MORTALITY STUDY OF DENTISTS

FINAL REPORT

December 30, 1976

Prepared for:

Department of Health, Education and Welfare
Public Health Service
Center for Disease Control
National Institute for Occupational Safety and Health

Under DHEW Contract No. HSM-99-72-72

Gerald Orner, DDS, MPH, ScD

and

Richard D. Mumma, Jr., DDS, MPH

Temple University
Of The Commonwealth System of Higher Education
Health Sciences Center
School of Dentistry
3223 N. Broad Street
Philadelphia, Penna. 19140

TABLE OF CONTENTS

INTRODUCTION

In modern times, the profession of dentistry has frequently been the subject of inquiry or, more often, speculation concerning the occurrence of occupationally related diseases. Such concern would naturally be generated when the dentist is viewed in his working milieu—where he is being constantly exposed at "low dosage" but for "long term" to a myriad of potentially hazardous biological, chemical and physical agents. Among such agents are included microbial and viral contaminants, mercury, ionizing radiation, oils or lubricants, waste sedation gases, particulate matter in aerosol sprays, various medicaments and other dental materials. Dentists, therefore, constitute a large occupational group at risk to multiple, potentially hazardous exposures.

The present contract, HSM-99-72-72, the Mortality Study of Dentists, has adopted a classic epidemiological approach to the study of chronic disease of possible occupational origin in the selected profession of dentistry. Disease states leading to death are identified as being associated with the particular profession in contrast to other occupations or professions. The excess of all cause or cause-specific mortality is, in turn, used as an indicator of potential occupational hazards. The research design is the prospective study done in retrospect. This approach has proved useful in the investigation of certain selected working populations where the histories of exposures to potentially hazardous agents are known or where there is little change in occupation over time. In the present study a cohort of dentists is defined and monitored over a specified period. The vital status of each member is determined and for those identified as deceased, the death certificates were obtained from the appropriate civil authority. Multiple causes of death including the underlying cause were coded and assigned by a trained nosologist according to the 7th International List.

Included among the demographic data which were captured for the entire cohort are year of birth, school of graduation, year of graduation (or years of exposure to risk) and specialty of practice. The observed death experience of the cohort was adjusted for age-sex and calendar year and compared to control or comparison populations to determine excess or deficit deaths in an attempt to establish if dentists do, in fact, present an unusual mortality pattern. This mortality experience is then used to indirectly address the question of identification of potential occupational hazards associated with the profession.

REVIEW OF THE LITERATURE

A. Mortality Experience

The earliest concern with the mortality experience of persons engaged in the profession of dentistry dates from the late nineteen-twenties with the publication of the Registrar General's Decennial Supplement, England and Wales, Occupational Mortality (1927). In that publication the mortality experience of dentists, for the first time, was described separately from that of other health professionals. The Decennial Supplement related deaths of 1920-1922 to the census of 1921 and reported that the Comparative Mortality Figure was lower for dentists than for medical practitioners. These rates were 910 compared with 1,021 for the latter. The mean annual death rate per 100,000 was 10,993 for dentists compared to 10,986 for physicians. Dentists demonstrated, however, greater mortality ratios for some specific causes than did their fellow medical colleagues. Their rates for diabetes, digestive diseases and phthisis were higher; the rate for cirrhosis of the liver was exceeded by only five other occupations. Howkins (1935) concluded that dentists "live considerably longer than medical men and very slightly longer than the average person."

The next Decennial Supplement (1938) related deaths of 1930-1932 to the census of 1931 and, again, dentists had "average mortality." Dentists had a Standard Mortality Ratio (SMR) of 96, relatively "average." They also had "probably a significant excess of mortality" from heart disease other than valvular and from suicide (16 observed compared with 9 expected). Physicians demonstrated an SMR of 106 for ages 20 to 65 years. Dentists, nevertheless, among professional men had the highest mortality rates in the most productive age group, 45 to 55 years of age.

In 1951 the American Dental Association initiated a study of the mortality experience of U.S. dentists (ADA, 1956). The cooperation of a majority of the state departments of health was enlisted to review death certificates in their respective jurisdictions and to forward copies that indicated occupation of the deceased to be "dentist." For the period 1951 through 1954, the number of reported deaths was 3,707. Data were reported only for white male dentists and as percentages adjusted for differences between the age distributions of living dentists and the 1952 white male population. Significantly higher percentages were recorded for diseases of the circulatory system. Suicides were higher but not significant; deaths from neoplasms were also lower. The percentage of dentists dying from accidents, poisonings and violence was significantly lower.

Because of World War II, there was no census in England in 1941 and therefore no Occupational Supplement was published. The next Supplement (1958) was based on the census of 1951 and related to deaths during 1949-1953. Again, dentists had an "average" mortality. There were 125 deaths registered (observed) for coronary thrombosis and 90 expected—a significant excess. The only other cause for which there was a significantly high mortality was suicide with 27 observed and 10

expected. Suicide, when considered as a cause of death for all ages, ranked dentists twelfth among 425 other occupations and first among the professions. A deficit was observed for bronchitis among dentists with 11 observed and 41 expected. Physicians, on the other hand, had an SMR of 89. Excesses were observed for coronary thrombosis, vascular lesions of the C.N.S., cirrhosis of the liver and suicide (61 observed and 27 expected). In the age group 45 to 55 years the death rate for all professional men (92) was lower than all males, taken as 100 for all causes; the same ratio for dentists was 100. Dentists in the same age group, therefore, demonstrated a death rate which was higher than other professionals. This was also true for the age group, 55 to 64 years of age.

The American Dental Association continued to collect data on mortality experience of U.S. dentists that was begun in 1951. The next study covered the years 1955 through 1960 (ADA, 1962). The number of participating states changed and some did not participate for the entire reporting period. Data on 6,739 deceased white male dentists were adjusted in the same manner as the previous study. Significantly higher proportionate mortality expressed as a percentage was indicated for diseases of the circulatory system. For four major causes of death—accidents, poisonings and violence, diseases of the respiratory system, infective and parasitic diseases and mental, psychoneurotic and personality disorders—the percentages were significantly lower than the white male population. Suicides accounted for 1.84 percent of all deaths (124 for the six-year period).

When the 1950 Census of Population was being formulated, circumstances were favorable to a reconsideration of the study of occupational mortality from the death and census records. Guralnick (1963a) reported on all and selected causes of death among men 20-64 years old within selected occupations by age and color. White male dentists aged 20-64 demonstrated an SMR of 87 while those 25 to 59 years of age were reported as 89. Comparable figures for white male physicians were 91 and 84 respectively. Significantly higher SMR's (computed using the population enumerated in the 1950 Census) for dentists were described for arteriosclerotic heart disease including coronary diseases, for diseases of the coronary arteries and for suicides for both age groups (this last was 142 and 156 respectively and were based on 596 deaths of which 27 were suicides). Significantly higher SMR's for the age group 20-64 years of age were found for major cardiovascular-renal disease, diseases of the cardiovascular system and diseases of the heart and rheumatic fever. Physicians had statistically significant SMR's for both age groups for major cardiovascular-renal diseases, diseases of the cardiovascular system, diseases of the heart and other diseases of the coronary arteries. Suicides numbered 48 and were based on 1,301 deaths. The SMR's were 114 and 111 for each of the age groupings and were not significant.

Blachly, et al. (1963) examined mortality from suicide among professional groups in the State of Oregon. The death certificates of all persons committing suicide in the state during 1950-1961 were reviewed for a twelve-year total of 2,674. Population figures for physicians and dentists were obtained from the respective state boards of registration. The average rate for dentists was 62.03 (77.91 per 100,000 per

year for 1950-1956 and 46.15 per 100,000 per year for 1957-1961 respectively). The rates for physicians were 30.29 or 15.75 per 100,000 per year year for the first period and 44.84 per 100,000 per year for the second. Blachly concluded that "the suicide rate among physicians, dentists and attorneys was about three times that of white-collar workers, whereas the rate of teachers in elementary and secondary schools was lower than average."

Glass (1966), in testing the hypothesis of excess mortality among dentists from leukemia because of use of X-ray, examined the mortality experience of a cohort of New England dentists for all and selected causes. The mortality experience of more than 11,000 white male dentists who had practiced in the New England states between 1921 and 1960 was compared with the New England white male population and with U.S. physicians. With only 3 percent of the cohort lost to trace, a statistically significant SMR of 83 for all causes was observed for the dentists compared to the New England white male population. Compared to U.S. physicians, SMR's for all causes were significantly less for the dentists (based on known deaths only) during 1921-30, 1939-43 and 1949-53. No significant difference was observed for leukemia, buccal cancer, cancer of the pancreas, cancer of the respiratory system, heart disease, cirrhosis of the liver or diabetes. Significantly less cardiovascular-renal disease, chronic nephritis, cancer of the digestive organs and all forms of cancer were observed, while excesses for vascular lesions of the C.N.S., accidents and suicides were found compared to the New England white male population.

The third in the series of mortality studies conducted by the American Dental Association covered the period 1961 to 1966 (ADA, 1968a). Reporting on 6,070 white male dentist deaths, diseases of the circulatory system were greater for the dentists while the proportion of dentists dying of cancer was only slightly less than the white male population.

Dean (1969) reported on the mortality experience of South African physicians and dentists for the seven-year period, 1960-1966, using the census of 1964 and tracing all those who had died before and after this time. Comparisons of age-specific death rates among white male physicians, dentists and the white male population indicated a favorable mortality experience for both professional groups. Physicians had considerably lower death rates than the white male population for all causes except coronary thrombosis, lung cancer and suicide. Dentists were not remarkable for any excesses in all or specific causes of death.

A cohort study of mortality experience among Massachusetts dentists was attempted to study deaths from leukemia with a group of 3,239 male dentists in 1959 (Warren and Lombard, 1970). A total of 392 deaths were observed; death from coronary disease was most frequent. No excess mortality was attributable to the use of ionizing radiation.

The Registrar General's Decennial Supplement, England and Wales, Occupational Mortality (1971) relates the number of deaths in 1959-1963 with the 1961 census. For the 1961 census, occupation was requested on a 10 percent sample and there is a suggestion that bias may have entered into the sample with an over-estimation of the number of dentists at risk. Death rates per 100,000 for male dentists were 74, 133, 460 and

1,393 for the age groups 25-34, 35-44, 45-54 and 55-64 respectively. This is substantially less than the recorded 103, 202, 653 and 1,929 for physicians in each of the above age groups. The ratio of each death rate, for each age group, to the corresponding rate for all males, with the ratio being expressed as a percentage, is 66, 55, 65 and 64. The SMR for dentists is 64 and for physicians is 89. Both professionals have SMR's that are less than that of all males. Most important is that the mortality of dentists is below "average" through age 65 and compares favorably with that of other professions.

Hill and Harvey (1972) re-examined the findings of the Decennial Supplements on Occupational Mortality for dentists and three other professional groups. They concluded that differences in mortality experience could be related to cohort date of birth. Dentists and physicians born before 1900 experienced an increased mortality while later cohorts experience a below average mortality. Calculated SMR's for specific causes for dentists, using the 1949-53 and 1959-63 figures combined, yielded statistically significant excesses only for suicide at the 0.05 level (SMR = 205). A higher than average risk existed for arteriosclerotic heart disease, hypertension and cirrhosis of the liver. However, none was statistically significant.

Occupational mortality in the State of Washington was the subject of a report by Milham (1972). The study covers the period 1950-1971. Proportionate mortality ratios calculated for the period 1961-1971 demonstrate statistically significant excesses for pancreatic cancer, accidents (800-999) and suicides. For the latter, 21 suicides were observed for the ten-year period while seven were expected.

Rose and Rosow (1973) examined the suicide experience of persons in the State of California by selected occupational groups. All death certificates filed in the state during the three-year period from January 1, 1959 through December 31, 1961 were reviewed. These deaths, in turn, were related to data on occupations that had been collected during the 1960 census in California. Age-sex adjusted suicide rates for male professional-technical workers, 25 years and older, yielded an annual rate of 83 per 100,000 per year for dentists. This rate was exceeded only by chemists, pharmacists and non-medical technicians. Physicians demonstrated a rate of 79 per 100,000 per year. All rates used the white male California population as a standard.

