32.
- Amstutz RD, and Rozier RG. 1995. "Community Risk Indicators for Dental Caries in School Children: An Ecologic Study." *Community Dentistry and Oral Epidemiology* 23, no. 3: 129–37.
- Bader JD, Sams DH, and O'Neil EH. 1987. "Estimates of the Effects of a Statewide Sealant Initiative on Dentists' Knowledge and Attitudes." *Journal of Public Health Dentistry* 47, no. 4: 186–92.
- Bawden JW. 1998. "Fluoride Varnish: A Useful New Tool for Public Health Dentistry." *Journal of Public Health Dentistry* 58, no. 4: 266–69.
- . 1999. Letter to the editor. *Dental Gazette*. Summer 1999.
- Biemer P, Hergert D, Morton J, and Willis G. 2001. "The Feasibility of Monitoring Field Interviewer Performance Using Computer Audio Recorded Interviewing (CARI)." Proceedings of the Section on Survey Research Methods, American Statistical Association.
- Born CD, Divaris K, Zeldin LP, and Rozier RG. 2016. "Influences on Preschool Children's Oral Health-Related Quality of Life as Reported by English and Spanish-Speaking Parents and Caregivers." *Journal of Public Health Dentistry* 76, no. 4: 276–86.
- Centers for Disease Control and Prevention. 1991. "Public Health Service Report on Fluoride Benefits and Risks." *Morbidity and Mortality Weekly Report* 40, no. RR-7: 1–8.
- Centers for Disease Control and Prevention. 2001. "Recommendations for Using Fluoride to Prevent and Control Dental Caries in the United States." *Morbidity and Mortality Weekly Report* 50, no. RR-14: 1–42.
- Chianca TK. 1996. "An Evaluation of the Madison County Oral Health Program: A five-year public health sealant intervention." A paper submitted to the faculty of the University of North Carolina in partial fulfillment of the requirements for the Degree of Master in Public Health in the Department of Health Policy and Administration, UNC School of Public Health.
- Close K, Rozier RG, Zeldin LP, and Gilbert AR. 2010. "Barriers to the Adoption and Implementation of Preventive Dental Services in Primary Medical Care." *Pediatrics* 125, no. 3: 509–17.
- Couper M, Holland L, and Groves R. 1992. Developing systematic procedures for monitoring in a centralized telephone facility. *Journal of Official Statistics* 8, no. 1: 63–76.
- Dilley GJ, Rozier RG, and Machen JB. 1982. "Pedodontic manpower and productivity in North Carolina—A pilot project." *Pediatric Dentistry* 4, no. 2: 115–18.

- Disney JA, Bohannon HM, Klein SP, and Bell RM. 1990. "A Case Study in Contesting the Conventional Wisdom: School-Based Fluoride Mouthrinse Programs in the USA." *Community Dentistry and Oral Epidemiology* 18, no. 1: 46–54.
- Divaris K, Rozier RG, and King RS. 2012. "Effectiveness of a School-Based Fluoride Mouthrinse Program." *Journal of Dental Research* 91, no. 3: 282–7.
- Eason KE, Close KL, Casey MW, and Earls MF. 2017. "A Commentary on Pediatric Oral Health in North Carolina." *North Carolina Medical Journal* 78, no. 6: 386–89.
- Eklund SA, and Bailit HL. 2017. "Estimating the Number of Dentists Needed in 2040." *Journal of Dental Education* 81, no. 8: eS146–eS152.
- Fulton JT, Hughes JT, and Mercer C. 1965. *The Natural History of Dental Diseases*. Chapel Hill, N.C.: School of Public Health, UNC-CH, 1965.
- Hughes JT, Rozier RG, and Ramsey DL. 1982. *The Natural History of Dental Diseases in North Carolina 1976-77*. Durham, N.C.: Carolina Academic Press.
- Hutchens LH. 1981. "Summary report of 'Project '80.'" *North Carolina Dental Gazette* 3, no. 4: 6–9.
- Journal of Public Health Dentistry*. 1995. "Proceedings of the Workshop on Guidelines for Sealant Use." 55, no. 5: 259–311.
- Lalumandier JA, and Rozier RG. 1995. "The Prevalence and Risk Factors of Fluorosis among Patients in a Pediatric Dental Practice." *Pediatric Dentistry* 17, no. 1: 19–25.
- Leverett D. 1986. "Prevalence of Dental Fluorosis in Fluoridated and Nonfluoridated Communities—A Preliminary Investigation." *Journal of Public Health Dentistry* 46, no. 4: 184–87.
- Levy SM, Murphy RF, and Dudney GG. 1985. *Preventive Dentistry in North Carolina: A Ten-Year Report*. N.C. Department of Human Resources, Division of Health Services, Dental Health Section, January 1985.
- Long CM, Quinonez RB, Beil HA, Close K, Myers LP, Vann WF Jr, and Rozier RG. 2012. "Pediatricians' Assessments of Caries Risk and Need for a Dental Evaluation in Preschool Aged Children." *BMC Pediatrics* 12: 49.
- Long LM Jr, Rozier RG, and Bawden JW. 1979. "Estimation of Actual Caries Prevalence and Treatment Needs from Field Survey Caries Information on a Child Population in U.S.A." *Community Dentistry and Oral Epidemiology* 7, no. 6: 322–29.
- Matsuo G, Aida J, Osaka K, and Rozier RG. 2020. "Effects of Community Water Fluoridation on Dental Caries Disparities in Adolescents" *International Journal of Environmental Research and Public Health* 17, no. 6. <https://doi.org/10.3390/ijerph17062020>.
- Meskin LH. 2001. "Look Who's Practicing Dentistry." *Journal of the American Dental Association* 132, no. 10: 1352–53.
- Miller AJ and Brunnelle JA. 1983. A summary of the NIDR community caries prevention demonstration program. *J Amer Dent Assoc* 107, no. 2: 265-269.
- Moyer VA. 2014. "Prevention of Dental Caries in Children from Birth Through Age 5 Years: US Preventive Services Task Force Recommendation Statement." *Pediatrics* 133, no. 6: 1102–11.
- National Institutes of Health. 1984. "Consensus Development Conference Statement. Dental Sealants in the Prevention of Tooth Decay." *Journal of Dental Education* 48, no. 2 (suppl.): 126–31.

- News & Observer*, editorial, July 18, 1999.
- North Carolina Dental Manpower Study. 2011. *Reimbursing Physicians for Fluoride Varnish*. Pew Charitable Trusts. Available at: <http://www.pewtrusts.org/en/research-and-analysis/analysis/2011/08/29/reimbursing-physicians-for-fluoride-varnish>.
- North Carolina Dental Society. 1979. *Dental Manpower for North Carolina: A Report of a Study Conducted by a Special Committee of the North Carolina Dental Society*. November 1979.
- North Carolina Institute of Medicine. 2005. *2005 North Carolina Oral Health Summit Access to Dental Care: Summit Proceedings and Action Plan*. Durham, N.C., October 2005.
- Onorriobe U, Rozier RG, Cantrell J, and King RS. 2014. "Effects of Enamel Fluorosis and Dental Caries on Quality of Life." *Journal of Dental Research* 93, no. 10: 972–79.
- O'Rourke JT. 1948. *A Report of a Study of the Dental Needs and Facilities of North Carolina*. Dental College Committee, N.C. Dental Society.
- Otto JL, Holodniy M, and DeFraitess RF. 2014. "Public Health Practice Is Not Research." *American Journal of Public Health* 104, no. 4: 596–602.
- Pahel BT, Rozier RG, and Slade GD. 2007. "Parental Perceptions of Children's Oral Health: The Early Childhood Oral Health Impact Scale (ECOHS)." *Health Quality and Life Outcomes* 5: 6.
- Perusi R., Sutton B.K., Bawden JW, and Rozier R. G. Meeting to discuss policies and implementation of fluoride varnish in Medicaid. July 16, 1999. Division of Medical Assistance, Department of Health and Human Services.
- Rozier RG, Hughes JT, and Ramsey DL. 1982. *Dental Health in North Carolina: A Chartbook*. Chapel Hill, N.C.: UNC-CH, Department of Health Policy and Administration, School of Public Health.
- Rozier RG, and King RS. 2005. "Defining the Need for Dental Care in North Carolina: Contributions of Public Health Surveillance of Dental Diseases and Conditions." *North Carolina Medical Journal* 66, no. 6: 438–44. <https://pubmed.ncbi.nlm.nih.gov/16438100/>.
- Rozier RG, Sutton BK, Bawden JW, Haupt K, Slade GD, and King RS. 2003. "Prevention of Early Childhood Caries in North Carolina Medical Practices: Implications for Research and Practice." *Journal of Dental Education* 67, no. 8: 876–85.
- Rozier RG, White BA, and Slade GD. 2017. "Trends in Oral Diseases in the U.S. Population." *Journal of Dental Education* 81, no. 8: eS97–eS109.
- Slade GD, Rozier RG, Zeldin LP, and Margolis PA. 2007. "Training Pediatric Health Care Providers in Prevention of Dental Decay: Results from a Randomized Controlled Trial." *BMC Health Service Research* 7: 176.
- Smiles For Life curriculum 2022. <https://www.smilesforlifeoralhealth.org/resources/practice-tools-and-resources/state-specific-fluoride-varnish-information/#:~:text=All%2050%20state%20Medicaid%20Programs,this%20service%20through%20their%20practice>.
- Stamm JW. 2005. "The Dentist Workforce in North Carolina 2005: A Commentary." *North Carolina Medical Journal* 2005 66, no. 6: 445–51.
- Weintraub JA, Burgette JM, and Chadwick DG. 2016. "Educating North Carolina's Oral Health Workforce in an Evolving Environment." *North Carolina Medical Journal* 77, no. 2:107–11.

- Weintraub WA, Stearns SC, Rozier RG, and Huang CC. 2001. "Treatment Outcomes and Costs of Dental Sealants among Children Enrolled in Medicaid." *American Journal of Public Health* 91, no. 11: 1877–81.
- Zhu Y, Close K, Zeldin LP, White BA, and Rozier RG. 2019a. "Implementation of Oral Health Screening and Referral Guidelines in Primary Health Care." *JDR Clinical and Translational Research* 4, no. 2: 167–77.
- Zhu Y, Close K, Zeldin L, Quinonez RB, White BA, and Rozier RG. 2019b. "A Clinical Vignette-Based Study of Physicians' Adherence to Guidelines for Dental Referrals of Young Children." *Academic Pediatrics* 19, no. 2: 195–202.

Concluding Comments

“History Has No Ending Date”

This review of the history of graduate education in dental public health begins with the Dean of the School of Medicine approving a request from E. A. Branch, the head of the state dental program, to establish an Institute of Dental Public Health at the University of North Carolina. But two events happening eight decades later were chosen to provide an end for this review. A private gift from Drs. Chester and Joy Douglass to establish a professorship at UNC-CH in dental public health to be held jointly between the Schools of Dentistry and Public Health is a major contribution in helping to ensure the dental program endures for another eighty years. The announcement of the professorship also corresponded to the official retirement of Professor Rozier from full-time teaching. This chapter summarizes the major themes evident in the period reviewed.

In the margin of Dr. Fulton’s notes for one of his classes in epidemiology is written, “The past is past, the present is now, and the future has yet to be written.” This well-worn phrase conveys in a few words the intended contribution of this book. An important milestone in the DPH program at UNC-CH will be its 100th anniversary in 2035 and the mid-century mark in 2050, both only the length of a short professional career away. A consensus on a strategic plan for moving forward with a progressive dental public health agenda that will benefit the citizens of North Carolina has not been articulated. Several ongoing national, state, and university initiatives will help preserve the DPH program. Documentation is provided in this final chapter for three of these.

Common Threads throughout the Program’s History

Several themes stand out in this review of the history of DPH education at UNC-CH because of their persistence, strong support among university decision-makers and impact on oral health. These themes are grouped under five categories: mission, education, research, collaboration, and integration for comprehensiveness.

Mission of Dental Public Health Education Program

The primary mission during the seven decades has been to educate leaders in population oral health. Graduates have assumed positions as university program directors,

department chairs, and deans in the United States and other countries. Examples at the federal level include the following: lead dentist for oral health in the Centers for Medicare and Medicaid Services; the Health Resources and Services Administration; and HIV/AIDS Bureau (in HRSA); several chief dental officers for the U.S. Public Health Service; project officer for the National Institute of Dental and Craniofacial Research; and Head of the Division of Oral Health in the Centers for Disease Control and Prevention. A large percentage of graduates have assumed management and leadership positions in state and local programs as statewide or regional managers or leaders of special initiatives. A smaller group of graduates have assumed positions of leadership in professional organizations like the American Dental Association. Because of the type of positions assumed by graduates of the master's, specialty, and doctoral-degree programs, leadership mostly by example and practical application has been an important part of the curriculum.

Education in Dental Public Health

A desire to have a strong, well-prepared DPH workforce using the most up-to-date and effective methods supported by science was evident in the actions of the School of Public Health and North Carolina's state health department. This goal was accomplished in the first half of the eighty years included in this review with continuing education courses. From the late 1950s, this goal was accomplished through graduate-level training in public health and by faculty taking a leadership role in the development and refinement of the scope of DPH practice knowledge, skills, and competencies. Training of a select group of dentists with advanced DPH skills for leadership positions was considered a priority. The state health department in partnership with the UNC-CH School of Public Health established an accredited DPH residency program in the mid-1960s that was among the first such education programs and remains the only residency in a state health department to this day.

Public Health Practice and Collaboration

A strong emphasis on public health practice and collaboration with state and federal programs is evident throughout the history of DPH education at UNC-CH. Collaborations in education, research, and practice were particularly strong between the School of Public Health and the N.C. state dental public health program. Development of the oral health surveillance in kindergarten and fifth grade and statewide oral-health surveys under the leadership of Dr. Rebecca King are examples. When the K-5 surveillance system was being developed, CDC had no recommendations or models for state-level surveillance systems. DPH residents, the state dental program, and UNC-CH faculty and students helped develop and test various aspects of surveillance, such as improving response rates with incentives, new measurement indices and techniques, reliability and validity of new and traditional measurements, linkage

of oral-health status and treatment files, and merges and use of multiyear datasets to monitor trends in dental diseases over time and evaluate program impact.

Implementation of the N.C. Preventive Dentistry Program, the N.C. Dental Workforce Study, sealant initiatives, integration of dentistry into medicine and social services programs, policies to improve access to oral-health services and other innovative programs highlight the importance of collaborations among public-health and dental professionals. These initiatives highlighted a consistent need for a workforce with DPH knowledge, competencies, and skills in program dissemination and implementation. Although need for a well-trained workforce was ever-present and recognized, strategies to align demand with need were not always successful.

Creating Evidence to Solve Practical, Population-Based Problems

As with most academic graduate programs, a robust research program addressing important health issues through innovative solutions is important. Virtually from the beginning of the DPH program, a funded-research program existed. The first DPH research project associated with the dental program in the School of Public Health was the NIH-funded and first-ever statewide household survey conducted in the United States. The end of the timeline included in this review is marked by another NIH-funded research project, this one evaluating the integration of early childhood education, dentistry, and medicine. In between these two important studies was a continuous series of funded projects related to prevention of dental disease and promotion of oral health. Decisions on research to pursue were guided by focusing on public-health needs and areas where the dental program had the greatest chance to create change and shape the future.