Finally, the newest study by the American Dental Association (1975) continues the original research into the mortality experience of dentists. During the period 1968-1972, 4,190 deceased white dentists' certificates were collected by 31 state departments of health. As in the previous studies the age-adjusted rates were calculated using the white male population. Eighty-five suicides were reported for the five-year period. This accounts for 2 percent of all deaths. Excesses are described only in diseases of the blood and blood-forming organs and symptoms of senility and ill-defined conditions.

This review of articles concerned with the mortality experience of dentists for all and specific causes demonstrates that many different approaches have been tried, that the mortality is reported in many

different ways and the focus has often been on different areas. All have one common finding—that the mortality experience of dentists is remarkably different than that of the general population. The dentists always have a more favorable experience than the general population for all causes and a more favorable experience than their professional peers. Most of the more substantial studies reviewed have generally the same design—the collection of death certificates around a census year and then relating occupation as reported in the census to the occupation designated on the death certificate. The problems associated with this approach are many and include the lack of comparability between the groups yielding the deaths and those representing the population. The question of size of numbers is also at test. Only the study by Glass (1966) was unique for its cohort approach. And most questionable about that study is its size for detecting "real" differences in cause-specific mortality. For the various studies and over different times, cause-specific mortality has changed. This may be a reflection of secular trends in mortality or result from the study design itself. One cause of death appears to be consistent. Suicide when reported is usually in excess of, if not statistically significantly different than that of the general population. Several times it is reported as exceeding that of other professional groups. This finding could very well be the result of underestimating the population at risk or reflect difficulties in study design.

The next section will review studies of morbidity and their possible impact for directing attention to potential hazards in the occupation of dentistry.

B. Morbidity Experience

Howkins (1935) categorized occupational diseases into four classes (1) due to posture, (2) due to infection, (3) associated with the nervous system and (4) due to drugs. Disabilities connected with posture were "dropped shoulder," flat feet, varicose veins and even hemorrhoids, scoliosis, and gastric or duodenal ulcers. Respiratory diseases, measles, whooping-cough, mumps, extragenital syphilis, and fections of the eye were diseases of the second class. Nervous system problems were headaches and migraine. Drug-caused idiosyncracies were dermatitis due to novocain, rhagades associated with use of plaster of Paris and perhaps even chronic mercurial poisoning from manipulation of amalgam. Formalin, tricresol-formalin, pyrogallic acid and hydroquinone were stated to have caused dermatitis or eczema. He concluded, despite the above, that the profession was a "healthy occupation."

For dentists who came to the Mayo Clinic for work-ups during the calendar year 1940, Austin and Kruger (1947) reviewed the physical findings for two hundred and seventy-three. The greatest incidence of disease involved the gastro-intestinal tract with ophthalmologic conditions next. Genito-urinary conditions, exhaustion, cardiac, proctologic and dermatologic diseases followed. Less frequently encountered conditions included rheumatism, malignant lesions and

orthopedic complaints. The findings were not compared with findings for all men of similar age groups but it was concluded that dentists are "reasonably healthy."

The Newark Clinical Group observed 56 dentists over a period of years (Berstein and Balk, 1953). Complete physical examinations and histories were obtained for all patients. The study group was divided by age: those less than 45 years of age and those 45 years and older. Patients could report more than one complaint. The most common complaint was an anxiety state which was reported in 42 percent of the entire group. For the younger dentists, it was a complaint of more than 52 percent. Gastrointestinal diseases were represented by more than one-third of the total group and were only slightly higher in the older aged. Cardiovascular diagnosis was made in 30 percent of the total group with a higher occurrence in the older dentists. The other disease of note is respiratory disease and this occurred in one-fourth of the dentists with little distinction by age. More than one-half of the dentists were classified as having another disease state. Findings in this study differed markedly from the previous study. Differences were attributed to selection of patients by facility—with the Mayo Clinic seeing most patients from the large midwest which was predominantly rural as opposed to the Newark Group whose patients came from a small, highly industrialized metropolitan area. The most important conclusion reached was that the anxiety state was the chief occupational disease of dentists.

Cureton (1961) in conjunction with others conducted physical fitness tests on more than 100 dentists and recorded results along with private interviews. The most commonly observed physical disability was "circulatory sluggishness" followed by an excessive girth of the abdomen compared to chest measurement. Both are characteristic of a sedentary occupation and poor physical fitness. In interview or questionnaire, joint weakness or aches, pain and stiffness was reported as frequently as nervous tension. Headaches, eye fatigue and varicose veins were the next most frequent complaints.

Russek (1962) in a study of emotional stress and coronary heart disease among three groups of professionals sent questionnaires eliciting information on occupation and coronary heart disease and hypertension. For dental specialists, general practitioners were ranked by the Delphi approach to be in the most stressful category, followed by oral surgeons, orthodontists and periodontists. Replies revealed a tendency of coronary heart disease prevalence to increase with increased stress rank. This was also characteristic of physicians ranked by "stress category." Among dentists as well as physicians, hypertension bore no consistent relationship to "stressfulness."

A survey of dentists over sixty years of age was conducted by the American Dental Association (ADA, 1963) to determine prevalence of illnesses and injuries among this group. Of 3,315 respondents, 682 or 20 percent reported one or more illnesses resulting from dental practice. Diseases of the circulatory system were reported most frequently, followed by diseases of bones and organs of movement. More than 3 percent reported other illnesses and conditions which included mental and nervous conditions, diseases of the genito-urinary system,

fractures and sprains. Sixty-nine percent of the respondents list one or more conditions described in the National Health Survey as chronic diseases. Age comparison for 5 selected conditions covered by the National Health Survey demonstrated that dentists had more hernias, diabetes and peptic ulcers. Chronic skin conditions and allergies were reported by dentists as being practice-related but no comparison group was available.

Eccles and Powell (1967) reported on the results of a postal questionnaire on morbidity sent to 358 English dentists. Questions asked were age, height, weight, number of years in practice, specialty, number of chairside hours worked per week, major changes in hours worked, number of patients seen per week, number of weeks of holiday per year, and questions concerning health, attitudes to the practice of dentistry under present conditions and surgery equipment and organization. Conditions of health were divided into those of musculo-skeletal, stress associated and miscellaneous. More than 70 percent reported symptoms related to musculo-skeletal while only a third reported stress-related diseases (more than one symptom could be reported). About 40 percent, however, reported symptoms that were classified as miscellaneous (such as hemorrhoids, varicose veins and hernia). The authors concluded that although their data gave prevalence figures for certain disorders, there was no comparable data for comparison with other professions.

The health of dentists in South Africa was the concern of Deverall (1969). Questionnaires were returned completed from 600 dentists, and described, among other things, common ailments. Without exception, the 330 who reported some ailment stated that it was associated with their profession and that it occurred frequently or was chronic. The most frequent disability was gastro-intestinal, followed closely by sinusitis, faulty sight, arthritis, headaches, dermatitis, indigestion, poor hearing, and respiratory and circulatory disease.

There has been only one, but unconfirmed, episode of fatal mercury intoxication of a dental surgery assistant (Cook and Yates, 1969; Yates and Cook, 1970). The authors concluded that the rapidly fatal renal failure in the case was the result of mercury intoxication. The reports are noted here for completeness.

Powell and Eccles (1970) extended their earlier research by looking at the health of another group of professionals, pharmacists, and compared the data with that of the dentists. Dentists suffered more musculo-skeletal disorders than did pharmacists. No other major differences in morbidity between the two groups was reported, although the groups differed in hours worked, concern with technical achievement and satisfaction with work.

Campbell, et al. (1971) studied the physical and recreational activity of dentists in Australia. Reasons for nonparticipation in physical activity varied but were mostly related to fatigue or will. Physical exercise is suggested as one of the means by which some of the occupational hazards of dentistry could be overcome.

The use of inhalation anesthetic in dentistry and as a potential occupational danger was studied by Cohen, et al. (1975). The study reports the results of a survey of certain health conditions among members of the dental profession. Using all members of the American

Society of Oral Surgeons and a 4 percent sample of the American Dental Association membership, the health histories and number of hours exposed per week to anesthetic gases were elicited via a mail questionnaire. The major results of the study indicate that the incidence of spontaneous abortion is increased about 78 percent in the spouses of exposed dentists compared with spouses of unexposed dentists, and is statistically significant at the 0.01 level. Congenital abnormalities appear to be slightly higher in fetuses of exposed dentists compared to unexposed dentists. The rate of cancer in male respondents appeared to be greater but not statistically significant for the exposed group. The incidence of liver disease was found to be increased 156 percent in the exposed group--a difference that was highly statistically significant.

Djerassi (1971) describes the potential occupational hazards in dentistry as being related to the effect of chemical substances, physical influence, mixed influences (chemical and physical), infections and skin manifestations. The difficulty is in proving the causal relationship between the manifestations of the disease and the occupational hazard which is considered the initiator of the disease. An excellent discussion of the problem is given and an extensive bibliography is included.

The above review is most noteworthy for the inadequacy of data relating current morbidity to the occupation of dentistry. There is a general "feeling" among dentists that some ailments are directly related to the profession, such as postural defects, varicose veins and eye injuries, but more subtle disease states have not really been defined. The following review describes potential hazards in the dental operatory.

C. Hazards

Of all potential hazards in the dental operatory, mercury probably has received the most attention. The use of mercury amalgam was introduced into the United States in the 1830's. Since that time controversy has raged about the mercury presence in the dental practitioner's office. Goldwater (1964) has remarked:

> After studying the absorption and excretion of mercury in man intensively for nearly five years I have reached one conclusion which I believe can not be disputed, namely that the areas of ignorance are vast and the areas of knowledge small.

The hazard to health of the dentist or his auxiliary personnel is (1) systematic absorption of mercury through direct contact with the skin, (2) inhalation of mercury vapor given off at room temperature and (3) inhalation of airborne particles of mercury or mercury-contaminated particles (Nixon and Rowbotham, 1971).

The symptoms of mercury poisoning are erthism, tremor, speech disorders, alteration of handwriting, motor and sensory nerve disorders, eye infections and an oral pathosis (Mantyla and Wright, 1976). Many studies have been concerned with the determination of mercury levels in the individual (Gaspersic, 1973; Goldwater, et al., 1964; Hefferren,

1976; Hoover and Goldwater, 1966; Hyland, et al., 1971; Jacobs, et al., 1964; Jacobs, et al, 1961; Kevorkian, et al., 1972; Nord, 1973). Ayer, et al., (1976) attempted to test reflexes as a measurement of mercury levels. Battistone, et al. (1976) correlated mercury concentrations with dental practice characteristics, but overall, none appeared significant in a comparison of blood levels with clinical chemical data and practice characteristics. The data indicated that U.S. dentists, as a group, practiced good mercury hygiene. Examination of the buccal mucosa was performed on 1,724 dentists by Brady, et al. (1976) and no evidence was found that could be correlated with mercury levels. Several studies have focused directly on the hazards of handling mercury by both the dentist (ADA, 1971; Brooks and Allingham, 1974; Buckwald, 1972; Joselow, et al., 1968; Knapp, 1973; McCord, 1961) and his staff (Chybowski, 1971; Mantyla, 1973; Meyer, 1962; Scheer, 1971). Contamination of dental offices, proper evaluation procedures and appropriate decontamination have been the subject of other reports (Cuzacq, et al., 1971; Gronka, et al., 1970; Grossman and Dannenberg, 1949; Lenihan, et al., 1973; Nixon and Smith, 1965; Pagnotto and Comproni, 1976; Schneider, 1974). The use of ultrasonic amalgam condensation was examined and the attention that was directed to the dangers of poor mercury hygiene in that procedure resulted in an eventual recommendation for withdrawing approval of the device (Chandler, et al., 1971). More recently, mercury vapor exposure and hypersensitivity among dental school populations have received attention (McGinnis, et al., 1974; White and Brandt, 1976). Mercury usage has, in fact, received so much attention in dentistry in recent times that the Council on Dental Materials and Devices of the American Dental Association has updated its recommendations on mercury hygiene in the present year (ADA, 1974, 1976).