This book does not make recommendations for specific research goals or areas where research is needed. A wealth of issues have been explored in reports by the government, philanthropic organizations and professional organizations, particularly in the last two decades, that can provide a foundation for a research agenda that meets the needs of the public. These issues and clarity on research priorities will continue to change. The most well-planned research agenda of more than a few years can go astray because of serendipitous events out of the control of investigators.

Although specific recommendations are not made in this book, even a superficial reading should be helpful in identifying gaps in oral-health knowledge that can and should be addressed through public-health research. For example, several factors appear to be important in dentists' selection of DPH or policy-making as a career, but no research has been done on this question. Similarly, race and associated factors are some of the more important determinants of oral-health status. Segregation of public schools and its effect on decisions to implement school-based preventive dentistry programs, access to private dental offices, adequacy of workforce supply, public

drinking-water infrastructure, and access to fluoridated water have received little to no attention in chapters throughout the history of DPH in North Carolina. They are a neglected part of the history of graduate education and public-health practice at UNC-CH. Attention to these pathways should help us understand some of the historical determinants of oral health in North Carolina and elsewhere in the South.

Some important history occurs at the local level and is not included in this review. For example, the Guilford County Department of Public Health was North Carolina's first full-time health department, established in July 1911, and the nation's second oldest. Robeson County established the first rural health department in the United States a year later in February 1912. Both county health departments had a dental program with histories that are untold, but which would likely make an important contribution to the unfolding of DPH events in the state.

The Gillings School is well suited for the exploration of public-health issues because of the expertise available in the school, some of which is unavailable elsewhere on campus. Expertise exists in well-grounded academic disciplines such as economics, biostatistics, epidemiology, comparative effectiveness, financial management and performance, health outcomes, organization and implementation science, quality of and access to care, leadership, and equity and justice, and other public-health disciplines. This history provides confirmation that above all else, the issues must be broad enough and important enough to solicit the collaboration of multiple partners to complete research of importance to the oral health of the state.

Putting It All Together for a Comprehensive Program

The approach in Gillings to graduate education in DPH has been to offer a comprehensive DPH program with at least three identifiable, three-credit-hour DPH courses every year with a content based on the DPH competencies. The program also has had a visible research and service component that not only supports the master's degree program but one that supports a PhD program. These components provided a visible DPH program housed in the Department of Health Policy and Management with at least one full-time faculty position equivalent to other specialty areas such as mental health, geriatrics, and social justice coordinated by someone who functions as a program director. It has been easier to maintain the research component than course offerings in recent years because of the lack of demand for courses.

Helping to Ensure the Future of Dental Public Health at UNC-CH

Rozier's Retirement and establishment of the Rozier-Douglass Distinguished Professorship

On June 8, 2014, a day-long celebration of the past and future of DPH was held in Chapel Hill. An entire afternoon and evening were devoted to the celebration, the first



Fig. 32. Gary Rozier and Chet Douglass Establish Rozier/Douglass Professorship.

of its kind in North Carolina. The event celebrated the retirement of Richard Gary Rozier, a logical place to end the current history of dental public health at UNC-CH. He had been a full-time professor at the Gillings School of Global Public Health for almost forty years by that time, longer than all the other dentists' with primary appointments in the School of Public Health combined. The announcement of a professorship to recognize his career was made possible by a generous private gift to the university. Funding from the BCBS Foundation and Delta Dental Plan of North Carolina to help support planning future initiatives in DPH was also announced.

The day started with two scientific panels in the afternoon. The first, held in the School of Dentistry, focused on the accomplishments of Dr. Rozier and his impact on DPH. It featured presentations by Dr. Bill Bailey, Assistant Surgeon General and Chief Dental Officer of the USPHS, who presented the Chief Professional Officer Exemplary Service Award to Dr. Rozier; Dr. Rebecca King, Kelly Close, Jacqueline Burgette, and Alex White also made comments. Each of the five panel members held at least one degree from UNC.

The other afternoon panel, held in the Gillings School of Global Public Health, focused on the future of DPH. The panel consisted of Dr. Rick Valachovic, executive director of the American Dental Education Association; Dr. Christopher Fox, executive director of the American Association for Dental Research; Dr. Bill Maas former

chief dental officer of the U.S.P.H.S; and Dr. Terri Dolan, former dean of the University of Florida School of Dentistry, and Vice President of Dentsply.

The evening ceremonies were emceed by Dr. Linda Niessen, now dean of Kansas City University School of Dentistry. The highlight of the even was the announcement of a professorship to honor the career of Dr. Rozier. The professorship was made possible by a private gift from Drs. Chester (Chet) and Joy Douglass, with the stipulation that the person eventually appointed to the professorship have a joint academic appointment in the Schools of dentistry and public health. Chet, former chair of Harvard School of Dental Medicine's Department of Oral Health Policy and Epidemiology and long-time faculty member, mentored an exceptionally large number of leaders in dentistry who hold a variety of important positions in the dental profession, many of whom were in attendance to celebrate with Chet on June 5.

The professorship is believed to be the first endowed professorship in the nation linking dentistry and public health. In announcing the professorship, Dr. Jane Weintraub, dean of the UNC-CH School of Dentistry, said, "This professorship provides assurance that this important academic discipline will have a home here at UNC. It ensures a continued collaboration between the schools of dentistry and public health, which are arguably among the best in the nation and already have a history of working together for the betterment of the health of citizens of North Carolina."

During the day-long event, a generous grant from the Blue Cross Blue Shield of North Carolina Foundation to support the Excellence in Dental Public Health initiative and a gift from Delta Dental to support dental public health were announced. The initiative will focus on DPH problems and challenges in North Carolina.

The event focused on the accomplishments of Rozier and the professorship. He expressed appreciation to the university and its tradition of excellence. He is proud of graduates of the more than 300 dentists, hygienists, and other students awarded master's and doctoral degrees. Graduates of these programs have assumed important leadership positions: at least five university deans, scores of faculty members, three chief dental officers of the USPHS, and leaders in many federal, state, and local programs here and abroad.

At the close of his comments, Gregory Chadwick, dean of East Carolina University's School of Dental Medicine and one of five deans to participate in the ceremonies, presented a Presidential Citation to Rozier for his "Pioneering Leadership in Dental Public Health" from the American Dental Association.

Appointment of Alex White to Joint Position in HPM and Dental Ecology

In anticipation of Rozier's retirement from full-time teaching in 2014, Alex White was recruited to lead joint efforts in DPH between the UNC-CH Adams School of Dentistry, the Gillings School of Global Public Health, and their community partners.

White was returning to his original academic home in dentistry and in some respects, his accessorial home. He was the third of three dentists born in Robeson County, North Carolina, who devoted their careers to leadership positions in DPH. In addition to White, there was Ernest A. Branch and Rozier. This historical note probably has little relevance to this account other than raising interesting academic questions about the effects that their origins might have had on their career choices. A brief diversion into this area also provides insights into the history of health care in one of North Carolina's interesting counties.

The title of Josephine Humphreys's 2000 book *Nowhere Else on Earth* could serve as a catchphrase for the environment in which Branch, Rozier, and White were raised. Although a novel, the book draws from the true history of the struggles and conflicts among Lumbee Indians, African American slaves, and White people living in this area of North Carolina in the nineteenth century. This book and others highlight a deeply ingrained history of racial, economic, and social disparities that contributed to large and long-standing inequities in health status (Ross 2005).

According to most sociodemographic metrics, Robeson County is one of the poorest counties in the state. An analysis by the University of Wisconsin's Population Health Institute ranked it last among the 100 counties in North Carolina in both health outcomes and a composite score based on a variety of factors that affect health, such as high school graduation rates, access to healthy foods, smoking, children in poverty, and teen births. (U Wisconsin Population Health Institute 2020; NCDCCR.gov 2016).

Decision-making about one's career is a complex process with many factors affecting choices at various stages of life (Akosah-Twumasi et al. 2018). Factors that influence the decision to enter dentistry at large or DPH in particular are not well studied. But social and physical environment can influence people's beliefs, which in turn, can affect career choices. The resulting beliefs can align with foundational public health values such as an obligation to prevent harm, to show respect for individuals, fairness, transparency, and production of benefits, justice, and equity. The social environment inherent in small towns in rural North Carolina like where Branch, Rozier, and White spent their childhoods could have been a contributing factor to the choice of these three dentists to choose dental public health as a career.

Ernest A. Branch: The first of the dentists with ties to Robeson County was Ernest A. Branch, who was appointed state dental director in 1929 at the age of forty-one and held that position until 1958. He was born in Robeson County in 1888 and is buried in Lumberton, North Carolina. He was educated in the public schools of Robeson County and from 1908 to 1910 attended Oak Ridge Institute, a private school in Guilford County. This school was incorporated by the N.C. General Assembly in 1891 for the purpose of "maintaining a school of high grade for the intellectual and moral training of the youth of the White race." He graduated from Atlanta Dental College in

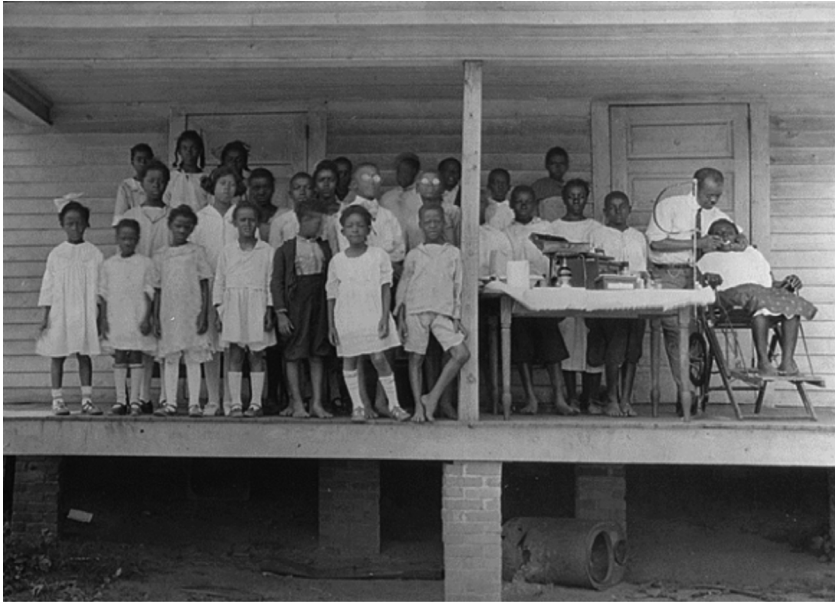


Fig. 33. Robeson County, N.C., Leading Health Department Dental Screening.

1913 and was in private dental practice from 1913 to 1922 and again in 1927 and 1928. In 1923, he was a visiting staff member at Forsyth Dental Infirmary.

Branch's obituary indicated that he was responsible for three firsts in DPH: The first oral hygiene program of its kind, the first school for training public-health dentists, and the first building to be used exclusively for a state dental health program.

Dr. Branch was active in professional organizations, having served as president of the North Carolina Dental Society; the American Association of Public Health Dentists; the North Carolina Public Health Association; and the State and Territorial Dental Directors. He served as chairman of the Oral Hygiene Section of the American Dental Association and as a member of the Maternal and Child Health Advisory Committee to the Children's Bureau of the U.S. Department of Labor.

Dr. Roy Norton, state health officer, commented that "no man in this country ever made a greater advancement to oral hygiene as a part of the public health program than did Dr. Branch" (*Greensboro Record* 1958).

R. Gary Rozier: He was born in Saint Pauls, one of the small towns that dot the rural landscape of Southeastern North Carolina. Excluding Lumberton, the county seat, and the largest city in the county with a population of about 35,000, the average population of these towns is less than 2,000 people according to the 2010 U.S. Census.

Rozier was educated in the Saint Pauls city schools, at Wake Forest College in Winston-Salem, N.C., graduating with a BA in history, and the Adams School of Dentistry, where he received a DDS degree. After four years of clinical dentistry in the U.S. Army Dental Corps, private practice in Mt. Airy, North Carolina, and public health in Randolph County, Rozier returned to UNC-CH for an MPH degree in health administration and a year-long DPH residency in the NC state health department. Upon completion of the residency in 1976, he accepted a research and teaching position in the Gillings School of Global Public Health.

Professor Rozier's ancestors migrated to Robeson County from Virginia before the Revolutionary War and settled in the small community of Howellsville, located a few miles north of Lumberton. His great-grandfather Stephen B. Rozier was a farmer, physician, and businessman who practiced medicine in the county from 1859 to 1909. The Civil War, Reconstruction, and the Jim Crow era left the area devastated and any progress overcoming socioeconomic barriers to health care was difficult in this small rural county. According to the 1880 census, the population for the county was 23,380. The first hospital would not open in the county until 1906. A local health department would not be established in the county until 1912, the first rural health department in the nation, when Dr. B. W. Page was hired as the health director. The poor health of the county is depicted in his first annual report in which he reported inspecting 500 rural homes and quarantining 118.

According to information published by Appalachian State University, twelve physicians were practicing in the Robeson County shortly after the end of the Civil War (1867–68). Other records suggest that Rozier was the only physician in practice during the Civil War. The county population was 15,489 in 1879. The number of physicians increased to nineteen about a decade later (1877). They also listed one dentist in the county.

Rozier's commitment to public-health principles and public service were apparent in his fifty years of practice as a country doctor in rural North Carolina. As an outward sign of his public service, he donated land to locate four churches that provided places of worship for three racial groups (Ten-Mile Baptist Church, 1885; Cedar Grove, 1891; Rozier Baptist Church, 1901; Magnolia Baptist Church, 1902). Reportedly, he met the need for health care to some extent with a small hospital in the upstairs portion of his home, which was constructed sometime in the 1880s.

A. Benjamin White: After graduating from UNC-CH's Adams School of Dentistry in 1983 with a DDS, Dr. White completed a two-year residency in general dentistry at the Brigham and Women's Hospital in Boston, Massachusetts. He then enrolled in Harvard University's T.H. Chan School of Public Health, where he earned two masters degrees (Master of Public Health and a Master of Science in Health Policy and Management) awarded in 1987 and a Doctor of Public Health degree in 1992,

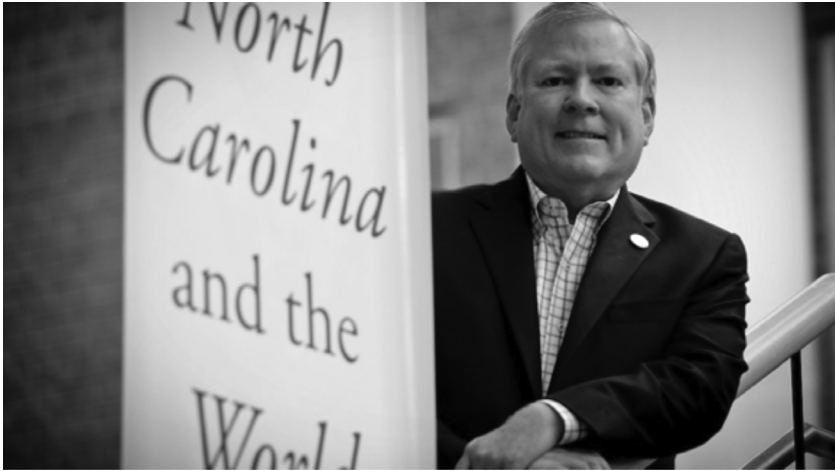


Fig. 34. B. Alex White, DDS, DrPH.

while part of the time serving as a (1987–89) Robert Wood Johnson Dental Services Research Scholar at the Harvard School of Dental Medicine.