Ionizing radiation has received almost as much attention as a potential occupational hazard as mercury. The biological effects can be somatic, which affects the person irradiated, and genetic (Hicks, 1967; Smith, 1972, 1973). Surveys of radiation dosages received by dentists (Spalding and Cowing, 1959) and the effects of that radiation were the subject of at least two studies (Glass, 1966; Warren and Lombard, 1966). Continued investigation of radiation hazards has continued even with the introduction of newer procedures, equipment and faster film (Rolofson, et al., 1969). Attention to inspections of equipment is becoming a priority in countries other than the United States (Rothe, 1975). Radiation hygiene procedures in the United States are continually updated by the Councils on Dental Research and on Dental Materials and Devices of the American Dental Association (ADA, 1967).

While ionizing radiation combines hazards that are both chemical and physical, the use of the high speed handpiece adds a bacteriological hazard (Terranova, 1967). Studies of air contamination by the coolant have documented hazards from the aerosol spray (Belting, et al., 1964; Haden, 1969; Kazantzis, 1961). Associated with the aerosol spray is the possible inhalation of oil particles (Nixon and Tilston, 1965; Madden, 1969). A nonlife threatening hazard is the sound of the handpiece in operation (Ward and Holmberg, 1969). The Council on Dental Materials and Devices of the American Dental Association addressed some of these problems (ADA, 1974).

The growth of inhalation therapy has created the potential for an occupational hazard (Cleaton-Jones, 1974; Millard and Corbett, 1974).

The transmissability of organisms has always presented a potential hazard in the dental operatory and a number of studies have addressed this continuing problem (Bartels, 1969; Clark, 1974; Katberg, 1974; Pelleu, 1969, 1970).

New findings have now demonstrated that viral hepatitis is a potential occupational hazard (Crawford, 1975; Feldman and Schiff, 1975; Glazer, et al., 1973; MacFarlane and Mason, 1972; Mosley and White, 1975; Southam, et al., 1968; Schwimmer and Howitt, 1973; Weil and Berstein, 1975). This concern has prompted a recommendation from the Council on Dental Therapeutics of the American Dental Association (ADA, 1976).

Infectious diseases are being once again examined as potential occupational hazards (Frick, 1973; Harris, et al., 1969). Other occupational hazards such as eye injuries (Gillette, 1966; Lorato, 1966) have always been recognized as are injuries to the hand (Lorato, 1968).

The final recognizable hazard to the dental practitioner is stress. While job stress is an occupational hazard, it has been a hidden hazard to many a practitioner. More dentists are beginning to recognize that stress can make them ill, tired and less productive (Cloutman, 1963; Dyce and Dow, 1965; Fox and Jones, 1967; Gutwirth, 1968; Heinrich, 1970; Kimmel, 1973; Lazarus, 1966; Opton, 1969; Paul, 1969; Selye, 1968).

Included in this report as Appendix B is an abridged inventory of dental materials by brand name and manufacturer for one selected dental school. An attempt was made to identify all components of the various materials but many formulations are trade secrets and difficult to discern.

METHODOLOGY

The purpose of this study was the examination of the mortality experience of a cross-sectional cohort of dentists for a specified period of time and to compare its experience with that of general and selected physician populations. It was hypothesized that differences in mortality for selected causes could be strong indicators of occupational exposures to potentially hazardous materials.

The study design was that of a prospective study done in retrospect with the year chosen for the cohort assembly being 1960. The preliminary cohort was obtained from the 1960 American Dental Directory published by the American Dental Association (1960). This Directory contains the names of all members and life members of the American Dental Association and all nonmembers for whom an address could be verified. It is essentially a listing of all dentists known to the Association in the preceding mid-year. Data elements include full name, street address, city and state, year of birth, year of graduation, school of graduation and character of practice (specialists were listed in this Directory in accordance with policies established prior to the 1959 session of the House of Delegates of the American Dental Association). The total number of dentists so obtained was 103,755. This Directory was keypunched and verified and transferred to magnetic tape. The tape was then edited and duplicates were purged. It should be noted that this procedure identified nearly 250 possible duplicates in the first examination. Utilizing the most stringent criteria of a complete match on five fields (excluding the field when it was missing data for one of the suspect pair) and with the restriction that there must be at least two other fields in addition to the name, approximately one-half of the potential duplicates were resolved. One procedure included contacting the appropriate dental school for verification. The problem of duplication was not completed until all data collection procedures were terminated because captured missing data or correction of original data helped in the final resolution (see Appendix A, III).

A readable tape used to print the 1968 American Dental Directory of the American Dental Association (1968), which was the first such Directory so printed, was obtained from the Bureau of Data Processing Services and Membership of the American Dental Association and converted to 9 track IBM mode. A matching program available to NIOSH was used to compare names on both tapes. The program created three lists. List I was composed of all dentists found in the 1960 Directory but not in the 1968 Directory. This listing should have covered all study decedents and contained approximately 20,000 names. List II contained all dentists matched successfully on both tapes and represented approximately 81 percent of the original cohort. This list should have comprised all dentists who lived through the study (January 1, 1960 through December 31, 1965). List III contained all dentists listed in the 1968 Directory but not in the 1960 Directory and whose year of graduation was earlier than 1960. This list was relatively small and contained less than 1,500 names. It should have

been comprised of dentists who could not be computer-matched for various reasons, dentists who had joined the Association between 1960 and 1968 and even nonmembers whose presence was only then known to the Bureau in 1968 (see Appendix A, IV).

Concurrently with the above activity, all death certificates and death notifications maintained by the Association for the years 1960-1965 were requested from the Bureau of Economic Research and Statistics. These certificates and notifications had been the source of data for an on-going study by the Association for the past fifteen years. Since 1951, in cooperation with various state departments of health and with various degrees of participation and success, death certificates or notifications of death had been forwarded to the Bureau when the deceased's occupation was identified as "dentist." In addition, obituaries in the Journal of the American Dental Association were reviewed for the period 1960-1966 and the first half of 1967. This composite file of death certificates, notifications and obituaries was cross-referenced and alphabetized (see Appendix A, I, II). This alphabetized file was then matched against List I according to the prescribed criteria (see appendix A, V and Exhibit I). Death certificates, notifications and obituaries not matched were reviewed to determine if they seemed appropriate for exclusion. For example, some were recent graduates while others appeared on List II in III (see Appendix A, V). Each was also checked against List the event that a dentist had died but had not been removed from the Directory. Less than 700 identified deaths comprised this group and were excluded from the study. Their age distribution was skewed to the older age groups and the group apparently consisted of dentists who had long been retired and thus never appeared in the Directory since its inception in 1947.

For every notification and obituary matched to a dentist, the death certificate was requested from the appropriate state department of health (or the U.S. State Department if death occurred outside the continental U.S.) in the appropriate format (see Appendix A, VI and Exhibit II). Included on List I were probable matches that could not be completed by the computer match program. These matches (R-pairs) were resolved by established criteria (see Appendix A, VII and Exhibit III). All unmatched dentists on List I were then compared with List III and the 1966-1968 obituaries (see Appendix A, VIII). If the former was successful, the dentist was classified as having lived through the study and was alive as of 1968 (a hand-match). In the latter case, if identification was made with an obituary, the dentist was classified as having lived through the study but coded as having died during 1966-1968. Any dentist not matched at this time with a death certificate, notification or obituary was entered into follow-up. The vital status of every dentist on List I was then up-dated by a pre-punched IBM card (see Appendix A, IX and Exhibit IV).

At this point in the study, 4,969 certificates were forwarded to the NIOSH nosologist for coding of causes of death (underlying plus up to five contributing causes) according to the 7th Revision of the International List (WHO, 1957). An additional 3,314 certifi-

cates were requested from the states. Procedures for processing returned certificates are described elsewhere (see Appendix A, X, XI, XII). It should be noted that for deaths in New York City, the study staff conducted the search of the record files and then requested the certificates by identification number. Certificates not recovered from the jurisdiction reported in the obituary were rerouted subsequently to other states (see Appendix A, XII). Returned certificates were again forwarded to the nosologist while coded certificates were keypunched and verified according to established procedures (see Appendix A, VIII and Exhibit V).

Collection of missing data was assisted by computer print-outs of all individuals with missing data fields, alphabetized by name and within city and state. Print-outs by school of graduation were also made available. Mailings were sent to the National Board of Dental Examiners, dental schools where appropriate or known repositories of records of now defunct dental schools. Additional information was obtained from subsequent editions of the Dental Directory and from the 1928 Polk's Dental Register and Directory of the United States and Canada (1928) (see Appendix A, XIV).

Initiation of follow-up for 7,521 dentists with vital status unknown (and some with missing information) and 2,249 individuals whose vital status had been ascertained but with missing data was begun with an individualized computer-printed master list of all records (see Appendix A, XV and Exhibit VII). The first step was to match these records against the Register of Licensed Dental Manpower maintained by the Manpower Development Branch of the Division of Dentistry, Bureau of Health Resources Development, DHEW, USPHS. This Register is of licensed dentists as of August 1971 but had been updated for some states as of 1972. Three difficulties with this procedure were that only an alive status could be determined, the Register was by state and time permitted only one record to be read against a state, and the Register was a record of only one point in time. Despite these problems, 649 dentists were identified as alive plus some missing data was collected.

A second source of information was the State Boards of Dental Examiners and/or the licensing agency for the State and the constituent and component societies of the American Dental Association. Prior to the mailings to these sources an edit check was completed for the entire file (see Appendix A, XVI, XVII). Mailings to the above included a copy of the record with known data elements, identification number and vital status. The form requested year of latest license renewal or membership, birth date, last known address and, if known to be deceased, date and place of death (see Appendix A, XVIII, XIX and Exhibits VII, VIII, IX, X, XI, XII). Each source was given the option of collecting the information for the study by its own staff for which a small remuneration was provided or permitting the study staff to review the records. Returns from both sources with conflicts in data were resolved in favor of "status unknown" or in the case of missing information, the dental licensing or dental examining board information had precedence over State Associations (see Appendix A, XX, XXI). When final returns were received (all sources responded with varying degrees of success), the data file was updated and death certificates were

ordered or reordered from the states. A core of 1,500 dentists remained lost to trace.

Five additional sources of follow-up were attempted. A 10 percent random sample of the dentists were surveyed by a commercial credit company and also by the Post Office mailing list correction service (see Appendix A, XXV, XXVIII). Neither were successful. It can be conjectured that the follow-up period was too lengthy for either procedure or that while dentists' mobility is restricted in distance, this population is highly mobile. Computer print-outs, alphabetized by name within city and state and by name alone were forwarded to the Bureau of Economic Research and Statistics of the American Dental Association to check against old records and correspondence. The vital status of a little more than 185 dentists' status were resolved by this procedure (see Appendix A, XXVI). A similar print-out was made available to a consultant in follow-up procedures and a country-wide telephone network was established for a two-month period (see Appendix A, XXVII). This procedure was more successful in yielding vital status information on more than 231 dentists. A final procedure but also one that was used continuously throughout the study was contact with professional associates (by noting addresses) and relatives by the principal investigator, a dentist (see Appendix A, XXIX). These telephone contacts were quite successful in resolution of vital status, collection of missing data or identifying place and time of death of known decedents. While contact was easily established, the cost in time was prohibitive.

Finally, the addition and deletion files were resolved. Dummy death certificates were prepared for those deaths reported but for which no certificate could be located. The entire file was reviewed and a sex code was assigned on the basis of the first name. All known deaths had sex indicated on the certificate. An average age at graduation was determined from available information to be 23 years. If only year of birth was known, the year of graduation was determined to be 23 years later. Year of birth was determined if year of graduation was known by subtracting 23 years. Only 144 individuals were missing both year of birth and year of graduation. All up-dates were keypunched and verified and entered to the file. The final cohort numbered 102,726 after deletions because of duplication or death before January 1, 1960.

DESCRIPTION OF THE STUDY GROUP

A total of 102,726 dentists was identified as being eligible for inclusion in the study by meeting the criteria of being listed in the 1960 Dental Directory of the American Dental Association (1960) and their vital status determined as alive as of January 1, 1960. Table 1 describes the age distribution of the dentists by membership status. Only 0.1 percent are unidentified by age. The 1960 Census of Population (1964) reporting on a 5 percent sample adjusted to represent the total population indicates that the number of dentists in that year is 87,110. This number does not include retired persons whose occupation was dentistry. If 65 years of age is an average age of retirement, the present study includes 18,378 retirees. If one-half of the number in the age interval 65-69 is used to adjust for retired dentists, then the number of active dentists in the study is 88,356—a favorable comparison with the Census data. For the year 1960, Glass (1966) reports percentage distributions by age for his cohort of New England dentists. For the present study, no 5-year age interval exceeds those reported percentages for New England dentists by more than 1.8 percent or is less than 1.5 percent. The cumulative percentage of dentists under 65 years of age is 82.1 percent for this study and 78.5 percent for the New England dentists. The percentage of the total number of dentists by membership status is 18.0 percent for nonmembers, 77.3 percent for members and 4.7 percent for life members. This agrees with current estimates that membership in the American Dental Association is about 80 percent of all licensed dentists. Life membership in the Association can only be conferred after reaching 65 years of age and having met a specified number of years of continuous or noncontinuous membership. The increase in the number of nonmembers after age 65 is partly explained by members who reach that age and retire without becoming life members.

The number and percentage of dentists by age and sex is presented in Table 2. Since data on sex were not available except on death certificates, the entire file was reviewed and sex assigned by first name. Conservative assignment probably resulted in an underestimate of females. The 1960 Census of Population (1964) estimates 2.2 percent of the dentists are females while the present study counts only 1.3 percent. Nevertheless the data for this study counts females at between 1 and 2 percent for each age group.

When number and percentage of study dentists are examined by age and year of graduation in Table 3, the largest percentage of graduates were in the years 1950 to 1959. This percentage decreases with time except for the years 1920-1929 where there appears to be a slight increase. This increase is probably nothing more than an artifact and is a reflection of the sudden decrease in graduating dentists in the depression years 1930-1939. In those same years 1930-1939, the average age at graduation also increases. The youngest graduate in the study was 16 years of age and the oldest in his sixties. The greatest number of years in practice is 71 years; on the average this group experienced 24 years of dental practice.

TABLE 1: NUMBER AND PERCENTAGE OF DENTISTS
BY AGE AND MEMBERSHIP STATUS

Age As of 1960 (In Years)	Membership Status				
	Nonmembers	Members	Life Members	Total	Percentage
20-24	5	81	0	86	0.1
25-29	1443	6290	0	7733	7.5
30-34	1273	6743	0	11016	10.7
35-39	1338	14979	0	15317	14.9
40-44	1039	10757	0	11796	11.5
45-49	946	8271	0	9217	9.0
50-54	1129	8214	0	9343	9.1
55-59	1782	8326	0	10108	9.8
60-64	2282	7450	0	9732	9.5
65-69	2463	4523	1031	8017	7.8
70-74	1821	1170	1529	4520	4.4
75-79	1295	420	1134	2849	2.8
80-84	961	119	781	1851	1.8
85-89	445	34	291	770	0.7
90-94	106	9	67	183	0.2
95-99	19	1	9	29	<0.1
100-104	3	0	2	5	<0.1
Unknown	128	15	1	144	0.1
TOTAL	18477	79402	4847	102726	100.0
PERCENTAGE	18.0	77.3	4.7	100.0	100.0

TABLE 2: NUMBER AND PERCENTAGE OF DENTISTS BY AGE AND SEX

Age As of 1960 (In Years)	SEX				
	Male	Percentage	Female	Percentage	Total
20-24	85	.1	1	.1	86
25-29	7677	7.6	56	4.1	7733
30-34	10918	10.8	98	7.1	11016
35-39	15154	15.0	163	11.8	15317
40-44	11655	11.5	141	10.2	11796
45-49	9108	9.0	109	7.9	9217
50-54	9241	9.1	102	7.4	9343
55-59	9980	9.8	128	9.3	10108
60-64	9523	9.4	209	15.2	9732
65-69	7853	7.7	164	11.9	8017
70-74	4430	4.4	90	6.5	4520
75-79	2796	2.8	53	3.8	2849
80-84	1826	1.8	35	2.5	1861
85-89	757	.7	13	0.9	770
90-94	182	.2	1	0.1	183
95-99	29	<.1	0	0.0	29
100-104	5	<.1	0	0.0	5
Unknown	132	.1	12	0.9	144
TOTAL	101351	--	1375	--	102726
PERCENTAGE	98.7	100.0	1.3	100.0	100.0

TABLE 3: NUMBER AND PERCENTAGE OF DENTISTS BY AGE AND YEAR OF GRADUATION

Age As of 1960 (In Years)	Year of Graduation								
	1880-1889	1890-1899	1900-1909	1910-1919	1920-1929	1930-1939	1940-1949	1950-1959	Total
20-24	0	0	0	0	0	0	0	86	86
25-29	0	0	0	0	0	0	0	7733	7733
30-34	0	0	0	0	0	0	327	10689	11016
35-39	0	0	0	0	0	0	7240	8077	15317
40-44	0	0	0	0	0	391	8885	2520	11796
45-49	0	0	0	0	2	5737	3116	362	9217
50-54	0	0	0	0	1149	7574	548	72	9343
55-59	0	0	0	1	7859	2124	107	17	10108
60-64	0	0	0	2059	7245	377	47	4	9732
65-69	0	0	4	6073	1831	81	27	1	8017
70-74	0	0	514	3644	341	18	3	0	4520
75-79	0	1	1771	995	79	2	1	0	2849
80-84	0	176	1472	196	16	1	0	0	1861
85-89	0	368	372	27	3	0	0	0	770
90-94	9	124	47	2	1	0	0	0	183
95-99	9	15	5	0	0	0	0	0	29
100-104	1	4	0	0	0	0	0	0	5
Unknown	--	--	--	--	--	--	--	--	144
TOTAL	19	688	4185	12997	18526	16305	20301	29561	102726
PERCENTAGE*	0.0	0.7	4.1	12.7	18.0	15.9	19.8	28.8	100.0

*Total = 102582, excluding 144 unknown (0.1 percent of grand total).

Table 4 presents the number and percentage of dentists by age and vital status. Only 1.3 percent or 1,370 dentists in the entire study group were lost in follow-up. Nearly 67 percent of this group were older than 60 years of age. While only 1.6 percent of the study group is reported as having died between 1966-1968, this is due to the fact that people in follow-up who lived through the study but died in that period were simply coded as having lived through the study. Approximately 4,470 deaths or more would have been expected between 1966-1968. For the study group as a whole, 8.7 percent or 8,945 died during the six-year period of observation; this includes 259 unrecovered death certificates.

The number and percentage of dentists by membership status and vital status is presented in Table 5. Nonmembers had the largest percentage lost to trace, while life members were next. Only 0.3 percent of members were lost in follow-up. As would be expected, life members, because of their advanced age, experienced the largest percentage of deaths during the study period (35.6 percent) compared with 5.3 percent for members and 16.2 percent for nonmembers. Persons lost in follow-up were generally older and nonmembers.

Only 1.3 percent of the males were lost in follow-up as shown in Table 6. While 5.2 percent of the females were also lost to trace, females comprise 1.3 percent of all dentists in the group. Thus females are disproportionately lost to follow-up.

When the number and percentage of deaths reported among dentists are prescribed by year of death and age as of 1960 in Table 7, the most striking feature is the almost consistent number of deaths over each of the years. The largest percentage of deaths is reported in 1962 and the lowest in 1960, but the difference is only 142 or 1.5 percent. Also important is the almost consistent number of deaths for each age group over each of the years.

Table 8 displays the number and percentage of deaths among dentists by age and sex. The 71 deaths among females represent 0.8 percent of all deaths.

The number and percentage of deaths among dentists by age and membership status is given in Table 9. More than 47 percent of all deaths are among members. Life members contribute 19 percent while the remaining one-third of deaths occurred in the nonmembers. Nevertheless 35 percent of the life members died during the study period while only 16 percent of the nonmembers and 5 percent of the members experienced mortality.

Table 10 describes the number and percentage of deaths among dentists by age at death and year of death. Again the almost consistent number of deaths at each 5-year age interval across years is demonstrated. More important is the distribution of deaths by age. The deaths peak at 65-69 years of age but there is a steady increase to that age and a steady decline thereafter. From 60-79 years of age, 58 percent of all deaths occurred.

Of the 8,945 deaths known to have occurred over the study period, only 259 of the certificates were not obtained. Table 11 gives the number and percentage of death certificates unrecovered by age at death and reported year of death. The 259 deaths represent only 2.8

TABLE 4: NUMBER AND PERCENTAGE OF DENTISTS
BY AGE AND VITAL STATUS

Age As of 1960 (In Years)	Vital Status				
	Died 1960-1965	Died 1966-1968	Alive	Lost to Trace	Total
20-24	0	0	85	1	86
25-29	23	8	7662	40	7733
30-34	76	14	10876	50	11016
35-39	159	48	15054	56	15317
40-44	191	61	11485	59	11796
45-49	298	92	8786	41	9217
50-54	531	126	8629	57	9343
55-59	1025	220	8786	77	10108
60-64	1318	275	7985	154	9732
65-69	1600	272	5960	185	8017
70-74	1185	212	2939	184	4520
75-79	1025	177	1469	178	2849
80-84	901	92	759	109	1861
85-89	470	34	194	72	770
90-94	122	5	34	22	183
95-99	16	0	6	7	29
100-104	4	0	0	1	5
Unknown	1	0	66	77	144
TOTAL	8945	1636	90775	1370	102726
PERCENTAGE	8.7	1.6	88.4	1.3	100.0

TABLE 5: NUMBER AND PERCENTAGE OF DENTISTS
BY MEMBERSHIP STATUS AND VITAL STATUS

Membership Status	Vital Status				
	Died 1960-1965	Died 1966-1968	Alive	Lost to Trace	Total
Nonmembers	2993 (16.2)	417 (2.3)	13991 (75.7)	1076 (5.8)	18477 (100.0)
Members	4226 (5.3)	954 (1.2)	73986 (93.2)	236 (0.3)	79402 (100.0)
Life Members	1726 (35.6)	265 (5.5)	2798 (57.7)	58 (1.2)	4847 (100.0)
TOTAL	8945	1636	90775	1370	102726

TABLE 6: NUMBER AND PERCENTAGE OF DENTISTS BY SEX AND VITAL STATUS

Sex	Vital Status				
	Died 1960-1965	Died 1966-1968	Alive	Lost to Trace	Total
Male	8874 (8.7)	1621 (1.6)	89558 (88.4)	1298 (1.3)	101351 (100.0)
Female	71 (5.2)	15 (1.1)	1217 (88.5)	72 (5.2)	1375 (100.0)
TOTAL	8945	1636	90775	1370	102726

TABLE 7: NUMBER AND PERCENTAGE OF DEATHS* AMONG DENTISTS BY AGE AND YEAR OF DEATH

Age As of 1960 (In Years)	Year of Death							
	1960	1961	1962	1963	1964	1965	Unknown	Total
25-29	3	5	5	3	1	6	0	23
30-34	8	8	17	18	16	9	0	76
35-39	19	20	26	26	35	33	0	159
40-44	23	26	35	32	34	41	0	191
45-49	42	51	53	42	48	62	0	298
50-54	81	76	85	83	102	104	0	531
55-59	139	149	178	180	185	194	0	1025
60-64	192	198	234	228	240	226	0	1318
65-69	256	256	256	303	262	267	0	1600
70-74	191	196	206	209	199	189	0	1185
75-79	150	182	211	167	152	163	0	1025
80-84	175	161	149	155	141	119	1	901
85-89	104	79	79	66	85	57	0	470
90-94	27	24	24	23	16	8	0	122
95-99	6	3	3	2	1	1	0	16
100-104	3	1	0	0	0	0	0	4
Unknown	0	0	0	0	0	0	1	1
TOTAL	1419	1435	1561	1537	1517	1474	2	8945
PERCENTAGE	15.9	16.0	17.4	17.2	17.0	16.5	0.0	100.0

*Includes 259 deaths reported but not verified by recovery of certificates.