In the early to mid-1990s, White held policy positions in Washington, D.C., with the Agency for Healthcare Research and Quality, Centers for Medicare and Medicaid Services, the White House, and the National Institutes of Health while a commissioned officer in the USPHS. Between 1995 and 2004, he was Senior Investigator at the Kaiser Permanente Center for Health Research in Portland, Oregon, and later Oral Research Director at Tom's of Maine. He then assumed a research and policy position (2003–2010) with the DentaQuest Institute in Westborough, Massachusetts. Immediately before joining UNC-CH, he was an assistant professor at East Carolina University's School of Dental Medicine in Greenville. In the tradition of DPH faculty at UNC-CH, Alex White served as president of the American Association of Public Health Dentistry and the American Board of Dental Public Health.

A “Public Health Generation”?

Outward signs of the importance of public health and a well-trained workforce have grown in the last several years. Indicators point to modest increases in demand and a rather dramatic growth in the capacity of public-health education in the United States to respond to this demand. There has been an increase in the number of accredited schools of public health in the United States, followed by a dramatic increase in undergraduate degrees in public health between 1992 and 2012, making it the ninth fastest growing undergraduate degree program in the country (Leider et al, 2015). The growth in undergraduate degrees has led some to refer to the next generation of college students as the “public health generation” (Petersen et al. 2015; Rosenstock

et al. 2011). Reilly (2021) has also reported an increase in the number of medical students pursuing an MD-MPH dual degree.

The pipeline for education in public-health dentistry, however, is not well described. Limited information is available about dental education and public health. The number of dentists and dental hygienists in MPH or related degree programs at any point in time is not presently known. However, the number of dentists becoming dental public health specialists has increased in recent years and is becoming more diverse. Weintraub and Rozier (2016) speculated that the recent increase in public-health training will create a pipeline that eventually will benefit public-health dentistry. The need for DPH knowledge and skills is increasing. There is a growing need for professionals with both population-based and individual patient care perspectives prepared to manage and evaluate programs, people and budgets, advocate for and promote prevention, critically appraise scientific evidence, develop and interpret policies affecting oral health, and conduct research to address oral and public-health problems.

However, the increase in workforce capacity has not manifested itself in increased enrollment of dental professionals in master's degree programs in public health. As reviewed in chapter 6, the number of dentists and dental hygienists enrolled in MPH-degree programs at UNC-CH has averaged only about three students over the sixty years or so since the first DPH courses were taught in the School of Public Health. But the enrollment exhibits a high degree of variability, caused by fluctuating federal support for DPH training, encouragement of its employees by state and federal programs at different times, special programs like joint clinical residency-MPH programs or distance learning programs, and visibility given to social and policy trends that highlight the importance of public health among policy-makers that make public health more popular.

Beyond those not officially enrolled in the DPH program and thus not meeting all requirements for this recognition were students from other programs such as: the graduate program in dental hygiene; distance learning degree programs; MPH-degrees in Gillings School departments other than Health Policy and Management; the DPH residency program in the state health department and dental residency programs in clinical specialties; PhD/DrPH public health leadership programs; and undergraduate students, particularly those who major in public health and related disciplines. Collectively, these students present a large pool of potential students for studies in dental public health.

Prototype for an Educational Program in Dental Public Health in North Carolina

Elevation of a small but well-defined discipline like dental public health to a level easily recognizable as a well-functioning interest area, particularly in a school as large as Gillings and with so many different interest areas, requires a welcoming

and accommodating academic home, a supporting administrative structure and a marketing strategy to gain space for the program within the curriculum and recruit students. A new school-wide master's program at Gillings and one of its interest areas provide an example if not prototype for a program that meets these requirements.

The Gillings MPH degree program was redesigned for the 2019 and subsequent cohorts of students. No longer will each department design and manage its own MPH program within the broad requirements set by the Council on Education in Public Health (CEPH), the UNC-CH Graduate School, and Gillings School. Previously, all students were required to take the five core courses required by CEPH, but the content in these courses generally was not integrated into other courses making up the specific department's requirements. Students often found the content of core courses irrelevant to their course of study because of the diverse interests of students admitted to the different departments. As pointed out, the MPH dental public health program has traditionally been located in Health Policy and Management, with the DPH students required to meet departmental-specific requirements.

The student handbook describes the new Gillings Master of Public Health degree as “a competency-based, practice-oriented degree program, designed to provide [students] with a breadth and depth of knowledge and skills in public health principles and practice through didactic preparation and applied learning experiences.”

Gillings MPH Degree Requirements

- 12 MPH Core credits
- 15 concentration credits
- 9 elective credits
- 3 applied practicum credits
- 200 hours 0-credit of field experience
- 3 culminating experience course credits

Minimum of 42 credits hours required

The curriculum in the new MPH-degree program is based on twelve public-health foundational learning objectives and twenty-two public-health foundational competencies required by CEPH. The objectives include study of a comprehensive list of determinants of population health, including social, political, and economic factors and how they contribute to population health and inequities.

The curriculum consists of four major parts—core courses, a specialty concentration, electives, and experiential learning activities. The core set of courses is the

cornerstone of the program. This integrated, two-semester, twelve-credit curriculum draws on essential public-health principles, methods, and evidence to identify, understand, and solve public-health problems. The MPH is a series of interconnected courses where all students work collaboratively to solve public-health problems at the intersection of multiple disciplines.

It is anticipated that students will choose one of twelve concentration areas when the program is fully implemented.

Planned MPH Concentrations

- Applied epidemiology
- Environmental health solutions
- Global health
- Health behavior
- Health equity, social justice, and human rights
- Health policy
- Leadership in practice
- Maternal, child health, family health
- Nutrition
- Population health for clinicians
- Public health data science

Features of the newly designed program that offer advantages over the existing program are the integration of public-health disciplines, the applied curriculum, and the opportunity for students from different departments and disciplines to work together to solve public-health problems.

The structure of the newly designed MPH degree program, with nine elective credit-hours, also allows for adequate time in the curriculum to develop a beginning knowledge base in DPH. For years, the graduate school in collaboration with the School of Public Health have agreed that nine credit-hours of coursework in a specific area like DPH constitutes a sufficient amount of the curriculum for the didactic portion of a specialty area.

The "Concentration in Population Health for Clinicians" can serve as a useful interdisciplinary prototype for a specialty concentration or interest area in DPH. The course content of this long-standing program, designed primarily for students in medical school and residencies but now part of the new MPH degree program, overlaps substantially with DPH. Titles of some of the required courses demonstrate

the similarities in content between preventive medicine and dental public health: Understanding Public Health Issues; Conceptualizing Public Health Solutions; Developing, Implementing, and Evaluating Public Health Solutions; Quantitative Methods for Healthcare Professionals; Clinical Measurement; Strategies of Prevention for Clinicians; Advanced Health Policy for Clinicians; and Critical Appraisal of the Health Literature.

Another important feature of the MPH-degree program is that knowledge, values, and competencies are based on the foundational competencies required for accreditation, which are almost identical to the ABDPH competencies (Appendix 8.1). This congruence is important, because dentists completing the Gillings MPH program will be prepared to continue their education in public-health dentistry. The curriculum will prepare graduates for a residency program in dental public health. The degree is a good fit with the one-year, practice-oriented DPH residency.

Thinking Back, Looking Forward

This review provides an assessment of DPH training at UNC-CH from a historical perspective. Broad trends identified in the review and listed in this chapter provide a backdrop against which current and future educational needs can be considered. Recent events that will help ensure the continuation and advancement of dental public health at UNC-CH are presented. The development of a common vision of dental public health at UNC-CH sufficient to keep the public healthy is a necessary step in ensuring time and space on campus for a comprehensive program in DPH for dental and dental hygiene students, master's students, clinical and public health residents, and doctoral students, to be followed by the commitment of necessary resources to fulfil the consensus vision.

The brevity of this concluding section should not mislead readers into thinking that little work is needed to advance dental public health. The health-care system and the place for DPH in this system, both clinical and population-based, have become more complex, requiring a comprehensive, deep, and continuing examination of the type of DPH workforce needed for the next twenty to forty years. Many federal, state, and local agencies, philanthropic organizations, for-profit organizations, advocacy groups, and professional organizations are actively involved in addressing oral health and have been doing so over the last decade, creating a wealth of information readily accessible through the Internet and other sources that can be used to inform such an assessment. UNC-CH has maintained a DPH program for decades, almost always in collaboration with the state health department and the Adams School of Dentistry.

A major health-sciences campus without a comprehensive DPH academic program is intellectually and practically incomplete. In the words of John Fulton, “the future [of dental public health] is yet to be written [on the UNC-CH campus].” The

dental public health practitioner needed to work in the complex health-care system in the future will assuredly be different than the practitioner who currently exists or has existed in the past. Let history be the judge of whether UNC-CH is successful in meeting its academic public-health responsibilities.

References Chapter 8

- Akosah-Twumasi P, Emeto TI, Lindsay D, Tsey K, Bulnmi BS, and Malau-Aduli BS. 2018. "A Systematic Review of Factors That Influence Youths Career Choices—The Role of Culture." *Frontiers of Education* 3: 58. <https://doi.org/10.3389/educ.2018.00058>.
- Bulletin of The North Carolina Dental Society*. 1950. "A Distinguished Servant in Public Health—Ernest A. Branch, DDS, FACD, Director of the Division of Oral Hygiene, North Carolina State Board of Health, Raleigh, N.C." Vol. 34, August 1950.
- Council on Education for Public Health. "Accredited Schools and Programs." <http://ceph.org>.
- Find a Grave*. "Dr. Ernest Alexander Branch." <https://www.findagrave.com/memorial/176335298/ernest-alexander-branch>.
- Greensboro Record* (Greensboro, N.C.). "Dr. Ernest Branch Passes in Raleigh after Long Illness." December 3, 1958.
- Hudson S. 2015. "Alex White Sinks His Teeth into Dental Public Health." *University Gazette*, June 17, 2015. <https://www.unc.edu/discover/alex-white/>.
- Leider JP, Castrucci BC, Plepys CM, Blakely C, Burke E, and Sprague JB. 2015. "Characterizing the Growth of the Undergraduate Public Health Major." *Public Health Reports* 130, no. 1: 104–13.
- N.C. Department of Natural and Cultural Resources. "Robeson County at the Forefront of Rural Health Movement." February 12, 2016. <https://www.ncdcr.gov/blog/2016/02/12/robeson-county-forefront-rural-health-movement>.
- Petersen DJ, Finnegan JR, and Spencer HC. 2015. "Anticipating Change, Sparking Innovation: Framing the Future." *American Journal of Public Health* 105, suppl. 1: S46–9.
- Reilly JM, Plepys CM, and Cousineau MR. 2021. "Dual MD-MPH Degree Students in the United States: Moving the Medical Workforce Toward Population Health." *Public Health Reports* 136, no. 5: 640–47. DOI: 10.1177/0033354920978422.
- Rosenstock L, Helsing K, and Rimer BK. 2011. "Public Health Education in the United States: Then and Now." *Public Health Reviews* 33, no. 1: 39–65.
- Ross TE. 2005. *One Land, Three Peoples: A Geography of Robeson County, North Carolina*. 3rd ed. Southern Pines, N.C.: Carolinas Press.
- University of Wisconsin Population Health Institute. 2020. *County Health Rankings State Report 2020*. https://www.countyhealthrankings.org/sites/default/files/media/document/CHR2020_NC_o.pdf.

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Fluoridation of Chapel Hill water supply

A case study on public health challenges for a university faculty

The events and timeline of this case study rely on the Daily Tar Heel and Chapel Hill News, minutes of the CH Board of Aldermen, and the State Board of Health biennial reports.

Kirk Ross, staff writer for the Chapel Hill News on April 1 2001 wrote of a visitor that William Friday had his first day on the job as president in 1956. The encounter described in Friday's own words was as follows: "A chauffeur in full dress uniform arrived at my office with a letter for me from John Sprunt Hill who was a trustee at the time." The letter warned the new president of a move by the university to fluoridate the water system in Chapel Hill. The idea, pushed by public health officials had first been floated in Chapel Hill in 1951. Hill had been fighting it ever since. Friday sent the deliveryman away without a response. It would take eight more years before the Chapel Hill drinking water was fluoridated. Friday told Ross that he has no regrets about the ultimate decision to fluoridate the water.

The University contributed to promotion of water fluoridation soon after it was recommended by the American Dental Association (ADA). The fluoridation of the Chapel Hill drinking water is an intriguing, multi-year story involving town-gown relationships and a broad set of individuals, including a CH gadfly, the court system, NC attorney general, University faculty, UNC administration, some of the most powerful individuals in the state, and citizens and government of Chapel Hill. The governor was official chairman of the UNC BOT.

UNC-CH was drawn into the fluoridation wars whether it wanted a fight or not, because it owned the water supply and was therefore in the utilities business. Between the time fluoridation was first proposed and the day it went into effect was more than twelve years. There was political intrigue and persistent criticism from a respected member of the BOT, John Sprunt Hill, who was elected to the board of trustees in 1905 and served for more than five decades until his death in July 1961 at the age of 92.

Chronology

1948 (Dec 16): N.C. State Board of Health approves policy on fluoridation:

"The State Board of Health takes the position that this [fluoridation] is still in the experimental stage and does not care to go on record as unqualifiedly recommending its use.

We call especial attention to the fact that there is a small margin of safety between 1.5 part per million which may be beneficial and 2 parts per million which may cause mottling of the enamel of the teeth.”

“If the officials of municipal or other water supplies wish to fluorinate their water supplies, we do not oppose that step” provided a number of conditions are met that they list.

1949 (Apr.): Charlotte fluoridates. Only four years after the three controlled water fluoridation studies were initiated in the US and Canada. The second largest city to fluoridate during 1945–49, having a 1950 population size of 134,042, second to Grand Rapids, Michigan.

1950 (June 5-9): Short course by NC Water Works Operators School (*Health Bulletin* 7 [July 1950]: 141–42: picture of some of faculty and Association officers)

- Conducted by UNC (Institute of Government & Department of Sanitary Engineering) with sponsorship of the NC Water Works Operators Association.
- The keynote was provided by Dr. Cecil Sheps from the UNC SPH and Mr. J. M. Jarrett, Chief Engineer of the NC State Board of Health entitled “The Continuing Job of the Prevention of Water-borne Disease.”
- At the time of the course, Charlotte was the only NC town fluoridating its water supply.
- Attended by 77 water works operators representing the principal municipalities of the State and industrial plants that operate their own water treatment facilities.
- Highlight of the training course that included topics such as corrosion, iron and magnesium removal, and taste and odor control was a 3-hour session on water fluoridation conducted by Dr. A.P. Black of the U Fla and Dr. Harry A. Faber of the Chlorine Institute. Dr. M.B. Bethel (Health Officer), Dr. Zachary Stadt (Dental Health Officer), Walter Franklin and R.S. Phillips (water Department officials, from Charlotte and a few experienced with fluoridation practices (fluoridated: 4/25/49) were available for what was characterized as a “lively” discussion. Their experience provided valuable information to those attending the course.

1951 (Nov.): UNC physician (Sydenham B. Alexander) proposes community water fluoridation (CWF).

Health Committee of Chapel Hill Board of Alderman does research and Board of Alderman endorse (November). Unanimously endorsed by Resolution of Board of Aldermen (Nov).

At the request of the dean and other members of the UNC school of Dentistry faculty, pass by unanimous vote, a resolution citing the beneficial effects to be

derived from fluoridation of water distributed for public consumption and requesting the University of North Carolina to fluoridate the Chapel Hill public water supply, distribution of which is under the control of the university of North Carolina; and whereas UNC official (Mr. Teague) says UNC will give full consideration. Held up by Board of Trustees who had members who were opposed to fluoridation. Dr. Pearson in a letter dated 9/7/61 to John Fulton reports that two individuals, among the most influential politically in the state (Hill and Carmichael) were opposed to “pushing” the fluoridation suit and that they had both recently died so it might go to court. Hill opposed to fluoridation; Carmichael’s position probably politically motivated.

1952 (Mar. 13): Dr. Branch requested a strong policy statement. CH town officials believe a stronger statement from the Board of Health is needed because water utilities owned by UNC which is state owned. The following statement was recommended:

“Based on the medical and scientific judgement of the American Medical Association, the American Dental Association, and the U.S. Public Health Service, all of which organizations endorse fluoridation, the North Carolina State Board of Health believes that the fluoridation of municipal water supplies is a safe and effective way of reducing the incidence of dental caries and recommends it to the cities and towns of the State, as a public health measure.”

1952: Statewide Forums held by UNC School of Dentistry and SPH. Only Charlotte and Winston-Salem were fluoridating at the time.

1955 (Oct.): Daily Tar Heel reports that fluoridation of Chapel Hill’s water supply is being held up by former and present members of the BOT. The proposal by Chapel Hill Board of Aldermen is opposed on the grounds that it would be mass medication, that it is too expensive and that it may be poisonous or cause adverse effects.

1959 (Nov. 19): Full-page letter (paid advertisement) from Manning Simons in *The News of Orange County*. In response to editorial “ardently advocating” for the fluoridation of Hillsborough, N.C.

1959 (Oct. 5): SPH resolution. Proposed document with evidence to support fluoridation resolution. Fulton is asked in January 19, 1960, SPH faculty meeting by Chipman to prepare a document in support of the resolution supporting fluoridation. Fulton submits six-page, well-documented resolution with twenty-one references (dated Feb. 4, 1960) to McGavran by memo dated February 6, 1960. McGavran published a lengthy editorial in the *Daily Tar Heel* three months later.

1960 (Winter): Chapel Hill Board of Aldermen request CWF for second time in ten years.

After consulting with SPH, Dental School, Medical School and state agencies UNC proposes that the water be fluoridated.

The Chapel Hill board of alderman, on April 11 by unanimously approved resolution, reiterated its previous request for fluoridation of the Chapel Hill public water supply.

1960 (May): McGavran editorial in DTH.

1960 (Jun.): Initial plans to fluoridate. Announcement to fluoridate after survey of water users. Plans to put into effect by October.

1960 (Jul.–Oct.): UNC water company surveys customers and finds support 2:1.

[3,164 of 6,200 respond. Yes=2,335; No=809; No opinion=865.] Another source had twenty cards “defaced and could not be counted” (Ross story in *CH News*, 2001).

1960 (Jun. 7): UNC orders fluoridation equipment.

1960 (Aug. 18): Attorney Harold Edwards files suit on behalf of Manning A. Simons to prevent UNC from fluoridating the water with seventy-three specifications. He was a tax consultant with an office on Franklin Street. He opposed fluoridation on health grounds. Seeks a mandatory court injunction prohibiting UNC from fluoridating university-owned water supply. Complicated pretrial maneuvers prevent suit from going to trial.

1960 (Sept): State Attorney General goes to Orange County Superior Court to ask that suit be dismissed on grounds of jurisdiction. In separate motion with the court, the AG asked for about 65 exceptions to the complaint. There was no formal action for over a year.

1961 (Oct.): In private hearing 18 allegations (items) dropped from suit by Superior Court judge Clawson Williams who agreed with University that they were irrelevant.

1961 (Feb. 18): Better Dental Health through Fluoridation WUNC-TV program

1961 (Nov.): UNC (Horton Roundtree, assistant DA and UNC attorney) withdraws motion to dismiss suit. Files demurrer.

1962 (Mar. 13): SPH faculty update review of fluoridation and add stronger policy statement in support for the University administration (“Controlled Fluoridation of Public Water Supplies as a means of Prevention of Dental Caries”).

“The faculty of the School of Public Health, University of North Carolina has reviewed this evidence and is satisfied that fluoridation of public water supplies is an effective and safe procedure and should be established as an integral part of any community health program. The faculty of the School strongly recommends that every community having a central water supply deficient in fluoride take steps to restore the fluoride concentration to the optimal level.”

Dean McGavran submitted a letter to Chancellor Aycock dated April 19, 1962. Dean and faculty are addressing “frequent criticisms of the press, which impugns the interests of the University Health Sciences toward water fluoridation, and has disturbed the faculty of the School. The Executive Faculty voted unanimously to present this material to the news bureau so that no doubt can be harbored about

its support for this important health measure". Submitted to R. H. Bartholomew (UNC Information Officer) by Fulton (April 17) with attached policy statement.

"The executive faculty of the School of Public Health, again, strongly recommends that every community having a central water supply that is deficient in fluoride take steps to restore the fluoride concentration to the optimal level.

The faculty has reviewed the evidence that communal water fluoridation makes a material reduction in dental caries incidence. It is satisfied that fluoridation of public water supplies is an effective and safe procedure that should be established as an integral part of any community health program.

The faculty states that the more widespread the use of water fluoridation, the better becomes the prospect of complete availability of the quality dental services which people want and which the profession desires to give."

1962 (Mar.): Chapel Hill Board of Aldermen pass 3rd resolution in favor of fluoridation

1962 (Jul): UNC BoT Executive Committee approves water fluoridation

Chapel Hill Citizens Fluoridation Committee formed with Roland Giduz as Chair (ER Burns [local dentist]; T. Oldenburg [SOD]; W. Crighton [SPH] and W. Straughn [SOM] members). Hires attorney Robert Cooper and asked him to prepare a brief of the case (*amicus curiae*) to be filed in court. Citizens Committee entered the court case as a "friend of the court" in an effort to push along the proceedings and inform the court. NC Assistant Attorney General James Bullock prepared a demurrer which challenged Simon's legal capacity to file a suit. Mr. Bullock claims that the operator of CH's water supply, the UNC, is not the proper party to be sued and the facts offered do not justify legal action. Sought dismissal on "misjoinder of parties and causes". "**Misjoinder**, where persons are wrongfully joined as plaintiffs or **defendants** in an action; in other words, where persons are made **parties** who ought not to be." When this is asserted, a court will usually accommodate a request to amend the court documents to strike, or substitute for, the name of the mis-joined **party**.

1962 (Nov 12): Chapel Hill Board of Aldermen pass resolution to the effect that Chapel Hill would use its police power to require UNC to fluoridate the water supply. Due to terms of agreement between UNC and water supply, Chapel Hill has delegated its authority over the water supply to UNC.

"...be it RESOLVED by the Board of Alderman of the Town of Chapel Hill, in the exercise of its police powers, that the public health and welfare of the citizens of the Town of Chapel Hill require that the public water supply of said municipality be fluoridated forthwith and without delay and that the University of North Carolina, in the operation of said public water supply system, proceed immediately with the steps necessary to accomplish this end."

The resolution was sent to Governor Sanford as official chairman of the University BOT.

Chapel Hill Board of Aldermen added eight more “whereas’ s” to the impressive accumulation of official documents on fluoridation of the CH water supply: (1) third resolution; (2) poll of citizens; (3) support from physicians, dentists and public health; (4) large majority of University faculty members who teach in fields related to public health had gone on record favoring fluoridation in a 1960 public statement; (5) university has said it will fluoridate; (6) district health officer (O. David Garvin) in favor; 7) town granted UNC exclusive franchise right to operate water supply; and (8) governing body of CH has determined the fluoridation of the public water supply is necessary for the public health and welfare of the citizens.”

1963 (Mar. 1): Demurrer heard and granted; led to dismissal in Orange Co. superior court. Twenty-four legal steps in 2.5 years. In Orange Superior court judge Hamilton Hobgood allowed the motion for demurrer by Assistant AG G. A. Jones who was representing UNC (March 1). This action had the effect of throwing case out of court. Judge gave Simons’ attorney ninety days to appeal or file new case (until Jun 1), but does neither. Gets another ninety-day extension to Aug 15. Third extension to Aug 19.

1963 (May): Still delayed. Helwig in a paper for RMPTV Department attributes the delays to opposition by some member of the Board of Trustees, in particular John Sprunt Hill.

1963 (Sept. 3): Suit is dismissed in Chatham Co superior court with 90 days to appeal. Mr. Bullock’s motion to dismiss contends that under state statute, “the plaintiff has failed to serve the case on appeal upon the defendants as agreed, and has not . . . attempted to do so.” Thus Mr. Bullock concluded, he is requesting dismissal of the case. Edwards is served with notice to appear in court. Motion to dismiss has ten allegations (listed in *Chapel Hill News*, Sept. 4, 1963).

1963 (Sept): UNC orders fluoridation equipment after announcing three years before that it would fluoridate. From RI, \$4,174. Old purchase order activated.

1964 (Feb. 28): Chapel Hill and Carrboro fluoridate. It was announced five days after starting fluoridation to allow time for water to transverse pipes. In the section “The Year that Was”, the Chapel Hill News under the headline “Integration, Fluoridation and Agitation” reported a quite end to the more than 3 years of litigation “... fluoride went into the water with hardly a ripple.”

When Chapel Hill and UNC started planning for fluoridation only 2 cities (Charlotte April 4, 1949; Winston-Salem Oct. 11, 1951) in the state were adding fluoride to their drinking water. In the intervening years between the Board of Alderman’s first resolution (UNC physician) and fluoridation, fifty-even towns in the state

fluoridated their water supply. In 1963, more than 1.2 million of a total population of 4.7 million North Carolinians were drinking fluoridated water (natural or adjusted); Chapel Hill was one of fourteen cities in North Carolina that fluoridated in 1964. (Just a few miles to the west, Burlington voted down fluoridation). Dr. O. David Garvin declared, “Every passing day that we do not have fluoridation means months of benefits lost.”

1945: The Grand Rapids study began and was designed to run for fifteen years. ADA position was equivocal initially. A 1944 editorial commented that “potentialities for harm far outweigh the good.” Research Commission informed the BOTs “no good reason” to oppose CF programs, as experiments, but did not want to put the association behind the policy of general fluoridation. In **June 1950 the USPHS** announced its approval of CWF. Secretaries of Councils on Dental Health and Dental therapeutics of the ADA polled members. August JADA editorial reported sides were closer together and at **Nov 1950** annual meeting the House of Delegates passed resolution recommending CWF when approved by local dental society. (McCluggage, 435. NIDCR History has good account of history/controversy)

1948 (Dec. 16): Policy adopted by NC Board of Health.

1951: NCDS adopted its Caries Committee resolution to support “water fluoridation for all communities which can meet the requirements of the state board of health.” (Herget pg 71).

1950–52 Biennial Report: NC Board of Health passes resolution to provide stronger position for Chapel Hill. Also procedural policies to “advise people who want to do this just how to proceed.”

Early in the 1950s, all support was in place . . . professional organizations, federal agencies, state agencies, etc. The State Board of Health optimistically reported in its minutes that “We expect to see a decided reduction in the incidence of tooth decay in North Carolina in a few years when fluoridation has been more widely adopted by these municipalities.” (Biennial Report 1950–52, 175).

History of UNC Facilities Administration

The university's utilities system began in the 1890s with the construction of a water plant. At that time, the town of Chapel Hill lacked resources to provide complete utilities service to its residents and to the university. Consequently, the university became the developer and eventually the supplier of all utilities to the town. This arrangement continued until 1976–77, when the university sold its public utilities. After the sale, the university's Utilities Division remained responsible for the maintenance and distribution of utilities on campus. The position of Superintendent of Utilities was created

in the 1920s to oversee the operation of the utilities; the title changed to Director of Utilities in 1965. Records include files of the Superintendent, later Director, of Utilities relating to the operation of the university's electric, telephone, and water and sewer utilities. Files consist largely of reports on the status and operation of the utilities. Also included are materials relating to the Regional Solid Waste Task Force, which investigated refuse disposal and recycling in the 1980s.

University remained in the facilities business and responsible for community dental intervention until 1977 when the town assumed responsibility for the water system. Rapid growth during the 1970s raised concern about the University's role as the long-term supplier of public water and sewer services. OWSA was officially born when the Agreements of Sale and Purchase for acquisition by OWASA of the separate water and sewer systems were executed in 1976 by the Town of Carrboro, Chapel Hill, and the university. Closing was held on February 15, 1977, and OWASA commenced operations on February 16, 1977.

Sources:

State Board of Health Meetings; Health Bulletin; Chapel Hill Town Council and Board of Aldermen meeting minutes; *Daily Tar Heel*; *Chapel Hill Weekly*; School of Public Health records; personal Files (e.g., Rozier); Chatham and Orange County Courthouse.

Original sources:

1. 1951 resolution by Chapel Hill Board of Aldermen
2. Board of Aldermen Health Committee Report
3. John Sprunt Hill Advertisement (Water fluoridation: "conceived in iniquity born in sin")
4. Law suit filed Aug 18 1960 by Harold Edwards on behalf of Manning Simons
5. Citizens' Fluoridation Committee Friend of the Court document
6. Demurrer filed by UNC lawyers

References

Minutes of Chapel Hill Town Council meetings. <https://townhall.townofchapelhill.org/records/>.

DPH Residency Timeline

Fifty Years of Dental Public Health Education in NC (1965–present)

Timeline information for 1950–68 was provided by Dr. Robert Weiss at the Dental Public Health Residency Conference (May 24–26, 1967).

1950: Founding of the American Board of Dental Public Health and the establishment of qualifications for eligibility

1962: Planning for residency programs

a. Tennessee – Jefferson County plan

b. Dental Health Center plan

a. Assistance and guidance provided by ad hoc Advisory Committee and American Board of Dental Public Health

b. Goal of 10 programs providing training for 20 residents established

1963: Dental Health Center plan activated with 5 residents, 4 commissioned officers and 1 supported by the New Jersey State Health Department. California, Colorado, and Kentucky also participated as training agencies

– American Dental Association House of Delegates instructed dental specialties to adhere to minimal education requirements.

– Accreditation for Dental Health Center program requested from ADA Council on Dental Education

1964: Council on Dental Education of the American Dental Association initiates a preliminary accreditation survey of postgraduate program in dental education with a paper review followed by a program site visit as soon as possible

1964–65: Five more residents trained under Dental Health Center plan

– Harvard announces three-year residency plan

– Traineeships extended to preventive medicine and dental public health residencies.