TABLE 8: NUMBER AND PERCENTAGE OF DEATHS* AMONG DENTISTS BY AGE AND SEX

Age As of 1960 (In Years)	Sex		
	Male	Female	Total
20-24	0	0	0
25-29	23	0	23
30-34	76	0	76
35-39	158	1	159
40-44	189	2	191
45-49	297	1	298
50-54	526	5	531
55-59	1019	6	1025
60-64	1309	9	1318
65-69	1593	7	1600
70-74	1172	13	1185
75-79	1015	10	1025
80-84	892	9	901
85-89	462	8	470
90-94	122	0	122
95-99	16	0	16
100-104	4	0	4
Unknown	1	0	1
TOTAL	8874	71	8945
PERCENTAGE	99.2	0.8	100.0

*Includes 259 deaths reported but not verified by recovery of certificates.

TABLE 9: NUMBER AND PERCENTAGE OF DEATHS* AMONG DENTISTS BY AGE AND MEMBERSHIP STATUS

Age As of 1960 (In Years)	Membership Status			
	Nonmembers	Members	Life Members	Total
20-24	0	0	0	0
25-29	5	18	0	23
30-34	10	66	0	76
35-39	20	139	0	159
40-44	26	165	0	191
45-49	46	252	0	298
50-54	82	449	0	531
55-59	235	790	0	1025
60-64	348	970	0	1318
65-69	513	846	241	1600
70-74	499	298	388	1185
75-79	465	148	412	1025
80-84	432	60	409	901
85-89	241	19	210	470
90-94	61	5	56	122
95-99	8	1	7	16
100-104	2	0	2	4
Unknown	1	0	0	1
TOTAL	2994	4226	1725	8945
PERCENTAGE	33.5	47.2	19.3	100.0

*Includes 259 deaths reported but not verified by recovery of certificates.

TABLE 10: NUMBER AND PERCENTAGE OF DEATHS* AMONG DENTISTS BY AGE AT DEATH AND YEAR OF DEATH

Age At Death (In Years)	Year of Death							
	1960	1961	1962	1963	1964	1965	Unknown	Total
20-29	3	5	2	1	0	0	0	11
30-34	8	8	11	6	1	6	0	40
35-39	19	19	21	25	22	9	0	115
40-44	23	21	33	26	37	33	0	173
45-49	42	43	48	38	32	41	0	244
50-54	81	70	59	50	59	62	0	381
55-59	139	132	150	125	121	104	0	771
60-64	192	187	199	200	193	194	0	1165
65-69	256	263	288	278	242	226	0	1553
70-74	191	211	205	254	254	267	0	1382
75-79	150	165	201	191	202	184	0	1093
80-84	175	170	179	162	146	163	0	995
85-89	104	107	119	128	130	119	0	707
90-94	27	25	41	43	69	57	0	262
95-99	6	8	4	10	8	8	0	44
100-104	3	1	1	0	1	1	0	7
Unknown	0	0	0	0	0	0	2	2
TOTAL	1419	1435	1561	1537	1517	1474	2	8945
PERCENTAGE	15.9	16.0	17.4	17.2	17.0	16.5	0.0	100.0

*Includes 259 deaths reported but not verified by recovery of certificates.

TABLE 11: NUMBER AND PERCENTAGE OF DEATH CERTIFICATES UNRECOVERED BY AGE AT DEATH AND REPORTED YEAR OF DEATH

Age At Death (In Years)	Reported Year of Death							
	1960	1961	1962	1963	1964	1965	Unknown	Total
25-29	0	1	0	0	0	0	0	1
30-34	0	0	0	1	0	1	0	2
35-39	1	1	0	0	0	0	0	2
40-44	2	0	0	1	3	2	0	8
45-49	1	2	1	3	1	4	0	12
50-54	2	3	1	3	2	2	0	13
55-59	6	1	2	5	5	6	0	25
60-64	4	4	6	8	6	9	0	37
65-69	12	4	7	8	5	6	0	42
70-74	3	6	7	8	7	9	0	40
75-79	6	0	5	10	7	2	0	30
80-84	2	3	6	4	5	3	0	23
85-89	5	2	2	3	2	2	0	16
90-94	0	2	1	3	1	1	0	8
Unknown	0	0	0	0	0	0	2	2
TOTAL	44	29	38	57	44	47	2	259
PERCENTAGE	17.0	11.2	14.7	22.0	17.0	18.1	0.0	100.0

percent of all certificates. The percentage unrecovered by year of death varies from a high of 22 percent in 1963 to a low of 11 percent in 1961. Again, except for the year 1961, the number of deaths is rather consistent. The number of deaths demonstrates the same slow increase to age group 65-69 and the gradual decline thereafter. This is what would be expected in a closed group over a short time. The same 58 percent of deaths occurred in the 60-79 age interval as shown in Table 10.

The distribution of dentists by specialty is presented in Table 12. General practitioners represent 92.5 percent of the total with only orthodontists and oral surgeons having appreciable numbers in their specialty. It should be cautioned that many dentists limit their practice to a particular specialty but are not classified as such in this Directory.

Finally, the study group demonstrates a size not inconsistent with Census data, and an age distribution comparable to another study (Glass, 1966). Membership status is consistent with best estimates. Sex may have been underestimated for the female population of dentists. Numbers at all graduation dates are consistent over the entire study group. Vital status demonstrated only 1.3 percent of the study group lost to follow-up. Nonmembers are more likely to be lost to trace, as would be expected, followed by life members. Life members experienced the largest percentage of deaths over the study period because of their advanced age. Females were disproportionately lost to trace and this probably reflects name changes with marriage. Reported total numbers of deaths are consistent over the years of the study and at each age interval (as of 1960) are consistent over each year. Age at death by year of death describes a consistent number of deaths at each 5-year age interval across years. Deaths show a steady increase to age 65-69 and a decline thereafter. These findings are also demonstrated for unrecovered death certificates. Distribution by specialty indicates that analysis by character of practice is not feasible using the Directory. All of the data demonstrate a consistency across all variables; if errors exist in the study design, they are random and do not appear to bias the results.

TABLE 12: NUMBER AND PERCENTAGE OF DENTISTS BY CHARACTER OF PRACTICE

Character of Practice	Number	Percentage
General Practioner	95070	92.5
Orthodontist	1982	1.9
Oral Surgeon	1066	1.0
Periodontist	268	0.3
Prosthodontist	225	0.2
Pedodontist	174	0.2
Oral Pathologist	22	0.0
Public Health	12	0.0
Sub-Total	98819	96.1
Full Time Faculty	737	0.7
Full Time Dental Internship or Residency	391	0.4
Full Time State Public Dental Health Program	381	0.4
Full Time Dental Association Administration	19	0.0
Full Time in Commercial Agency Dental Field	42	0.0
Retired	2271	2.2
Other Profession	60	0.1
TOTAL	102726	99.9

ANALYSIS

Both Proportional Mortality Ratios (PMR) and Standardized Mortality Ratios (SMR) using the United States general population's mortality experience as comparison were calculated. In addition, the mortality experience of the dentists was compared to that of members of three medical societies.

Proportional Mortality Ratios

The deaths among the dentists were grouped by year of death, age at death, and cause of death for white males, nonwhite males and white females. (There were only 2 nonwhite female deaths.) The ages of death were grouped by five-year age intervals (20-24, 25-29...95 and over). The numbers of deaths for each calendar year, age group, and cause were abstracted for each sex-race group from the respective U.S. Vital Statistics Reports, 1960-1965.

The expected numbers of deaths in each sex-race group for each cause and age group in a calendar year were obtained by multiplying the proportion of deaths from a specific cause in a given age group for a particular calendar year in the general population by the total number of deaths for that age group among the dentists. These expected numbers were then summed over all calendar years and all age groups to give the expected number for a particular cause group.

Symbolically, within each sex-race group let

i = calendar years
j = age group
k = cause group

d_{ijk} = deaths in year i, in age group j from cause k among the dentists

D_{ijk} = deaths in year i, in age group j, from cause k among the general population

$(\hat{d}_{ijk})$ = the expected number of deaths in year i, age group j from cause k among dentists

$$\hat{d}_{ijk} = (d_{ij+})\ (D_{ijk}/D_{ij+})$$

$$\hat{d}_{++k} = \sum_i \sum_j \hat{d}_{ijk} = \text{expected number of deaths among dentists from cause } k$$

$$PMR_k = d_{++k}/\hat{d}_{++k}$$

The PMR for any particular cause is the ratio of the expected deaths in a cause group to the observed deaths from those causes.

The significance of the PMR was determined by an adaptation of the Mantel-Haenszel (1969) procedure as described by Li, et al. (1969).

Standardized Mortality Ratios

Although it was possible to classify the dead dentists by sex and color because these items were recorded on the death certificates, it was not possible to classify the entire study population by sex and color because the original file did not contain these data.

The method used to ascertain the number of females has been described elsewhere.

The inability to identify the male dentists by color presented a problem in the definition of a comparison population.

According to the 1960 census, about 3.5 percent of all dentists were nonwhite while 12-13 percent of the total population were nonwhite. Using total male population rates would give expected numbers that would be too high. It was felt that if the analysis were confined to members and life members of the American Dental Association, a nearly all white population would be defined. Since only 2.3 percent of the deaths were nonwhite, using the death rates of the total white population compared to the total study population would cause little bias because of color.

Person years at risk were used to calculate expected numbers of deaths. The person years for each calendar year were calculated by assuming that a person at any particular age lived half his age year in one calendar year and half in the next.

	Person Years Lived Calendar Year					
Age in 1960	1960	1961	1962	1963	1964	1965
26	.5	.5				
27		.5	.5			
28			.5	.5		
29				.5	.5	
30					.5	.5
31						.5

The person years were summed for individual years of age and then grouped into five-year age groups for each calendar year.

Persons of unknown vital status were withdrawn alive halfway through the study. These were so few that they contributed relatively few person years.

United States mortality rates were obtained by using the numbers of deaths for white females and white males in each calendar year 1960-1965 by age and cause group that were abstracted for the PMR analysis and dividing them by the appropriate U.S. Census population estimates.

Within each sex group, for each calendar year, the expected number of deaths was obtained by multiplying the mortality rate by the person years at risk. These were then summed over all calendar years and ages to give the expected number for a cause.

Symbolically, within each sex, let

i = calendar year
j = age group
k = cause

m_{ijk} = U.S. mortality rate for year i, age group j, cause k

Y_{ij} = person years at risk in year i, age group j

d_{ijk} = observed deaths in calendar year i, age j, from cause k

d^*_{ijk} = expected deaths in calendar year i, age j, from cause k

$$d^*_{ijk} = m_{ijk} Y_{ij}$$

$$d^*_{++k} = \sum_i \sum_j d^*_{ijk}$$

$$SMR_k = d_{++k}/d^*_{++k}$$

Standardized Mortality Ratios (SMR) were obtained by dividing the observed deaths for each cause by the expected deaths.

If one assumes that the observed mortality rates can be approximated by a Poisson variable, the SMR can be tested for significance using Table 40, "confidence limits for the expectation of a Poisson variable" in Biometrika Tables for Statisticians (1958). The tabled values of the upper and lower limits are divided by the observed number to give an upper and lower SMR. For d_{++k} greater than 50, the general formula given by Haenszel, et al. (1962)

$$1/d \; (d + .5t^2 \pm .5 \pm (dt^2 + .25t^4 \pm .5t^2)^{1/2})$$

where d is the observed number of deaths and t is students t for the desired probability level.

In comparing the dentists to the physicians, the same procedure was used, substituting the rates of the dentists for that of the general population and using the person years at risk among the physicians.

RESULTS

Proportional Mortality Ratios

The PMR's for nonwhite males and for females are not remarkable (Tables 13 and 14). Nonwhite male dentists exhibit proportionally more deaths from cancer than nonwhite males in general, primarily cancer of the intestines. Cancer of the intestine has been noted to be related to socioeconomic class and hence this difference is probably more socioeconomic than occupational in origin. There were too few female deaths to isolate significant departures from expected.

For white male dentists (Table 15), the PMR's suggest that dentists die significantly more frequently from:

Cancer of the intestine
Cancer of the pancreas
Malignant lymphomas
Leukemia
Suicide

They die significantly less frequently from stomach cancer and mental disease.

Standardized Mortality Ratios

Women (Table 16).