- Assistance provided by American Board of Dental Public Health to Council on Dental Education in developing accreditation requirements and procedures
- Preliminary provisional approval granted to Dental Health Center and affiliated health agencies by Council on Dental Education

1965: Fifteen years after establishment of dental public health as one of the initial specialties in dentistry and with funding from the USPHS, the Dental Health Section begins the NC Dental Public Health Residency Program. Dr. John Hughes, professor of Health Administration at the UNC-CH School of Public Health, was appointed director with Dr. Alex Pearson, state dental director, as codirector. Dr. Richard Murphy is selected to be the first resident.

1965: North Carolina residency program approved by Dental Health Center as collaborative residency training site.

1965: With support from the Dental Health Center in San Francisco, the Dental Health Section enrolls the first resident in the N.C. residency program, Dr. Richard Murphy.

1965–66: Ten residents trained under Dental Health Center plan; Georgia and North Carolina become training agencies

- Harvard implements program with candidates in various levels of program
- Individual accreditation sought for all agencies

1966–67: Eighteen residents trained in 12 programs

- 12 in Dental Health Center plan (one with international health focus)
- 6 independent
- Jefferson County, Alabama, Philadelphia, Minnesota, and U Michigan become DPH residency training agencies and institutions
- Provisional approval granted all programs and site visits for accreditation begun by Council on Dental Education
- Dental Health Center announced transition of its programs to independent operation and discontinuance of development and coordination roles

1967: Preliminary provisional approval granted to the N.C. residency program by the ADA Counsel for Dental Education as part of the Council's initial efforts to catalogue and review specialties.

1968: Application for approval of programs primarily related to the educational preparation of dental specialists is submitted to the Council on Dental Education requesting recognition of the residency program in the Dental Health Division, N.C. State Board of Health in Raleigh. Dr. Hughes, who had just become a diplomate and had just joined the faculty at the UNC School of Public Health, is named director.

1968: Site visit by Wesley Young from the University of Alabama at Birmingham. Program granted "approval" status by Council on Dental Education of the American Dental Association.

- 1968: By the summer of 1968 residency training opportunities will exist for 30 or more candidates in 15 separate programs. New programs are being offered or are under development by the state health departments of New York, Illinois, and Pennsylvania and the PHS Division of Indian Health.
- 1974: Dr. John Hughes directs the workshop in Boone, North Carolina, to develop Behavioral Objectives in Dental Public Health. The educational objectives and competencies developed at the workshop are integrated into the curriculum of the NC Dental Public Health Residency Program and used as the foundation for individual residency plans developed for each resident.
- 1975: The NC General Assembly appropriates state funds in support of the NC Dental Public Health Residency Program along with a preventive medicine program. Funds for the DPH residency were appropriated for only one year, while the preventive medicine residency was transferred to UNC-CH School of Medicine and continued to receive state appropriated funds for a number of years.
- 1975: Chapter 130A-11 of the NC Public Health Laws provided for the establishment of public health residency programs by the State of North Carolina, making it the only state in the nation required by law to train public-health dentists.

“The Department shall establish a residency program designed to attract dentists into the field of public health and to train them in the specialty of public health practice. The program shall include practical experience in public health principles and practices” (www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter_130A/GS_130A-11.html).

1975: Faculty / Residency Advisory Committee

With concern that the residency was becoming more of a working residency as opposed to an educational training experience, the advisory committee to the program was formed in 1975. Members were Hughes, Pearson, Dudney, Murphy and Dr. William T. Johnson, Chief, Dental Health Section, Georgia Department of Human Resources. They are both diplomates of the board and possess a tremendous amount of knowledge and expertise in dental public health. This committee both selects and guides the resident throughout his or her training. The four health educators employed by the Dental Health Section are available to the resident for consultation.

- 1976: Reaccreditation by the American Dental Association after a site visit by Dr. Sidney L. Miller from Baylor School of Dentistry. Granted “approval” status.
- 1981: The Army begins sponsorship of residents for training in public-health dentistry in North Carolina, including one year at the UNC-CH School of Public Health and a second year in the residency Program. Dr. John King was selected as the first of eleven residents in total to complete the program while actively serving in one of the branches of the military.

- 1983: With the retirement of Dr. John Hughes, Dr. Gary Rozier is named director of the residency program.
- 1984: Successful site visit accredits program for another seven years.
- 1986: Formal advisory committee approval by the Department of Human Resources, Division of Health Services
- 1986: In conjunction with the Division of Dental Health, the UNC-CH School of Public Health offers a combined two-year academic program leading to an MSPH degree and residency certificate in dental public health.
- 1987: The USPHS's Bureau of Maternal and Child Health sponsors Dr. Gene Sterritt, the first of five residents actively serving in the Public Health Service Corps to enroll in the Program.
- 1987: An off-site residency is established in collaboration with the South Carolina Department of Health and a resident supported by the USPHS enrolls for a two-year period.
- 1988: Competency objectives for training in dental public health developed at a workshop in Bethesda, Maryland, and organized by a committee chaired by Dr. Rozier are used to review and update the curriculum for the NC residency program.
- 1990: In its twenty-fifth year, the dental public health residency program completes training of the twentieth and twenty-first residents and is fully accredited by the Commission on Dental Accreditation of the American Dental Association for another seven years. The Residency Advisory Committee consists of Delton Atkinson (Director, State Center for Health Statistics), Joseph Doherty (State Dental Director, Virginia), Durward Collier (State Dental Director, Tennessee), John Daniel (State Dental Director, South Carolina), Richard Graves (Associate Professor, UNC-CH School of Dentistry), Edna Hensey (Health Educator, Division of Oral Health), John King (Chief Public Health Dentist, U.S. Army), Richard Murphy (Regional Dentist, Division of Public Health), Jane Weintraub (Associate Professor, UNC-CH School of Dentistry) and Raymond White (Dean, UNC-CH School of Dentistry).
- 1996: Dr. Rebecca King achieved Diplomate Status with the American Board of Dental Public Health and is appointed Residency Program Director with Gary Rozier as codirector and Jean Spratt as program administrator. This faculty and administrative arrangement remained in place until the retirement of Dr. King in 2013.
- 1997: The UNC-CH School of Public Health (PI: Rozier) is awarded a three-year training grant from HRSA to support Specialty Training in Public Health Dentistry in conjunction with the Oral Health Section. The grant is subsequently renewed for two three-year cycles through 2006, and then transferred to the Oral Health Section for administration.

- 1998: Core faculty for this re-accreditation site-visit year included Dr. Steven Cline, Chief, Dental Health Section; Rebecca King, Head of Oral Epidemiology, Dental Health Section; Ronald Hunt, Professor and Associate Dean for Academic Affairs, UNC-CH School of Dentistry; and Gary Rozier, Professor, UNC-CH School of Public Health.
- 2005: Members of the Residency Advisory Committee during this re-accreditation year were: Keshia Bailey, Head of Health Education, Oral Health Section; Paul Buescher, Chief of Statistical Services Section, State Center for Health Statistics; Joseph Doherty, Dental Director [Retired], Division of Dental Health, Virginia; Jorge Izquierdo, Scientific Coordinator, Center for Environmental Health and Susceptibility, UNC-CH School of Public Health; Stuart Lockwood, State Dental Director, Alabama; and Jean Spratt, Regional Dentist Supervisor, Oral Health Section.
- 2007: The HRSA Specialty Training Grant continues with the Oral Health Section as grantee (PI: Rebecca King). Approximately ten residents were supported with stipends, research funds and travel allocations with all years of HRSA training grant awards.
- 2007: Admission requirements are changed to allow consideration of graduates of foreign dental schools not accredited by the Commission on Dental Accreditation of the American Dental Association. Irene Garbero becomes the first of six international residents to be admitted to the program under these guidelines. The counties of origin include Argentina, India, Nigeria, Sudan, Cameroon, and Japan.
- 2012: The Residency Advisory Committee members are reappointed by the state health director, Dr. Laura Gerald. The Committee is chaired by Rebecca King (Chief, Oral Health Section), and in addition to Gary Rozier (co-chair and professor, UNC-CH School of Public Health) and Jean Spratt (Administrator, Oral Health Section), consists of Doranna Anderson (Health Educator, Oral Health Section), Karen Knight (Chief, State Center for Health Statistics), Gary Slade (Professor, UNC-CH School of Dentistry), Jane Weintraub (Dean, UNC-CH School of Dentistry), and Alex White (Assistant Professor, ECU School of Dental Medicine). The program is re-accredited by the CODA for another seven years.
- 2013: Dr. King retires having served more than fifteen years as Residency Program Director. Dr. Rozier is reappointed as Program Director by Dr. Robin Cummings, Deputy Secretary for Health Services and Acting State Health Director.
- 2014: Leo Achembong becomes the 15th resident to receive recognition from the American Association of Public Dentistry (AAPHD) in national competition with other graduate students. His paper, on the positive effects of provision of oral health services in medical offices on statewide trends in dental caries of

five-year-old children in North Carolina, is published in *Pediatrics*. Projects completed by residents in the two years preceding him were likewise recognized with AAPHD Graduate Student Merit Awards and were published in the *Journal of the American Dental Association* and the *Journal of Dental Research*, highlighting the significance of their work not only for North Carolina but for national and international audiences. These papers are among about a dozen studies published by residents using N.C. oral health surveillance or survey data for evaluation of the state's programs. Questions important to the state, such as the effects of public insurance, school-based preventive dentistry programs, and provision of oral health preventive services by physicians and dentists, are included in publications and addressed more comprehensively in a following section.

2014: Go Matsuo from Japan, who obtained his MPH degree from the University of Maryland, is the 42nd resident to complete the Program.

2015: Fiftieth anniversary of initiation of the residency program and enrollment of the first resident.

North Carolina Residents' Major Projects and Publications

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Richard Murphy	1966	An Attitude Scale for Dental Health
Ralph Young	1967	Comparison of Three Referral, Follow-up Techniques as Applied in One School Dental Health Program
William Jasper	1968	The Planning Process and its Application to Community Dental Planning
No Resident	1969	
William Satterfield	1970	The Utilization of Auxiliary Personnel by a Group of Private Practicing Dentists in North Carolina
George von Mohr	1971	Evaluation of the Effectiveness of the North Carolina Dental Public Health Programs Using a Cross-sectional Study Design
No Resident	1972	
Newlands Dodo	1973	Dental Needs of Governor Morehead School (The North Carolina School for the Blind) Children
No Resident	1974–75	
Gary Rozier	1976	An Evaluation of the North Carolina Preventive Dentistry Program Dudney GG, Rozier RG, Less MF, and Hughes JT. 1977. "Ten Years of Fluoridation in Asheville, North Carolina." <i>North Carolina Dental Journal</i> 69: 11–14.
No Resident	1977–80	
John King	1981	North Carolina Department of Correction Oral Health Status Study
Christopher Wadsworth	1981	A Comparison of DMFT and PI Data to Field Estimates of Treatment Needs and Clinical Examination for 408 New Admissions at the North Carolina Department of Correction

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
No Resident	1982–83	
Stephen Levy	1984	<p>An Investigation of Fluoride Supplement Use by North Carolina Dentists</p> <p>Levy SM, Bawden JW, Rozier RG, and Bowden BS. 1984. "Fluoride Analyses of Patient Water Supplies by N.C. Health Professionals." <i>Journal of Dental Research</i> 63 (Special Issue): 197, abst. no. 238.</p> <p>Levy SM, Bawden JW, and Rozier RG. 1985. "Determinants of Water Fluoride Assay among NC Dentists." <i>Journal of Dental Research</i> 64 (Special Issue): 224, abst. no. 449.</p> <p>Levy SM, Bawden JW, Bowden BS, and Rozier RG. 1984. "Fluoride Analyses of Patient Water Supplies Requested by North Carolina Health Professionals." <i>American Journal of Public Health</i> 74, no. 12: 1412–14.</p> <p>Levy SM, Rozier RG, and Bawden JW. 1986. "Determinants of Water Fluoride Assay Among North Carolina Dentists." <i>Journal of Dental Research</i> 65, no. 1: 71–74.</p> <p>Levy SM, Rozier RG, and Bawden JW. 1987a. "Knowledge about Systemic Fluoride Supplements among Pediatric Dentistry Faculty and Practitioners." <i>ASDC Journal of Dentistry for Children</i> 2: 101–5.</p> <p>Levy SM, Rozier RG, and Bawden JW. 1987b. "Use of Systemic Fluoride Supplements by North Carolina Dentists." <i>Journal of the American Dental Association</i> 114, no. 3: 347–50.</p>
No Resident	1985	
Michael Chisick	1986	Dental Restorative and Surgical Treatment Needs of Army Family Members
Gene Sterritt	1987	<p>Inter-Examiner Reliability Study for North Carolina School Oral Health Survey</p> <p>Sterritt G, and Rozier R. 1988. "Examiner Agreement during Conduct of a Large-Scale Prevalence Survey." <i>Journal of Dental Research</i> 67 (Special Issue): 171, abst. no. 471.</p>

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Robert Selwitz	1987	<p>Factors Influencing the Use of Pit and Fissure Sealants in South Carolina: The Consumer and Professional Perspectives</p> <p>Selwitz RH, Colley-Niemeyer BJ, and Rozier RG. 1988a. "Factors Associated with the Use of Dental Sealants." <i>Journal of Dental Research</i> 67 (Special Issue): 113, abst. no. 5.</p> <p>Selwitz RH, Colley-Niemeyer BJ, and Rozier RG. 1988b. "Prevalence of and Need for Dental Sealants in School Children." <i>Journal of Dental Research</i> 67 (Special Issue): 192, abst. no. 634.</p> <p>Selwitz RH, Colley BJ, and Rozier RG. 1992. "Factors Associated with Parental Acceptance of Dental Sealants." <i>Journal of Public Health Dentistry</i> 52, no. 3: 137-45.</p>
James Tupa	1988	Goals and Objectives of State Dental Programs
William Milner	1989-90	Development of a Screening Technique to Monitor Dental Caries
Betty DeBerry-Summer	1989	<p>Oral Health Status of Children of Migrant Farmworkers in North Carolina</p> <p>DeBerry-Summer B, and Rozier RG. 1989. "Dental Caries Experiences of Migrant Workers' Children, Tri-County, NC." <i>Journal of Public Health Dentistry</i> 49, no. 2: 108.</p>
Dale Armstrong	1989	<p>Oral Health Status of Children Enrolled in North Carolina's head Start Programs</p> <p>"Caries Prevalence of Children Enrolled in North Carolina Head Start Programs, 1987-88." Second Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Armstrong DP, Rozier RG, Dudney GG, and Bowling M. 1989. "The Prevalence of Periodontal Conditions in North Carolina Schoolchildren." <i>Journal of Public Health Dentistry</i> 49, no. 2: 104.</p>
Jack Jones	1989	The Use of Pit-and-Fissure Sealants in the North Carolina Medicaid Population
Robert Sappington	1990	The Variability of the Buffering Capacity of Stimulated Saliva in Children and the Relationship of their Buffering Capacities to Dental Caries