The overall SMR for women using only known deaths was .49. As might be expected the SMR was less than 1 for most causes. Significant deficiencies were observed among all cancers, cerebral vascular lesions, and non-malignant respiratory disease. If the known deaths from unknown causes are distributed as all other deaths, the deficiencies are still present.

Unfortunately 72 of the females were lost to trace. If one assumes the extreme, that is, that all these women are dead, then the total SMR would be 1.01. Again if it is assumed that if dead, these deaths are distributed by cause as the known deaths then the deficiencies for all cancer would disappear (SMR $\approx$ 1.09) and hypertension without heart disease would be significantly greater than 1 (SMR $\approx$ 5.41).

It is highly unlikely that these women were lost to trace because of death, but rather because of name change due to marriage. Hence the women probably have significantly lower overall mortality than the general female population with no remarkable excesses or deficiencies by cause.

TABLE 13: PROPORTIONAL MORTALITY RATIOS 1960-1965
NONWHITE MALE DENTISTS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
All causes (001-999)	Observed	0.00	9.00	8.00	39.00	105.00	42.00	6.00	0.00	209.00
	Expected	0.00	9.00	8.00	39.00	105.00	42.00	6.00	0.00	209.00
	PMR	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
All cancer (140-205)	Observed	0.00	2.00	2.00	5.00	26.00	9.00	3.00	0.00	47.00
	Expected	0.00	0.85	1.29	7.09	18.00	5.52	0.61	0.00	33.36
	PMR	0.00	2.36	1.55	0.71	1.44	1.63	4.91	0.00	1.41
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.00	0.04	0.06	0.22	0.42	0.10	0.02	0.00	0.86
	PMR	0.00	0.00	0.00	0.00	2.39	0.00	0.00	0.00	1.17
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
	Expected	0.00	0.04	0.11	0.42	0.90	0.24	0.01	0.00	1.72
	PMR	0.00	0.00	0.00	0.00	0.00	4.14	0.00	0.00	0.58
CA stomach (151)	Observed	0.00	0.00	0.00	0.00	3.00	0.00	1.00	0.00	4.00
	Expected	0.00	0.08	0.13	0.83	2.39	0.76	0.08	0.00	4.27
	PMR	0.00	0.00	0.00	0.00	1.25	0.00	12.22	0.00	0.94
CA intestines (152-153)	Observed	0.00	0.00	1.00	1.00	5.00	1.00	0.00	0.00	8.00
	Expected	0.00	0.05	0.07	0.45	1.31	0.46	0.05	0.00	2.38
	PMR	0.00	0.00	15.24	2.24	3.81	2.16	0.00	0.00	3.35
CA rectum (154)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00
	Expected	0.00	0.02	0.03	0.19	0.52	0.18	0.03	0.00	0.96
	PMR	0.00	0.00	0.00	0.00	1.93	5.62	0.00	0.00	2.07

TABLE 13: PROPORTIONAL MORTALITY RATIOS 1960-1965
NONWHITE MALE DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Expected	0.00	0.03	0.04	0.21	0.48	0.15	0.02	0.00	0.92
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	62.11	0.00	1.09
CA pancreas (157)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.00	0.04	0.08	0.43	1.09	0.29	0.03	0.00	1.96
	PMR	0.00	0.00	0.00	0.00	0.92	0.00	0.00	0.00	0.51
CA respiratory system (160-164)	Observed	0.00	0.00	0.00	1.00	3.00	1.00	1.00	0.00	6.00
	Expected	0.00	0.26	0.42	1.98	3.87	0.70	0.05	0.00	7.28
	PMR	0.00	0.00	0.00	0.50	0.78	1.43	18.98	0.00	0.82
CA prostate (177)	Observed	0.00	0.00	1.00	2.00	3.00	4.00	0.00	0.00	10.00
	Expected	0.00	0.01	0.04	0.78	3.51	1.72	0.22	0.00	6.28
	PMR	0.00	0.00	23.42	2.55	0.85	2.33	0.00	0.00	1.59
CA kidney (180)	Observed	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
	Expected	0.00	0.02	0.02	0.10	0.21	0.04	0.01	0.00	0.41
	PMR	0.00	43.86	0.00	0.00	0.00	0.00	0.00	0.00	2.47
CA bladder (181)	Observed	0.00	0.00	0.00	1.00	3.00	0.00	0.00	0.00	4.00
	Expected	0.00	0.01	0.03	0.19	0.55	0.17	0.02	0.00	0.96
	PMR	0.00	0.00	0.00	5.27	5.47	0.00	0.00	0.00	4.15
CA brain (193)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.00	0.03	0.02	0.07	0.07	0.01	0.00	0.00	0.21
	PMR	0.00	0.00	0.00	0.00	13.99	0.00	0.00	0.00	4.83

TABLE 13: PROPORTIONAL MORTALITY RATIOS 1960-1965
NONWHITE MALE DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Malignant lymphomas (200-203,205)	Observed	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	3.00
	Expected	0.00	0.08	0.07	0.30	0.62	0.14	0.01	0.00	1.21
	PMR	0.00	0.00	0.00	0.00	4.81	0.00	0.00	0.00	2.48
Leukemia (204)	Observed	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	3.00
	Expected	0.00	0.04	0.03	0.17	0.44	0.14	0.02	0.00	0.83
	PMR	0.00	25.97	0.00	0.00	2.27	7.29	0.00	0.00	3.63
Other cancer (REM 140-205)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.00	0.11	0.15	0.74	1.62	0.43	0.06	0.00	3.11
	PMR	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.32
Diabetes mellitus (260)	Observed	0.00	1.00	0.00	1.00	3.00	2.00	1.00	0.00	8.00
	Expected	0.00	0.12	0.11	0.68	1.70	0.54	0.06	0.00	3.21
	PMR	0.00	8.26	0.00	1.48	1.76	3.71	17.83	0.00	2.49
Mental disorders (304-326)	Observed	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00
	Expected	0.00	0.17	0.09	0.14	0.19	0.04	0.01	0.00	0.63
	PMR	0.00	11.47	0.00	0.00	0.00	0.00	0.00	0.00	3.18
Cerebral vascular lesions (330-334)	Observed	0.00	0.00	1.00	5.00	12.00	4.00	0.00	0.00	22.00
	Expected	0.00	0.58	0.80	5.07	15.87	7.12	1.03	0.00	30.47
	PMR	0.00	0.00	1.25	0.99	0.76	0.56	0.00	0.00	0.72
Hypertension with heart disease (440-443)	Observed	0.00	0.00	0.00	3.00	5.00	4.00	0.00	0.00	12.00
	Expected	0.00	0.46	0.52	2.93	7.95	3.11	0.40	0.00	15.37
	PMR	0.00	0.00	0.00	1.02	0.63	1.29	0.00	0.00	0.78

TABLE 13: PROPORTIONAL MORTALITY RATIOS 1960-1965
NONWHITE MALE DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Hypertension without heart disease (444-447)	Observed	0.00	1.00	0.00	0.00	2.00	1.00	0.00	0.00	4.00
	Expected	0.00	0.24	0.14	0.43	1.18	0.53	0.09	0.00	2.61
	PMR	0.00	4.12	0.00	0.00	1.69	1.89	0.00	0.00	1.53
Other circulatory disease (400-439,448-468)	Observed	0.00	2.00	3.00	18.00	37.00	15.00	1.00	0.00	76.00
	Expected	0.00	1.67	2.19	12.84	37.06	16.17	2.53	0.00	72.46
	PMR	0.00	1.20	1.37	1.40	1.00	0.93	0.40	0.00	1.05
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	0.00	1.00	3.00	2.00	0.00	0.00	6.00
	Expected	0.00	0.52	0.42	2.07	5.92	2.40	0.36	0.00	11.68
	PMR	0.00	0.00	0.00	0.48	0.51	0.83	0.00	0.00	0.51
Cirrhosis of the liver (581)	Observed	0.00	0.00	1.00	1.00	2.00	0.00	0.00	0.00	4.00
	Expected	0.00	0.35	0.21	0.46	0.53	0.09	0.00	0.00	1.65
	PMR	0.00	0.00	4.73	2.17	3.77	0.00	0.00	0.00	2.43
Nephritis-nephroses (590-594)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	2.00
	Expected	0.00	0.16	0.13	0.49	1.32	0.63	0.10	0.00	2.84
	PMR	0.00	0.00	0.00	0.00	0.00	1.60	10.38	0.00	0.71
Ill defined causes (780-795)	Observed	0.00	0.00	0.00	2.00	0.00	1.00	0.00	0.00	3.00
	Expected	0.00	0.29	0.25	1.16	3.28	1.57	0.26	0.00	6.82
	PMR	0.00	0.00	0.00	1.72	0.00	0.64	0.00	0.00	0.44
Accidents (800-962)	Observed	0.00	1.00	0.00	1.00	3.00	0.00	0.00	0.00	5.00
	Expected	0.00	1.34	0.64	1.56	2.68	0.93	0.12	0.00	7.27
	PMR	0.00	0.74	0.00	0.64	1.12	0.00	0.00	0.00	0.69

TABLE 13: PROPORTIONAL MORTALITY RATIOS 1960-1965
NONWHITE MALE DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Suicide (963,970-979)	Observed	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	2.00
	Expected	0.00	0.14	0.06	0.14	0.22	0.05	0.00	0.00	0.61
	PMR	0.00	0.00	0.00	7.10	4.61	0.00	0.00	0.00	3.26
All other causes (REM 001-999)	Observed	0.00	0.00	1.00	1.00	11.00	3.00	0.00	0.00	16.00
	Expected	0.00	2.09	1.13	3.94	9.10	3.32	0.44	0.00	20.01
	PMR	0.00	0.00	0.89	0.25	1.21	0.90	0.00	0.00	0.80

Number of cases - 209

TABLE 14: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
All causes (001-999)	Observed	0.00	0.00	2.00	12.00	13.00	20.00	7.00	0.00	54.00
	Expected	0.00	0.00	2.00	12.00	13.00	20.00	7.00	0.00	54.00
	PMR	0.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
All cancer (140-205)	Observed	0.00	0.00	1.00	5.00	3.00	4.00	1.00	0.00	14.00
	Expected	0.03	0.02	0.76	3.73	2.67	2.45	0.51	0.02	10.12
	PMR	0.00	0.00	1.32	1.34	1.12	1.63	1.96	0.00	1.38
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.03	0.08	0.04	0.04	0.02	0.02	0.19
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.06	0.04	0.03	0.02	0.02	0.14
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA stomach (151)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00
	Expected	0.03	0.02	0.02	0.15	0.17	0.20	0.05	0.02	0.59
	PMR	0.00	0.00	0.00	0.00	6.02	4.88	0.00	0.00	3.37
CA intestines (152-153)	Observed	0.00	0.00	0.00	2.00	0.00	1.00	0.00	0.00	3.00
	Expected	0.03	0.02	0.06	0.45	0.40	0.44	0.10	0.02	1.45
	PMR	0.00	0.00	0.00	4.48	0.00	2.27	0.00	0.00	2.07
CA rectum (154)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.12	0.11	0.12	0.04	0.02	0.40
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 14: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.08	0.07	0.07	0.02	0.02	0.24
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA pancreas (157)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.17	0.16	0.15	0.04	0.02	0.54
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA respiratory system (160-164)	Observed	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00
	Expected	0.03	0.02	0.05	0.23	0.14	0.11	0.03	0.02	0.55
	PMR	0.00	0.00	0.00	8.85	0.00	0.00	0.00	0.00	3.66
CA of the breast (170)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
	Expected	0.03	0.02	0.23	0.82	0.44	0.35	0.08	0.02	1.91
	PMR	0.00	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.52
CA of the genital organs (171-179)	Observed	0.00	0.00	1.00	0.00	1.00	1.00	1.00	0.00	4.00
	Expected	0.03	0.02	0.17	0.76	0.44	0.30	0.06	0.02	1.73
	PMR	0.00	0.00	5.92	0.00	2.27	3.28	17.83	0.00	2.31
CA kidney (180)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.06	0.05	0.04	0.02	0.02	0.16
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA bladder (181)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.09	0.03	0.02	0.02	0.02	0.15
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 14: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
CA brain (193)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.09	0.03	0.02	0.02	0.02	0.15
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Malignant lymphomas (200-203,205)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.03	0.18	0.13	0.09	0.02	0.02	0.45
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leukemia (204)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.11	0.10	0.10	0.03	0.02	0.35
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other cancer (REM 140-205)	Observed	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	2.00
	Expected	0.03	0.02	0.05	0.31	0.30	0.31	0.07	0.02	1.05
	PMR	0.00	0.00	0.00	3.19	3.30	0.00	0.00	0.00	1.91
Diabetes mellitus (260)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.03	0.40	0.48	0.49	0.08	0.02	1.48
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mental disorders (304-326)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.07
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cerebral vascular lesions (330-334)	Observed	0.00	0.00	0.00	2.00	2.00	2.00	0.00	0.00	6.00
	Expected	0.03	0.02	0.15	1.09	1.76	3.68	1.41	0.02	8.08
	PMR	0.00	0.00	0.00	1.83	1.14	0.54	0.00	0.00	0.74

TABLE 14: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Hypertension with heart disease (440-443)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Expected	0.03	0.02	0.04	0.41	0.62	1.08	0.37	0.02	2.52
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00	0.40
Hypertension without heart disease (444-447)	Observed	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	3.00
	Expected	0.03	0.02	0.02	0.07	0.09	0.19	0.08	0.02	0.43
	PMR	0.00	0.00	0.00	0.00	0.00	15.88	0.00	0.00	6.97
Other circulatory disease (400-439,448-468)	Observed	0.00	0.00	0.00	4.00	6.00	10.00	5.00	0.00	25.00
	Expected	0.03	0.02	0.43	4.00	5.53	9.36	3.53	0.02	22.84
	PMR	0.00	0.00	0.00	1.00	1.08	1.07	1.42	0.00	1.09
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00
	Expected	0.03	0.02	0.06	0.35	0.40	0.81	0.38	0.02	2.00
	PMR	0.00	0.00	0.00	2.85	0.00	0.00	0.00	0.00	0.50
Cirrhosis of the liver (581)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
	Expected	0.03	0.02	0.07	0.21	0.10	0.05	0.02	0.02	0.43
	PMR	0.00	0.00	0.00	0.00	0.00	19.34	0.00	0.00	2.30
Nephritis-nephroses (590-594)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.09	0.08	0.11	0.04	0.02	0.34
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ill defined causes (780-795)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.02	0.08	0.07	0.13	0.07	0.02	0.37
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 14: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Accidents (800-962)	Observed	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	2.00
	Expected	0.03	0.02	0.11	0.36	0.28	0.51	0.23	0.02	1.49
	PMR	0.00	0.00	9.26	0.00	3.53	0.00	0.00	0.00	1.35
Suicide (963,970-979)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.03	0.02	0.06	0.13	0.04	0.02	0.02	0.02	0.25
	PMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All other causes (REM 001-999)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.03	0.02	0.25	1.05	0.88	1.10	0.30	0.02	3.58
	PMR	0.00	0.00	0.00	0.00	1.14	0.00	0.00	0.00	0.28

Number of cases - 54

TABLE 15: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE MALE DENTISTS BY MEMBERSHIP; MEMBERS, LIFE MEMBERS, NONMEMBERS

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
All causes (001-999)	Observed	57.00	275.00	617.00	1867.00	2700.00	1972.00	858.00	37.00	8383.00
	Expected	57.00	275.00	617.00	1867.00	2700.00	1972.00	858.00	37.00	8383.00
	PMR	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
All cancer (140-205)	Observed	7.00	53.00	128.00	363.00	513.00	288.00	108.00	1.00	1461.00
	Expected	6.75	39.18	111.58	386.41	514.81	273.85	75.16	1.67	1409.42
	PMR	1.04	1.35	1.15	0.94	1.00	1.05	1.44	0.60	1.04
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	5.00	12.00	9.00	6.00	4.00	0.00	36.00
	Expected	0.09	1.04	5.05	14.68	14.90	7.39	2.46	0.08	45.69
	PMR	0.00	0.00	0.99	0.82	0.60	0.81	1.63	0.00	0.79
CA esophagus (150)	Observed	0.00	0.00	5.00	10.00	10.00	4.00	2.00	0.00	31.00
	Expected	0.02	0.46	2.80	10.65	12.76	5.83	1.47	0.04	34.03
	PMR	0.00	0.00	1.78	0.94	0.78	0.69	1.36	0.00	0.91
CA stomach (151)	Observed	0.00	1.00	6.00	19.00	20.00	10.00	2.00	0.00	58.00
	Expected	0.22	1.98	6.53	24.37	41.38	27.32	7.39	0.15	109.33
	PMR	0.00	0.50	0.92	0.78	0.48	0.37	0.27	0.00	0.53
CA intestines (152-153)	Observed	1.00	1.00	17.00	54.00	73.00	48.00	16.00	1.00	211.00
	Expected	0.36	2.86	8.54	32.87	53.06	33.46	9.43	0.21	140.79
	PMR	2.82	0.35	1.99	1.64	1.38	1.43	1.70	4.80	1.50
CA rectum (154)	Observed	0.00	3.00	5.00	17.00	23.00	10.00	4.00	0.00	62.00
	Expected	0.14	1.11	3.80	13.66	22.21	13.24	3.82	0.06	58.04
	PMR	0.00	2.70	1.32	1.24	1.04	0.76	1.05	0.00	1.07

TABLE 15: PROPORTIONAL MORTALITY RATIOS 1960-1966
WHITE MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
CA liver (155.0,156.1)	Observed	1.00	0.00	0.00	5.00	15.00	5.00	0.00	0.00	26.00
	Expected	0.08	0.48	1.84	8.02	10.44	4.91	1.27	0.02	27.06
	PMR	13.19	0.00	0.00	0.62	1.44	1.02	0.00	0.00	0.96
CA pancreas (157)	Observed	0.00	2.00	16.00	39.00	46.00	20.00	5.00	0.00	128.00
	Expected	0.14	1.83	6.53	23.76	31.64	15.82	3.93	0.08	83.74
	PMR	0.00	1.09	2.45	1.64	1.45	1.26	1.27	0.00	1.53
CA respiratory system (160-164)	Observed	0.00	10.00	33.00	79.00	125.00	37.00	12.00	0.00	296.00
	Expected	0.69	9.52	37.93	135.41	145.29	42.31	6.37	0.08	377.61
	PMR	0.00	1.05	0.87	0.58	0.86	0.87	1.88	0.00	0.78
CA prostate (177)	Observed	0.00	0.00	1.00	24.00	44.00	61.00	38.00	0.00	168.00
	Expected	0.01	0.11	1.45	16.17	50.88	53.61	19.64	0.39	142.26
	PMR	0.00	0.00	0.69	1.48	0.86	1.14	1.93	0.00	1.18
CA kidney (180)	Observed	0.00	2.00	5.00	9.00	12.00	5.00	0.00	0.00	33.00
	Expected	0.10	1.04	3.40	9.95	11.61	4.60	0.76	0.02	31.48
	PMR	0.00	1.92	1.47	0.90	1.03	1.09	0.00	0.00	1.05
CA bladder (181)	Observed	0.00	0.00	3.00	8.00	23.00	21.00	7.00	0.00	62.00
	Expected	0.03	0.36	2.14	11.58	21.93	14.61	4.58	0.13	55.36
	PMR	0.00	0.00	1.40	0.69	1.05	1.44	1.53	0.00	1.12
CA brain (193)	Observed	1.00	3.00	2.00	13.00	14.00	3.00	1.00	0.00	37.00
	Expected	0.78	3.38	5.66	11.27	6.68	0.94	0.07	0.00	28.76
	PMR	1.28	0.89	0.35	1.15	2.10	3.21	15.13	0.00	1.29

TABLE 15: PROPORTIONAL MORTALITY RATIOS 1960-1966
WHITE MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Malignant lymphomas (200-203,205)	Observed	1.00	10.00	14.00	22.00	30.00	13.00	3.00	0.00	93.00
	Expected	1.45	5.16	7.83	19.63	22.88	9.26	1.74	0.04	67.98
	PMR	0.69	1.94	1.79	1.12	1.31	1.40	1.73	0.00	1.37
Leukemia (204)	Observed	0.00	11.00	7.00	14.00	27.00	22.00	5.00	0.00	86.00
	Expected	0.83	2.94	4.69	13.55	20.51	12.11	3.30	0.07	57.99
	PMR	0.00	3.75	1.49	1.03	1.32	1.82	1.51	0.00	1.48
Other cancer (REM 140-205)	Observed	3.00	10.00	9.00	38.00	42.00	23.00	9.00	0.00	134.00
	Expected	1.82	6.91	13.35	40.78	48.67	28.33	8.94	0.30	149.10
	PMR	1.65	1.45	0.67	0.93	0.86	0.81	1.01	0.00	0.90
Diabetes mellitus (260)	Observed	2.00	2.00	6.00	29.00	48.00	27.00	4.00	0.00	118.00
	Expected	1.02	4.14	7.26	25.74	41.92	28.41	8.02	0.17	116.68
	PMR	1.96	0.48	0.83	1.13	1.14	0.95	0.50	0.00	1.01
Mental disorders (304-326)	Observed	0.00	1.00	0.00	0.00	2.00	2.00	0.00	0.00	5.00
	Expected	0.50	2.85	4.35	6.29	4.17	1.53	0.74	0.04	20.48
	PMR	0.00	0.35	0.00	0.00	0.48	1.30	0.00	0.00	0.24
Cerebral vascular lesions (330-334)	Observed	2.00	11.00	27.00	100.00	273.00	329.00	154.00	6.00	902.00
	Expected	1.41	9.06	26.47	113.50	257.31	291.42	146.24	5.73	851.14
	PMR	1.42	1.21	1.02	0.88	1.06	1.13	1.05	1.05	1.06
Hypertension with heart disease (440-443)	Observed	0.00	3.00	9.00	38.00	50.00	53.00	30.00	2.00	185.00
	Expected	0.20	2.15	8.90	38.58	69.19	63.34	28.54	1.07	211.96
	PMR	0.00	1.39	1.01	0.98	0.72	0.84	1.05	1.87	0.87

TABLE 15: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	85-94	Over 95	Total
Hypertension without heart disease (444-447)	Observed	0.00	1.00	3.00	5.00	18.00	17.00	14.00	0.00	58.00
	Expected	0.17	1.05	2.35	6.83	13.93	16.60	9.69	0.44	51.05
	PMR	0.00	0.96	1.28	0.73	1.29	1.02	1.44	0.00	1.14
Other circulatory disease (400-439,448-468)	Observed	7.00	81.00	295.00	1000.00	1342.00	972.00	407.00	18.00	4122.00
	Expected	7.18	87.55	272.91	884.17	1292.08	955.64	436.40	20.09	3956.02
	PMR	0.98	0.93	1.08	1.13	1.04	1.02	0.93	0.90	1.04
Non-malignant respiratory disease (470-527)	Observed	0.00	4.00	8.00	58.00	106.00	95.00	42.00	5.00	318.00
	Expected	1.47	8.77	23.75	95.13	164.51	121.38	57.66	3.09	475.75
	PMR	0.00	0.46	0.34	0.61	0.64	0.78	0.73	1.62	0.67
Cirrhosis of the liver (581)	Observed	1.00	10.00	21.00	33.00	32.00	15.00	2.00	0.00	114.00
	Expected	1.02	10.22	23.69	41.22	31.58	8.41	1.44	0.03	117.62
	PMR	0.98	0.98	0.89	0.80	1.01	1.78	1.39	0.00	0.97
Nephritis-nephroses (590-594)	Observed	2.00	1.00	6.00	10.00	16.00	13.00	8.00	0.00	56.00
	Expected	1.12	3.43	4.96	10.56	13.39	11.41	5.63	0.25	50.75
	PMR	1.78	0.29	1.21	0.95	1.20	1.14	1.42	0.00	1.10
Ill defined causes (780-795)	Observed	2.00	4.00	4.00	12.00	10.00	7.00	10.00	1.00	50.00
	Expected	0.72	4.04	7.53	17.99	20.76	13.61	6.64	0.50	71.79
	PMR	2.79	0.99	0.53	0.67	0.48	0.51	1.51	2.01	0.70
Accidents (800-962)	Observed	20.00	48.00	37.00	67.00	77.00	40.00	19.00	1.00	309.00
	Expected	22.29	53.09	49.32	72.77	66.28	46.58	23.40	1.16	334.89
	PMR	0.90	0.90	0.75	0.92	1.16	0.86	0.81	0.86	0.92