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
James Lalumandier	1990	<p>Prevalence and Risk Factors for Fluorosis in Children in a Pediatric Practice in a Fluoridated Community of North Carolina.</p> <p>"The Prevalence and Risk Factors of Fluorosis among Children in a Pediatric Practice in Asheville, North Carolina." First Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Lalumandier JA, and Rozier RG. 1995. "The Prevalence and Risk Factors of Fluorosis among Patients in a Pediatric Dental Practice." <i>Pediatric Dentistry</i> 17, no. 1: 19–25.</p> <p>Lalumandier JA, and Rozier RG. 1998. "Parental Satisfaction with Child's Tooth Color: Fluorosis as a Contributing Factor." <i>Journal of the American Dental Association</i> 129: 1000–1006.</p>
Richard Amstutz	1991	<p>Community Risk Indicators for Dental Caries in School Children.</p> <p>"Community Risk Indicators for Dental Caries in School Children." Second Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Amstutz RD, and Rozier RG. 1992. "Community Risk Factors for Dental Caries in Schoolchildren." <i>Journal of Dental Research</i>. 71(Special Issue): 128, abst. no. 182.</p> <p>Amstutz R, and Rozier RG. 1995. "Community Risk Indicators for Dental Caries in Schoolchildren: An Ecologic Study." <i>Community Dentistry and Oral Epidemiology</i> 23, no. 3: 129–37.</p>
Gerry Uswak	1992–93	<p>Perceptions and Activities of State, Territorial and Local Dental Program Directors toward Periodontal Diseases.</p> <p>"Perceptions and Activities of State, Territorial, and Local Dental Programs Toward the Periodontal Diseases." Second Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p>
Jean Spratt	1992	<p>Actions of the North Carolina Dental Society Access to Care/Medicaid Liaison Committee from 1991 to 1995 and its Influence on the North Carolina Division of Medical Assistance Dental Program and the North Carolina Dental Society: A Case Study</p>
No Resident	1993	

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Rebecca King	1994–96	Evaluation of the Effectiveness of school Water Fluoridation on Dental Caries in Elementary School Children King RS, Iafolla TJ, Rozier RG, and Satterfield WC. 1998. “Surveillance Technique for Dental Caries in Schoolchildren.” <i>Journal of Public Health Dentistry</i> 58: 184. King RS, Satterfield WC, and Rozier RG. 1998. “A Statewide System for Dental Caries in Kindergarten Children.” <i>Journal of Dental Research</i> 77 (Special Issue A): 224, abst. no. 946.
Jerry Batten	1995	Validity and Reliability of a Fluorosis Screening Index used in a School-based Oral Health Program
Bruce Brehm	1996–97	Dentists’ Willingness to Participate in Medicaid when Reimbursed what they Consider a Reasonable Fee
Mark Piotrowski	1997–98	North Carolina Dental Surveillance: Community-Level Risk Factors Associated with Dental Caries in Elementary School Children Hughes TL, Piotrowski MJ, King RS, and Rozier RG. 1999. “Predicting the Risk of Dental Caries at the School Level.” <i>Journal of Dental Research</i> 78 (Special Issue): 404, abst no. 2386.
Miriam Williams-McIntosh	1998	Evaluation of Impact of Local dental Public Health Clinical Programs on Access to dental Care for Low-Income Children
Mahyar Mofidi	1999–2000	A Multicultural Study of Parents’ Perceptions of Access to Dental Care Problems. “Problems with Access to Dental Care for Medicaid-Insured Children: What Caregivers Think.” Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health. Centennial Awards for Graduate and Professional Students: Outstanding Research Benefiting the State of North Carolina. Mofidi M, Rozier RG, and King R. 2001. “Problems with Access to Dental Care for Medicaid-Insured Children: What Caregivers Think.” <i>Journal of Public Health Dentistry</i> 61: 238. Mofidi M, Rozier RG, and King RS. 2002. “Problems with Access to Dental Care for Medicaid-Insured Children: What Caregivers Think.” <i>American Journal of Public Health</i> 92, no. 1: 53–58.
No Resident	2000–2001	

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Tewgyn Hughes	2002	<p>The Effect of Publicly Financed Insurance Programs on the Use of dental Services and Dental health Outcomes of Young Children.</p> <p>Hughes TL, dela Cruz GG, Rozier, RG. 2003. "Oral Health, Early Childhood." In <i>Encyclopedia of Primary Prevention and Health Promotion</i>, edited by Gullotta TP and Bloom M, 756–67. New York, N.Y.: Kluwer Academic/Plenum Publishers.</p>
Georgia dela Cruz (Rodgers)	2001–2	<p>Factors Associated with Dental Referral by Physicians. "Dental Referral Behavior of Pediatric Primary Care Providers." Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>dela Cruz GG, Rozier RG, Bawden JW, and Deaton T. 2002. "Lifetime Fluoride Exposures and Fluoride Content of Primary Tooth Dentin." <i>Journal of Dental Research</i> 81(Special Issue): A-93, abst. no 0548.</p> <p>dela Cruz GG, Rozier RG, and Slade GD. 2003. "Dental Referral Behavior of Pediatric Primary Care Providers." <i>Journal of Public Health Dentistry</i> 63 (suppl. 1): abst. no. 72.</p> <p>dela Cruz GG, Rozier RG, and Slade GD. 2004. "Dental Screening and Referral of Young Children by Pediatric Primary Care Providers." <i>Pediatrics</i> 114, no. 5: e642–e652.</p> <p>dela Cruz GG, Rozier RG, and Bawden JW. 2008. "Fluoride in Dentin of Exfoliated Primary Teeth as a Biomarker for Cumulative Fluoride Exposure." <i>Caries Research</i> 42: 419–28.</p>
Jayasanker Valiyaparambil	2002–3	<p>Effects of Monetary Incentives on Response Rates for a School-Based Dental Survey</p> <p>"Improving Response Rates in a School-Based Dental Survey: A Group-Randomized Trial." Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p>
Helen Nahourii	2003–4	<p>Social support and Dental Care Use in Children of Recently Immigrated Latino Families</p> <p>Nahouraii H, Wasserman M, Rozier RG, and Bender DE. 2008. "Social Support and Dental Use in Young Children of Recently Immigrated Latina Mothers." <i>Journal of Healthcare for the Poor and Underserved</i> 19: 428–41.</p>
Timothy Mitchener	2005	<p>Oral-facial Injuries in North Carolina School Children and their Determinants</p>

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Larry Myers	2005–6	<p>Parental Knowledge about Fluoride. “Fluoride Knowledge of Parents of School Children in North Carolina.” Second Place. Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Myers LP, King RS, and Rozier RG. “The Fluoride Knowledge in Parents of North Carolina School Children.” Eight National Oral Health Conference, Denver, Colo., April 31–May 2, 2007.</p>
Barbara Martin	2006–7	Integrating Oral Health Promotion into Health Promotion Programs for Pregnant Women
Irene Garbero	2007–8	<p>Cognitive Evaluation of the Family Dental Home Index among Hispanics “Cognitive Evaluation of the Family Dental Home Index (FDHI) among Hispanics and their Perceptions of its Concepts.” Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Garbero I, King RS, and Rozier RG. “Cognitive Evaluation of the Family Dental Home Index among Hispanics and Their Perceptions of Its Concepts.” Abstract No. 107. Tenth National Oral Health Conference, Portland, Ore., April 21–23, 2009.</p>
Joseph Abraham	2008–9	<p>Effects of Early Childhood Caries and Treatment on Oral Health-related Quality of Life in Young Children. “The Effects of Early Childhood Caries and Treatment on Oral Health-related Quality of Life in Young Children.” Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Abraham J, Rozier RG, and Pahel BT. “Early Childhood Caries, Treatment and Oral Health-related Quality of Life.” Abstract No. 65. Eleventh National Oral Health Conference, St. Louis, Mo., April 26–28, 2010.</p> <p>Abraham J, Rozier RG, and Pahel BT. 2010. “Early Childhood Caries, Treatment and Oral Health-related Quality of Life.” <i>Journal of Dental Research</i> 89 (Special Issue A): 850. AADR General Session in Washington, DC.</p>
No resident	2009–10	

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Uvoh Onoriobe	2011–12	<p>Relative Impact of Enamel Fluorosis and Dental Caries on the Oral Health-related Quality of Life of Children and Families</p> <p>“Impacts of Dental Caries and Enamel Fluorosis on Oral Health-related Quality of Life.” Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Onoriobe U, Rozier R, King R, and Cantrell J. 2011. “Caries and Fluorosis Impacts on Oral Health-Related Quality of Life.” <i>Journal of Dental Research</i> 91 (Special Issue A): 63. AADR General Session in Tampa, Fla.</p> <p>Onoriobe U, Rozier RG, Cantrell J, and King RS. 2014. “Effects of Enamel Fluorosis and Dental Caries on Quality of Life.” <i>Journal of Dental Research</i> 93, no. 10: 972–79.</p>
Rania Abasaeed	2012–13	<p>The Impact of the Great Recession on Untreated Dental Caries among Kindergarten Students in North Carolina. “Impact of the Great Economic Recession on Untreated Dental Caries among Children in North Carolina.” Honorable Mention. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Abasaeed R, Rozier RG, and Kranz A. 2012. “Great Recession Impacts Untreated Dental Caries in North Carolina Children.” <i>Journal of Dental Research</i> 92 (Special Issue A): 1525. AADR General Session in Seattle, Wash.</p> <p>Abasaeed R, Rozier RG, and Kranz A. “The Impact of the Great Recession on Untreated Dental Caries in North Carolina Children.” Fourteenth National Oral Health Conference, Huntsville, Ala., April 22–May 24, 2013.</p> <p>Abasaeed R, Kranz AM, Rozier RG. 2013. “The Impact of the Great Recession on Untreated Dental Caries among Kindergarten Children in North Carolina.” <i>Journal of the American Dental Association</i> 144, no. 9: 1038–46.</p>

Resident	Year	Project Title; Recognition; Published Abstracts of Presentations; Journal Publications
Leo Achembong	2012–13	<p>A Medical Office-based Preventive Dental Program and Statewide Trends in Dental Caries</p> <p>“Impact of a Preventive Dental Program in Medical Offices on Statewide Trends in Dental Caries.” Second Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health.</p> <p>Achembong LN, Kranz AM, King RS, and Rozier RG. “Impact of a Preventive Dental Program in Medical Offices on Statewide Trends in Dental Caries.” Abst No. 8. Fifteenth National Oral Health Conference, Fort Worth, Tex., April 28–April 30, 2014.</p> <p>Achembong LN, Kranz AM, and Rozier RG. 2014. “Office-Based Preventive Dental Program and Statewide Trends in Dental Caries.” <i>Pediatrics</i> 2014 133, no. (4): e827–e834.</p>
Go Matsuo	2013–14	<p>Racial and Ethnic Disparities in Dental Caries Experience among Kindergarten Students in North Carolina</p> <p>“Racial and Ethnic Disparities in Dental Caries Experience among Kindergarten Students in North Carolina.” Third Place. American Association of Public Health Dentistry, Graduate Student Merit Award for Outstanding Achievement in Dental Public Health</p> <p>Go M, Rozier RG, and Kranz AM. “Racial and Ethnic Disparities in Dental Caries Experience among Kindergarten Students in North Carolina.” Abst No. 111. Sixteenth National Oral Health Conference, Kansas City, Mo., April 27–April 29, 2015.</p> <p>Go M, Rozier RG, and Kranz AM. 2015. “Dental Caries: Racial and Ethnic Disparities among North Carolina Kindergarten Students.” <i>American Journal of Public Health</i> 105, no. 12: 2503–9.</p>
No resident	2014–15	

Members of the RAC at approximately the time of accreditation self-study

Year: 1968

Director: John T. Hughes, DDS, DrPH, Associate Professor, Department of Administration, School of Public Health, University of North Carolina (Diplomate, American Board of Dental Public Health)

Co-Director: Alex A. Pearson, DDS, MPH Director, Dental Health Division, NC State Board of Health

Program Administrator: George G. Dudney, DDS, MPH, Assistant Director, Dental Health Division, North Carolina State board of Health

Advisory Committee: Richard Murphy, DDS, MPH
Ralph Young, DDS, MPH

Year: 1976

Director: John T. Hughes

Co-Director: Alex A. Pearson

Program Administrator: George G. Dudney

Advisory Committee Members:

William T. Johnson

Richard F. Murphy

Year: 1984: [1983 photo of residency faculty and advisory committee]

Director: R. Gary Rozier, DDS, MPH

Program Administrator: C. Jean Spratt, DDS, MPH

Advisory Committee Members:

Durward R. Collier, DDS, MPH, Director of Dental Health Services, Tennessee Department of Health and Environment (Diplomate of the American Board of Dental Public Health)

John P. Daniel, DMD, MMS, Director, Office of Public Health Dentistry, South Carolina Department of Health and Environmental Control

Joseph M. Doherty, DDS, MPH, Director, Division of Dental Health, Virginia Department of Health (Diplomate of the American Board of Dental Public Health)

Richard Graves, DDS, MPH, DrPH, Research Professor, Department of Dental Ecology, School of Dentistry and clinical Professor, Department of Health Policy and Administration, University of North Carolina, (Diplomate of the American Board of Dental Public Health)

Edna Hensey, BS, MPH, Head, Health Education, Dental Health Section,

John E. King, DDS, MPH (Diplomate of the American Board of Dental Public Health)

Richard F. Murphy, DDS, MPH, Regional Dentist Supervisor, Division of Dental Health, NC Department of Environment, Health and Natural Resources (Diplomate of the American Board of Dental Public Health)

Raymond P. White, Jr., DDS, PhD, Professor, Division of Oral and Maxillofacial Surgery, NC Memorial Hospital

Year: 1990

Director: R. Gary Rozier, DDS, MPH

Coordinator: Rebecca S. King, DDS, MPH

Program Administrator: C. Jean Spratt, DDS, MPH

Advisory Committee Members:

Delton Atkinson, Director, State Center for Health Statistics, NC Department, Health, and Natural Resources

Durward R. Collier, DDS, MPH, Director of Dental Health Services, Tennessee Department of Health and Environment (Diplomate of the American Board of Dental Public Health)

John P. Daniel, DMD, MMS, Director, Office of Public Health Dentistry, South Carolina Department of Health and Environmental Control

Joseph M. Doherty, DDS, MPH, Director, Division of Dental Health, Virginia Department of Health (Diplomate of the American Board of Dental Public Health)

Richard Graves, DDS, MPH, DrPH, Research Professor, Department of Dental Ecology, School of Dentistry and clinical Professor, Department of Health Policy and Administration, University of North Carolina, (Diplomate of the American Board of Dental Public Health)

Edna Hensey, BS, MPH, Head, Health Education, Dental Health Section,

John E. King, DDS, MPH (Diplomate of the American Board of Dental Public Health)

Richard F. Murphy, DDS, MPH, Regional Dentist Supervisor, Division of Dental Health, NC Department of Environment, Health and Natural Resources (Diplomate of the American Board of Dental Public Health)

Raymond P. White, Jr., DDS, PhD, Professor, Division of Oral and Maxillofacial Surgery, NC Memorial Hospital

Jane A. Weintraub, DDS, MPH, Assistant Professor, Department of Dental Ecology (Diplomate of the American Board of Dental Public Health)

Year: 1998

Director: Rebecca S King, DDS, MPH

Co-Director: R. Gary Rozier, DDS, MPH

Program Administrator: C. Jean Spratt, DDS, MPH

Advisory Committee Members:

Paul Buescher, PhD, Chief of Statistical Services Section, State Center for Health Statistics, North Carolina Department of Health and Human Services

J. Steve Cline, DDS, MPH, Section Chief, Dental Health Section, Division of Community Health, North Carolina Department of Health and Human Services

Joseph M. Doherty, DDS, MPH, Dental Director [Retired], Division of Dental Health, Virginia Department of Health (Diplomate, American Board of Dental Public Health)

Edna Hensey, BS, MPH, Head, Health Education branch, Dental Health Section, Division of Community Health, Department of Health and Human Services.

Ronald Hunt, DDS, MS, Professor and Associate Dean for Academic Affairs, UNC School of Dentistry and Adjunct Professor, Program in Dental Public Health, UNC School of Public Health (Diplomate, American Board of Dental Public Health)

Stuart Lockwood, DMD, MPH, Acting Chief, Surveillance, Research and Investigation Branch, Division of Oral Health, National Center for Health Promotion / Disease Prevention, Centers for Disease Control and Prevention (Diplomate, American Board of Dental Public Health)

William C. Satterfield, DDS, MPH, Field Dentist Supervisor, Dental Health Section, Division of Community Health, North Carolina Department of Health and Human Services

Year: 2005

Director: Rebecca S King, DDS, MPH

Co-Director: R. Gary Rozier, DDS, MPH

Advisory Committee Members:

Keshia Bailey, BS, Head of Health Education, Oral Health Section, Division of Public Health, North Carolina Department of Health and Human Services

Paul Buescher, PhD, Chief of Statistical Services Section, State Center for Health Statistics, North Carolina Department of Health and Human Services

Joseph M. Doherty, DDS, MPH, Dental Director [Retired], Division of Dental Health, Virginia Department of Health and Diplomate of the American board of Dental Public Health

Jorge Izquierdo, DDS, PhD, MPH, Scientific Coordinator, Center for Environmental Health and Susceptibility, School of Public Health University of North Carolina at Chapel Hill

Stuart Lockwood, DMD, MPH, State Dental Director, Alabama Department of Public Health and Diplomate of the American Board of Dental Public Health

Jean Spratt, DDS, MPH, Field Dentist Supervisor, Oral Health Section, Division of Public Health North Carolina Department of Health and Human Services

Year: 2012

Director: Rebecca S. King, DDS, MPH, Section Chief, Oral Health Section, Division of Public Health, NC Department of Health and Human Resources

Co-Director: R. Gary Rozier, DDS, MPH

Administrator: C. Jean Spratt, DDS, MPH

Advisory Committee Members:

Doranna Anderson, BS, RHED, Head, Oral Health Education and Promotion Branch, Oral Health Section, Division of Public Health, NC Department of Health and Human Services

Hiroko Iida, DDS, MPH, Assistant Professor, Department of Pediatric Dentistry, School of Dentistry, University of North Carolina at Chapel Hill

Karen Knight, MS, Director, State Center for Health Statistics, Division of Public Health, NC Department of Health and Human Services

Gary Slade, BDS, DPH, PhD, Distinguished Professor and Director of Oral Epidemiology PhD Program, School of Dentistry, University of North Carolina at Chapel Hill and Department of Epidemiology, Gillings School of Global Public Health, University of North Carolina at Chapel Hill

Jane Weintraub, Dean and Alumni Distinguished Professor School of Dentistry, University of North Carolina at Chapel Hill

B. Alex White, DDS, DrPH, Unit Chief, Public Health Dentistry, School of Dental Medicine, East Carolina University.

Course syllabus for first dental epidemiology course at UNC-CH

1959 First Oral Epidemiology Course (Objectives and session topic in history brief)

Prospectus: The objective of this course is to give you some perspective as a foundation for your future work. It is not a course in dental pathology. We hope to further elucidate the principles and methods of epidemiology by using dental conditions as the State of Health. The course is designed for study in the epidemiological method as applied to dental diseases including dental caries, periodontal diseases, dental facial deformities, growth problems, and oral manifestations of systemic diseases. Hopefully, a fair theory of dental diseases will be presented from which hypotheses already stated or implied, can be examined and some notion gained as to what is available and what needs to be done to test these hypotheses.

Requirements: No final. Three assignments during the course will be graded for credit. A list of required readings for each session. They should be read carefully and critically for the student will be expected to be fully prepared for class discussion. Important to make notes or abstracts for these readings because some of the material will be discussed from different aspects in several sessions of the course. A second list of readings will be issued from time to time, which provides further readings at the option of the student.

Schedule:

Session 1: Uses of the Epidemiologic Method

Session 2: Definitions and Diagnostic Criteria – DMF

Session 3: Definitions – PMA, Russell Index, DFI

Session 4: Group Characteristics – Age, Sex, Race

Session 5: Group Characteristics – Growth Patterns

Session 6: Data Analysis – Prevalence / Incidence, Rates, Distributions

Session 7: Physical Habitat = Geography, Climate, Water Supplies

Session 8: Other Disease Processes – Oral Manifestations of Systemic Disease

Session 9: Social / Cultural Processes – Community Income Status

Session 10: Social / Cultural Processes – Education

Session 11: Social / Cultural Processes – Attitudes, Values, Habits

Session 12: Social / Cultural Processes – Family Patterns

Session 13: Social / Cultural Processes – Dietary Behavior

Session 14: Social / Cultural Processes – Diet (Cont'd.)

Session 15: Congenital Anomalies – Oral Clefts

Session 16: General Review and Summary

Syllabus for Frank Law's health administration course

1961-62 Materials for George Dudney, enrolled in MPH Program 1961-62. Material appears to be notes of the seminar content and a rating of the quality of the presentation by guest lectures. Appears to be graded by Dr. Frank Law in what would be his first year in the department

P.H. 207: Dental Public Health Practice

P.H. 307: Seminar in Dental Public Health Practice

It is hoped that this course in dental public health administration will achieve the following objectives: (1) To help public health dental personnel appreciate and understand the basic principles of public health administration when applied to a program of dental public health. (2) To provide assistance in applying principles of public health administration to a dental public health program. (3) To help dental public health personnel organize plan, and administer a critical, scientific, and comprehensive outlook toward programs of dental public health be they local, state or national.

Topics of Seminar Discussions

- Principles of dental public health practice
- Status and scope of dental public health
- Dental public health and its relationship to the organized profession and the community
- Dental indices
- Preventive and control measures applicable to the dental public health program
- Preventive and control measures applicable to the dental health program with particular reference to fluoridation of public water supplies
- Dental health education and the dental health program
- Other program areas in the field of dental public health such as radiological health, manpower, payment plans, disease immunities and conditions and others
- Program planning and budgeting in the dental public health program

Schedule (Visiting lecture series for P.H. 207 & 307) 1962—Dudney a student)

11:00 AM, Rm. 215, South Wing

April 2, 1962: Dental Programs for the Chronically Ill (William J. Putnam, Consultant Chronic Disease Branch, USPHS)

April 3, 1962: The National Health Examination Survey (James E. Kelly, National Center for Health Statistics).

April 4, 1962: Dental Aspects of Radiological Health (George L. Crocker, Radiological Health Laboratory, USPHS).

April 9, 1962: Prepayment Plans and the Public Health Dentist (Quentin M. Smith, Chief, Health Programs Branch, Division of Dental Public Health and Resources, USPHS).

April 10, 1962: Legislation Affecting Dental Public Health Manpower Problems (Harry W. Bruce, Jr. Assistant Chief, Manpower and Education Branch, Division of Dental Public Health and Resources, USPHS).

April 11, 1962: Social Science and Dental Public Health (S. Stephen Kegeles, Chief, Social Studies Branch, Division of Dental Public Health and Resources, USPHS).

April 16, 1962: A Critique of Fluoridation in the United States (Viron L. Diefenbach, Disease Control Branch, Division of Dental Public Health and Resources, USPHS).

April 17, 1962: Research and Demonstration Grants in the Bureau of States' Services. (Gunnar E. Sylow, Chief, Research Grants Unit, Division of Dental Public Health and Resources, USPHS).

April 18, 1962: Technical Aspects of Water Fluoridation. (Franz J. Maier, Chief, Engineering and Chemistry Laboratory, Disease Control Branch, Division of Dental Public Health and Resources, USPHS).

Dissertations on Dental Topics: Gillings School of Global Public Health

Hyman K. Schonfeld: Periodontal diseases in association with unmet dental needs. 1962.

John T. Hughes: Family patterns of dental disease. 1963.

Earl J. Williams: The relationship of sialic acid to dental caries. 1965.

Luis F. Duany: Prevalence of potentially cariogenic Streptococci, diet, dental plaque and oral hygiene in caries-free and caries-active students. 1970.

Diane M. Makuc: An analysis of two complex surveys to evaluate dental health status changes in North Carolina. 1980.

Deborah M. Winn: Oral and pharyngeal cancer in relation to tobacco use, alcohol, and occupation. 1980.

Martha Ann Keels: The role of maternal cigarette smoking during pregnancy in the etiology of cleft lip with or without cleft palate. 1991.

Mark E. Moss: Psychosocial factors, immune function, and adult periodontitis. 1994.

Suzanne Eberling: Preschool dental treatment and the risk of future caries. 1994.

R. Fernando Salazar: Distribution and risk of coronal caries in older Iowans. 1994.

Valerie A. Robison: An investigation of dental treatment in North Carolina's child Medicaid program using epidemiologic and administrative data. 1995.

Daniel J. Caplan: Factors-related to loss of root canal treated teeth. 1995.

Linda M. Kaste: Occupation and reproductive health of female dentists: the relationships of nitrous oxide and amalgam (mercury) with spontaneous abortion. 1996.

Sigurdur Runar Saemundsson: Dental caries prediction by clinicians and neural networks. 1996.

Susan Lieff: Maternal cigarette smoking during pregnancy and risk of oral facial clefts in newborns. 1996.

Rosemary G. McKaig: Periodontitis and HIV infection: factors associated with prevalence, extent, and severity of periodontitis in an HIV-infected population. 1997.

Catherine A. Watkins: Comparison of clinical oral disease measures and perceived oral health status among community-dwelling older adults. 1997.

Michelle Lynn Mayer: The effects of Medicaid policies on dentists' participation. 1997.

John R. Elter: Etiologic models for incident periodontal attachment loss in older adults. 1997.

Samuel J. Arbes Jr: Factors contributing to the racial differences in the survival from oral cancer. 1998.

Umo O. Isong: Heterogeneity in dental research: a comparison of cross-sectional and longitudinal studies. 1998.

Piya Siriphant: Healthy lifestyles, social relationships and perceived dental status. 2001.

Stacy Anne Stewart Geisler: Survival and squamous cell carcinoma of the head and neck. 2001

Paul I. Eke: Relationship between antibodies to periodontal organisms and atherosclerosis-related conditions: the dental-atherosclerosis risk in communities (D-ARIC) study. 2002.

Jessica Y. Lee: The effects of WIC on dental Medicaid use and related expenditures by preschool children. 2002.

Tegwyn L. Hughes: The effect of publicly financed insurance programs on the use of dental services and dental health outcomes of young children. 2002.

Amit Chattopadhyay: HIV associated oral disease: prevalence, incidence, and role of salivary secretory leukocyte protease inhibitor. 2003.

Hua Wang: The effects of the State Children's Health Insurance Program on health insurance coverage and access to care. 2005.

Gloria C. Mejia: Oral health care use among Hispanics/Latinos/other Spanish population in the United States. 2005.

Bhavna Talekar Pahal: Referrals for dental care in a medical office-based preventive dental program. 2008.

Heather A. Beil: Effect of early preventive dental care on dental treatment, expenditures, and oral health among Medicaid enrolled children. 2010.

Kimon Divaris: Exploring the genetic basis of chronic periodontitis: a genome-wide approach. 2011.

Ashley M. Kranz: Comparative Effectiveness of the Mode of Delivery for Preventing Dental Caries in Young Children. 2013.

Jacqueline M. Burgette: The Impact of Early Head Start on Children's Oral Health. 2016.

Timeline for Smart Smiles and Into the Mouths of Babes

1995: Local child advocacy coalitions in NC Appalachian Mountains, under the direction of Doris Hoffman (working in Secretary Britt's office) bring a diverse group of parties interested in health issues together to do a needs assessment. Dental is identified as the top priority for action.

Fall/Winter 1996: Huffman's group has meeting with Graham Children's Health Center. They survey dentists in ARC counties to determine Medicaid participation and concerns regarding participation. Redirect efforts from primary dental care to community prevention.

September 1997: Tom Davis, Jr., MPH hired by ARC counties to find out what data are available for nation, state and county for judging pediatric dental problems and interventions among birth to 5-year-olds. Meetings with UNC School of Dentistry and NC Oral Health Section field staff, Graham Center personnel. Move forward fluoride varnish as intervention.

1998: Doris Huffman, NC DHR special consultant representing the local Partnerships for Children, collaborates with Oral Health Section; Graham Children's Health Center and NC Partnership for Children officials to prepare a grant for submission to the Appalachian Regional Commission (ARC). The grant outlines development models to improve oral health in the preschool population in the NC Appalachian counties.

May 1998: ARC Retreat held. Dr. Steve Cline and Monica Teutsch share information from the Graham Center's Statewide Task Force on Medicaid Reimbursement. Dr. Cline provides overview of fluoride varnish. Draft grant proposal reviewed. Peter Leousis provides briefing on issues impacting local partnerships including S-CHIP legislation.

October 1998: The Smart Smiles grant funding begins. The grant statewide advisory committee is established that includes state and local representation of the Smart Start; Oral Health Section, UNC Schools of Dentistry and Public Health; and Ruth and Billy Graham Children's Health Center.

November 1998: First meeting of Advisory Committee in Oral Health Section Raleigh office. Potential models for fluoride varnish were discussed. Minutes indicate that Medicaid will "cover" fluoride varnish treatments.

Fall/Winter 1998: Advisory board's committees develop protocols and educational information while recruiting director.

December 1998: Project Community Development Coordinator is hired (Doug Sailer).

Spring 1999: Partnership for Children in each area begins development of plans. Bawden travels around involved counties with Smart smiles and Oral Health Section staff doing presentations on fluoride varnish for community and dental groups to assist the project areas in developing their plans for how to implement the preventive services. He writes, distributes, and later publishes a summary paper on fluoride varnish (JPHD 1999). OHS health educators confer with other states (e.g., Arizona, Texas and Washington) and take the lead in developing educational training materials. Dentists from UNC-CH take the lead in developing screening and referral guidelines and fluoride varnish application guidelines.

Spring 1999: Selected Smart Smiles Advisory Committee members meet with appropriate licensure boards to discuss legal issues related to proposals for implementation of the project. Sample standing orders are developed for nurses working in local health department without a physician on site.

April 1999: NC IOM Committee recommends that the Division of Medical Assistance develop a new service delivery package and payment method to reimburse for early caries screening, education and administration of fluoride varnish provided by physicians and physician extenders to children between the ages of 9 and 36 months.

May 1, 1999: Four Smart Smiles dental hygienists to serve the identified 9-county area begin work, finish development of the area plans and immediately began recruiting medical practices and health departments to provide fluoride varnish, preventive education, screening and referral. Dr. Bawden does training for the new dental hygienists as they receive a crash course in dental public health. A tenth county later receives Smart Start funding to hire a fifth dental hygienist to start a preventive dentistry program in an adjoining county, and she joins the Smart Smiles group.

Summer 1999: While some physicians agree to provide the preventive services as part of the Smart Smiles project with no reimbursement, the unreimbursed cost of providing the services is a barrier to recruiting practices to participate. The hygienists work with health department staff and department of social services staff so they can identify high-risk, 9-month-old children to inform them about the program and encourage them to enroll their children. The Smart Smiles hygienists provide training and ongoing support for the pediatric practices and health departments that are participating in the Smart Smiles program, and contact patients to encourage them to come for their recall visits. The dental hygienists work in the community to increase knowledge of dental issues. Smart Smiles reporting mechanism is put in place to collect demographic and service data on the patients, as well as volunteer data.

June 1999: UNC-CH School of Dentistry, Department of Pediatric Dentistry, works with Medicaid and suggest a bundled package of three services (varnish, counseling and screening) to be provided by medical personnel.

July 1999: Information that the Smart Smiles project is in place, that physicians are indeed willing and eager to participate, and that the project is working towards obtaining funding for an evaluation component becomes a turning point. The senior Med-

icaid official (Dick Perusi) endorses the concept of the preventive oral health package and decides that it should be available stateside. Immediately thereafter, Smart Smiles modifies the practitioners' training presentation to include the bundled preventive package and billing information so practitioners could receive Medicaid reimbursement for their enrolled patients and informed practices that were formerly trained.

Summer/Fall 1999: Meetings held with top Medicaid officials, the President of the Pediatric Society and the President of the Academy of Family Physicians, UNC-CH faculty and OHS officials to develop strategy for statewide implementation of the preventive package.

Fall 1999: Medicaid reimbursement guidelines are developed. The promise of Medicaid funding dramatically increases the number of practices and health departments who are willing and financially able to participate. Development of Into the Mouths of Babes (IMB) program begins. Bawden takes the lead in developing the dental content of the training course using the didactic PowerPoint presentation that he had developed for Smart Smiles, while Dr. Sutton takes the lead in developing materials for reimbursement and administrative mechanisms including reporting (encounter form).

December 1999: Bawden begins the first of the IMB pilot trainings using the Smart Smiles didactic PowerPoint presentation, and distribution of Smart Smiles educational materials for use by providers in their counselling of caregivers. IMB institutes data collection form to monitor services during patient encounters. EDS begins training on Medicaid reimbursement.

2000: Smart Smiles continues, and Medicaid providers begin billing for oral health services. 6,259 visits recorded in 2000 (Rozier JDE 2003).

January 2001: Medicaid officially announces payment to physicians for delivery of preventive oral health services in NC Medicaid bulletin.

January 2001: Kelly Haupt, a dental hygienist is hired with IMB grant funds to coordinate IMB implementation. She was provided an office at the NC Pediatrics Society and later the NC Academy of Family Physicians in Raleigh. She strengthens education materials and working with Peter Margolis in the Children's Primary Care Research group at UNC-CH, creates a "tool kit" of materials for practitioners containing resource materials. She includes a copy of the Smart Smiles videotape in the toolkit.

February 2001: CMS (formerly HCFA) / HRSA/ CDC fund evaluation. Didactic presentation is modified based on feedback from the IMB pilots held the previous December. Jim Bawden, Kelly Haupt and an EDS representative (billing process) conduct the training sessions.

March 2001: Kelly Haupt assumes responsibility for didactic training component of IMB from Bawden, a position that she will hold for almost twenty years.

September 2001: Detailed plan for transition of Smart Smiles project providers to IMB program are developed.

December 31, 2001: ARC funding for Smart Smiles ends and becomes part of statewide IMB initiative.

Comparison of CEPH and ABDPH Competencies

CEPH		ADA / ABDPH	
Domain (n=8)	Competencies (n=22)	Domain (n=10)	Competencies Intent Statement
Evidence-based Approaches to Public Health	<ol style="list-style-type: none"> 1. Apply epidemiologic methods in public health practice. 2. Select data collection methods. 3. Analyze data using biostatistics, informatics, computer-based programming & software. 4. Interpret results of data analysis. 	<p>Critically Appraise Evidence to Address Public Health Issues</p>	<p>Assess research evidence pertinent to public health problems, questions, & uncertainties. Apply a systematic critical appraisal process to develop reports & presentations that summarize findings. These findings inform public health policies & programs. Require a firm foundational knowledge in epidemiology & biostatistics.</p>
Note 1		<p>Conduct Research to Address Oral & Public Health Problems</p>	<p>Incorporate best evidence for health promotion & disease prevention into clinical practice & public health. Design, conduct & report primary quantitative, qualitative & mixed methods research to evaluate oral & public health concerns.</p>

CEPH	ADA / ABDPH
Public Health & Health Care Systems	<p>5. Compare the organization, structure & function of health care, public health & regulatory systems.</p> <p>6. Discuss means by which structural bias, social inequities & racism undermine health & create challenges to achieving health equity.</p>
Planning & Management to Promote Health	<p>7. Assess population needs & assets.</p> <p>8. Apply awareness of cultural values & practices to the design or implement public health policies or programs</p> <p>9. Design a population-based policy; program, project of intervention.</p> <p>10. Explain budget & resource management.</p> <p>11. Select evaluation methods.</p>
Note 2	<p>Evaluate Systems of Care that Impact Oral Health</p> <p>Assess the effectiveness of oral health care systems, analyze & report oral health disparities within communities & / or population groups, & compare availability of oral health services & providers in different communities.</p> <p>Manage programs for population health</p> <p>Perform population-based needs assessment & choose intervention. Plan, implement & evaluate programs in public health. Implement quality assurance methods. Provide financial management.</p> <p>Design surveillance systems to measure oral health status & its determinants</p> <p>Continuously collect, analyze & interpret health-related data required for needs assessment, & the planning, implementation, & evaluation of public health practice.</p>

CEPH		ADA / ABDPH
Policy in Public Health	<p>12. Discuss multiple dimensions of policy making process, including roles of ethics & evidence.</p> <p>13. Propose strategies to identify stakeholders & build coalitions for influencing public health outcomes.</p> <p>14. Advocate for political, social or economic policies.</p> <p>15. Evaluate policies for their impact on public health & health equity.</p>	<p>Advocate for public health policy, legislation & regulations to protect and promote the public's health</p> <p>Support a cause, policy, or strategy to reduce inequalities in oral health status or access to services through persuasive speaking, writing or actions. Awareness of perspectives of policymakers, & recognition of issues, programs, values and political goals that are priorities are needed to craft advocacy messages</p>
Leadership	<p>16. Apply principles of leadership, governance & management, which include creating a vision, empowering others, fostering collaboration & guiding decision making.</p> <p>17. Apply negotiation and mediation skills.</p>	<p>Lead Collaborations on Oral & Public Health Issues</p> <p>Develop, mobilize & support partnerships & collaborations among educational, health system, governmental, private sector & community groups to share resources & responsibilities when implementing public health programs.</p>
Communication	<p>18. Select strategies for different audiences.</p> <p>19. Communicate appropriate public health content in writing & oral presentation.</p> <p>20. Describe importance of cultural competence in communicating public health content.</p>	<p>Communicate on Oral & Public Health Issues</p> <p>The capacity to communicate (i.e., exchange information, ideas & opinions) effectively is a critical competency. Competency in communication is intertwined with the roles performed by dental public health professionals.</p>
Interprofessional Practice	<p>21. Perform effectively on interprofessional teams.</p>	<p>Identify needs & opportunities for intra-professional & inter-professional health care services & delivery. Assist with implementation & monitoring of public health programs that involve health care providers & other practitioners from multiple disciplines.</p>

CEPH	ADA / ABDPH
Systems Thinking	<p>22. Apply systems thinking tools (e.g., concept map, causal loop diagram) to a public health issue.</p>
Note 5	<p>Integrate social Determinants of Health into Public Health Practice</p> <p>Analyze the influence of social determinants when assessing community health status, identifying health care access barriers, developing policy, forming partnerships, managing programs, analyzing outcomes and conducting oral health research.</p>
Note 6	<p>Demonstrate Ethical Decision-making in Public Health Practice</p> <p>Ensure use of core ethical values of public health including commitment to equity, justice, equivalent access to health care resources, sustainable development for all communities & population groups, recognition of importance of overall health to the community as well as the individual, & respect for diversity, inclusiveness, self-determination, empowerment & community participation.</p>
Note 1:	Similar knowledge and skills in “evidence domains” but with different applications that distinguish between research and practice.
Note 2:	Skills and competencies needed for public health “Surveillance” are included in the CEPH competencies but do not include the “continuous” requirement.
Note 3:	ABDPH document has one competency on intra- & interprofessional health care.
Note 4:	CEPH domain for “systems Thinking” specifically relates to application of tools to a public issue, which are not included in the ABDPH Competencies.
Note 5:	Current popular term “social determinants” does not appear in the CEPH competencies, but concept fits under the “Planning & Management to Promote Health” domain.
Note 6:	CEPH competencies related to ethical decision making (#6, 8, 12, 15, 20) are integrated into several domains rather than a single domain.

The 22 core competencies required by CEPH and used to design the Gillings MPH degree program and the domains and “intent” competency statements used by the ABDPH and ADA for accreditation standards for dental public health programs overlap substantially. Of the 8 CEPH domains and 10 ABDPH domains, only 6 do not align almost completely (see 6 footnotes in Table in Appendix 8.1).

Four domain labels to ABDPH do not have corresponding labels that are the same as the CEPH labels and 2 that are vice versa. The most important consideration of the two is the number of domains in the curriculum that don’t have corresponding core competencies in the CEPH list, which would increase the chances that it would not be included in the core MPH curriculum. The four domains are “research”; “surveillance”; “Ethical Decision-making” and “Integration of social determinants of Health into Public Health Practice.”

ACKNOWLEDGEMENTS

This book blends history, observations of public health dentistry and personal narrative to document the development and contributions of the public health dentistry program at UNC to the oral health of North Carolinians and beyond. In doing so, I hope to inspire critical thought about how academic Dental Public Health programs could be in the future. My perspectives of the history of graduate education in public health dentistry at the University of North Carolina are influenced, like other writings and research, by events and people with whom I came into contact in my 50 plus years of affiliation with UNC as a student, professor, and casual observer.

Beginning with Rosenau and McGavran, every Dean and Department chair in the UNC School of Public Health was supportive of the program in dental public health, and I am grateful. Deans Barbara Rimer, Michel Ibrahim, and Bernie Greenberg have been particularly supportive, which was important because we experimented with innovative preventive dentistry methods and programs and generated new information to improve oral health.

From a historical perspective, the dental public health individuals who came before us should be acknowledged for their contributions. Faculty included Harry Bruce who taught the first dental public health course, John Fulton who began the curriculum in oral epidemiology, Frank Law, who further developed courses in health administration, and John Hughes who was committed to teaching many continuing education courses. These early leaders entrusted me with their documents which enables this history to be written. Collaboration with the Dental Division of the North Carolina State Health Department led to a seamless cooperative working agreement which benefitted everyone, particularly the Dental Public Health residents. The leadership of Alex Pearson, George Dudney, Jean Spratt, Steve Cline, Rick Mumford, and Rebecca King made it happen.

From the Dental Public Health archives handed down to me I can document an impressive number of actions by dentists and others devoted to teaching, practice, and research in public health dentistry. Knowledge of the early efforts of Frank Law, Harry Bruce, John Fulton, Carl Holmes, and John Hughes has been documented. Similarly, the research of Jim Bawden in preventive dentistry and Jim Beck in oral epidemiology added greatly to the UNC leadership in public health dentistry over the years.

The impact of the North Carolina Dental Public Health program has been supported by many administrators outside the program. Dental School Deans: Jim Bawden, Ray White, Ben Barker, John Stamm, and Jane Weintraub all supported collaborations with the School of Public Health. Similarly, state health department

leaders: Jake Kooman, Hugh Tilson, Leah Devlin, Elizabeth Tilson and others, have supported the Dental Public Health Residency Program which allowed it to obtain HRSA grant support. Gordon DeFriese, Director of the Sheps Center, routinely supported dentists in health services research, provided traineeships for dentists, and was co-Principal Investigator of the Dental Manpower Study. Also, Jim Bader provided leadership in conducting dental health services research. Several colleagues who read early drafts of this book: Jim Beck, Chet Douglass, Edna Hensey, Rebecca King, Sally Stearns, and Jane Weintraub, have all provided comments and encouragement.

Finally, I want to acknowledge my Chairman Morris Weinberger and Dean Emerita Barbara Rimer for sponsoring the publication of "First in the Nation." Julie MacMillan at the Gillings School managed the prepublication coordination with the Office of Scholarly Publishing Services of the UNC Press. And thank you to Chet Douglass who worked directly with me these last several months to assure that my thoughts and intentions were reflected in the editing and publication process. Finally, a very special thank you to my wife Jeanette for her unwavering support of this book and, in fact, my whole career since our school days together in St. Pauls, North Carolina.

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GARY ROZIER is from Robeson County, NC. He received his DDS and MPH degrees from The University of North Carolina at Chapel Hill. For his entire academic career, he served as full time faculty in Dental Public Health at the Gillings School of Global Public Health. He is one of the most respected innovators in his specialty field with seminal work in preventive dentistry that led to Medicaid coverage for physicians providing fluoride varnish to their patients in all 50 states, reaching millions of children. CDC relied on him for years to write and update the national guidelines for school-based and community-wide preventive dentistry programs. During Gary Rozier's four decades on the faculty, 28 doctoral students and 200 masters students enrolled in the Dental Public Health concentration. He supervised the primary project for about 3 dozen residents enrolled in the NC DHHS dental residency.

Since its early teaching activity in 1936, the North Carolina Dental Public Health program has had an outstanding 80-year history that is summarized into five themes. It has served as a key resource for training the dentists in public health, which has benefited the state of North Carolina. It has provided the science base for improving oral health with new prevention technologies. The program has advanced public health practice and collaborations with state and federal agencies, and it has maintained a robust research program that developed methods for solving population-based problems. Finally, it has offered a comprehensive teaching program that supported the knowledge base for the MPH program and research methods for PhD students in epidemiology and health services research.

The UNC research focus on early childhood caries reversed the increase observed in statewide surveys, and its prevention methods have been adopted nationally. Rozier also documents the first courses in dental public health which provided definitions and direction for the specialty.

Oral diseases are largely preventable, but they affect more than three billion people worldwide. *First in the Nation* is elegantly convincing in its message—that a major health sciences campus without a comprehensive Dental Public Health academic program is intellectually devoid of part of its purpose for being.



**GILLINGS SCHOOL OF
GLOBAL PUBLIC HEALTH**

PUBLISHED BY THE UNC GILLINGS SCHOOL OF GLOBAL PUBLIC HEALTH

DISTRIBUTED BY THE UNIVERSITY OF NORTH CAROLINA PRESS

www.uncpress.org