TABLE 15: PROPORTIONAL MORTALITY RATIOS 1960-1965
WHITE MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	85-94	OVER 95	Total
Suicide (963,970-979)	Observed	10.00	37.00	36.00	49.00	28.00	14.00	1.00	0.00	175.00
	Expected	5.64	19.02	21.88	33.10	22.63	10.31	2.48	0.04	115.09
	PMR	1.77	1.95	1.65	1.48	1.24	1.36	0.40	0.00	1.52
All other causes (REM 001-999)	Observed	4.00	19.00	37.00	103.00	185.00	100.00	59.00	3.00	510.00
	Expected	7.51	30.45	52.02	134.64	187.42	129.58	55.96	2.72	600.30
	PMR	0.53	0.62	0.71	0.76	0.99	0.77	1.05	1.10	0.85

Number of cases - 8383

TABLE 16: STANDARDIZED MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	0.00	1.00	4.00	17.00	15.00	24.00	8.00	69.00
	Expected	0.52	3.18	5.94	18.24	46.75	43.02	22.07	139.73
	SMR	0.00	0.31	0.67	0.93	0.32	0.56	0.36	0.49*
All cancer (140-205)	Observed	0.00	0.00	1.00	4.00	2.00	4.00	1.00	12.00
	Expected	0.11	1.00	2.07	5.04	8.75	4.61	1.25	22.83
	SMR	0.00	0.00	0.48	0.79	0.23	0.87	0.80	0.53*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.01	0.04	0.10	0.15	0.08	0.03	0.42
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.00	0.02	0.07	0.12	0.07	0.02	0.31
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA stomach (151)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	2.00
	Expected	0.00	0.03	0.06	0.23	0.59	0.44	0.14	1.50
	SMR	0.00	0.00	0.00	0.00	1.69	2.26	0.00	1.33
CA intestines (152-153)	Observed	0.00	0.00	0.00	2.00	0.00	1.00	0.00	3.00
	Expected	0.01	0.07	0.19	0.68	1.47	0.94	0.28	3.64
	SMR	0.00	0.00	0.00	2.96	0.00	1.06	0.00	0.82
CA rectum (154)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.02	0.06	0.19	0.39	0.25	0.08	0.99
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 16: STANDARDIZED MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA brain (193)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.05	0.07	0.14	0.12	0.02	0.00	0.40
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Malignant lymphomas (200-203,205)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.06	0.10	0.28	0.49	0.20	0.03	1.17
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leukemia (204)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.05	0.06	0.17	0.36	0.22	0.05	0.92
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other cancer (REM 140-205)	Observed	0.00	0.00	0.00	1.00	1.00	0.00	0.00	2.00
	Expected	0.02	0.10	0.18	0.51	1.10	0.66	0.21	2.77
	SMR	0.00	0.00	0.00	1.97	0.91	0.00	0.00	0.72
Diabetes mellitus (260)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.05	0.11	0.61	1.74	1.05	0.23	3.80
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mental disorders (304-326)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.02	0.03	0.04	0.05	0.04	0.02	0.20
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cerebral vascular lesions (330-334)	Observed	0.00	0.00	0.00	2.00	2.00	2.00	0.00	6.00
	Expected	0.02	0.18	0.42	1.68	6.17	7.91	4.34	20.71
	SMR	0.00	0.00	0.00	1.19	0.32	0.25	0.00	0.29*

TABLE 16: STANDARDIZED MORTALITY RATIOS 1960-1966
WHITE FEMALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.01	0.03	0.12	0.26	0.16	0.04	0.62
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA pancreas (157)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.02	0.06	0.26	0.58	0.33	0.09	1.35
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA respiratory system (160-164)	Observed	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00
	Expected	0.00	0.07	0.16	0.33	0.53	0.23	0.05	1.37
	SMR	0.00	0.00	0.00	6.02	0.00	0.00	0.00	1.46
CA of the breast (170)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Expected	0.03	0.33	0.67	1.20	1.65	0.75	0.22	4.84
	SMR	0.00	0.00	0.00	0.00	0.00	1.34	0.00	0.21
CA of the genital organs (171-179)	Observed	0.00	0.00	1.00	0.00	1.00	1.00	1.00	4.00
	Expected	0.03	0.27	0.51	1.12	1.65	0.66	0.14	4.38
	SMR	0.00	0.00	1.97	0.00	0.61	1.52	7.11	0.91
CA kidney (180)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.01	0.03	0.09	0.18	0.08	0.02	0.40
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA bladder (181)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.00	0.00	0.02	0.07	0.20	0.18	0.06	0.52
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 16: STANDARDIZED MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Hypertension with heart disease (440-443)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Expected	0.00	0.03	0.12	0.64	2.14	2.31	1.12	6.36
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.89	0.16*
Hypertension without heart disease (444-447)	Observed	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
	Expected	0.00	0.01	0.03	0.10	0.32	0.41	0.24	1.11
	SMR	0.00	0.00	0.00	0.00	0.00	7.40	0.00	2.71*
Other circulatory disease (400-439,448-468)	Observed	0.00	0.00	0.00	4.00	6.00	10.00	5.00	25.00
	Expected	0.06	0.49	1.29	6.23	19.70	20.13	11.34	59.23
	SMR	0.00	0.00	0.00	0.64	0.30	0.50	0.44	0.42
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.02	0.11	0.19	0.54	1.46	1.78	1.29	5.39
	SMR	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.19*
Cirrhosis of the liver (581)	Observed	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
	Expected	0.01	0.13	0.23	0.30	0.35	0.11	0.02	1.16
	SMR	0.00	0.00	0.00	0.00	0.00	8.75	0.00	0.86
Nephritis-nephroses (590-594)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.04	0.06	0.14	0.28	0.23	0.11	0.87
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ill defined causes (780-795)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.01	0.05	0.06	0.12	0.26	0.28	0.26	1.04
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 16: STANDARDIZED MORTALITY RATIOS 1960-1965
WHITE FEMALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group							
		Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Accidents (800-962)	Observed	0.00	0.00	1.00	0.00	1.00	0.00	0.00	2.00
	Expected	0.08	0.29	0.31	0.53	1.04	1.09	0.72	4.06
	SMR	0.00	0.00	3.24	0.00	0.96	0.00	0.00	0.49
Suicide (963,970-979)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.04	0.16	0.16	0.18	0.17	0.05	0.01	0.76
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All other causes (REM 001-999)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
	Expected	0.12	0.63	0.69	1.58	3.23	2.37	0.92	9.43
	SMR	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.11
Cause unknown	Observed	0.00	1.00	2.00	5.00	2.00	4.00	1.00	15.00

Number of cases - 1373

Men

Four subgroups of the study population were compared to the mortality experience of the white general population.

1. Members of American Dental Association (Table 17)

In comparison with the general population, members had significant lower mortality rates (SMR = .66). The members exhibited a significantly lower mortality rate than the general population in nearly every cause group. If those dead from unknown causes and those members lost to trace are assumed to be dead and distributed by cause as the known deaths, the deficits remain (SMR for all causes, = .69) and no SMR was observed to be significantly greater than 1.

2. Members and Life Members of the American Dental Association (Table 18)

The overall SMR for members and life members was .69. Assuming all the lost to trace were dead, the SMR would be .72. The SMR's for nearly all causes were significantly less than 1 and for no cause was the SMR significantly greater than 1. The addition of those lost to trace did not alter the findings.

3. Nonmembers (Table 19)

The overall SMR was .77. Again the SMR's for each cause tended to be less than 1 except for cancer of the brain, cirrhosis, nephritis and nephroses, and suicide which had SMR's greater than unity, but only the excess of suicides were statistically significant if the unknown cause of death cases were assumed to be distributed as all known causes.

Since it is likely that most nonwhite dentists were not members of the ADA at the inception of the cohort, the SMR's were investigated including the nonwhite male deaths.

Including the nonwhites raised the SMR for all causes to .82. This had the effect of demonstrating statistically significant excesses of suicide (SMR = 1.42) and cirrhosis (SMR = 1.41).

The largest number of persons lost to trace were among the nonmembers. Hence it is only appropriate that SMR's were calculated for this group under assumption that these cases were all deceased. When this was done, the SMR for the nonmembers was 1.11, a statistically significant excess. Significant excesses would then be predicted for cancer of the brain, diabetes, cirrhosis, nephritis and nephroses and suicides. Significant deficits would be predicted for all cancer, cancer of the stomach, cancer of the respiratory system, cerebral vascular lesions, other circulatory diseases and non-malignant respiratory diseases.

TABLE 17: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	48.00	259.00	545.00	1523.00	1452.00	283.00	47.00	4157.00
	Expected	100.07	478.16	923.76	2030.67	2240.33	481.53	87.89	6342.41
	SMR	0.48	0.54	0.59	0.75	0.65	0.59	0.53	0.66*
All cancer (140-205)	Observed	6.00	49.00	114.00	303.00	296.00	50.00	5.00	823.00
	Expected	11.82	68.55	166.52	420.55	432.74	69.52	7.46	1177.15
	SMR	0.51	0.71	0.68	0.72	0.68	0.72	0.67	0.70*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	3.00	6.00	3.00	1.00	1.00	14.00
	Expected	0.16	1.89	7.49	16.02	12.61	1.83	0.24	40.25
	SMR	0.00	0.00	0.40	0.37	0.24	0.55	4.08	0.35*
CA esophagus (150)	Observed	0.00	0.00	2.00	9.00	4.00	0.00	0.00	15.00
	Expected	0.03	0.83	4.14	11.58	10.70	1.48	0.15	28.91
	SMR	0.00	0.00	0.48	0.78	0.37	0.00	0.00	0.52*
CA stomach (151)	Observed	0.00	2.00	6.00	18.00	14.00	3.00	0.00	43.00
	Expected	0.36	3.56	9.58	26.42	33.77	6.68	0.73	81.10
	SMR	0.00	0.56	0.63	0.68	0.41	0.45	0.00	0.53*
CA intestines (152-153)	Observed	1.00	1.00	15.00	47.00	46.00	5.00	0.00	115.00
	Expected	0.64	5.03	12.75	35.76	43.88	8.43	0.94	107.42
	SMR	1.57	0.20	1.18	1.31	1.05	0.59	0.00	1.07
CA rectum (154)	Observed	0.00	3.00	5.00	15.00	12.00	2.00	1.00	38.00
	Expected	0.24	1.97	5.61	14.76	18.37	3.31	0.37	44.64
	SMR	0.00	1.52	0.89	1.02	0.65	0.61	2.67	0.85

TABLE 17: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	1.00	0.00	0.00	4.00	6.00	2.00	0.00	13.00
	Expected	0.12	0.83	2.72	8.74	8.68	1.23	0.13	22.44
	SMR	8.06	0.00	0.00	0.46	0.69	1.62	0.00	0.58*
CA pancreas (157)	Observed	0.00	2.00	16.00	30.00	29.00	7.00	0.00	84.00
	Expected	0.25	3.23	9.74	25.81	26.61	4.06	0.39	70.09
	SMR	0.00	0.62	1.64	1.16	1.09	1.72	0.00	1.20
CA respiratory system (160-164)	Observed	0.00	9.00	30.00	69.00	65.00	9.00	0.00	182.00
	Expected	1.20	16.99	56.69	147.56	125.71	11.64	0.63	360.42
	SMR	0.00	0.53	0.53	0.47	0.52	0.77	0.00	0.50*
CA prostate (177)	Observed	0.00	0.00	1.00	19.00	26.00	6.00	2.00	54.00
	Expected	0.01	0.21	2.13	17.53	40.81	13.03	1.94	75.66
	SMR	0.00	0.00	0.47	1.08	0.64	0.46	1.03	0.71*
CA kidney (180)	Observed	0.00	2.00	5.00	7.00	7.00	0.00	0.00	21.00
	Expected	0.18	1.87	5.12	10.85	9.90	1.21	0.08	29.20
	SMR	0.00	1.07	0.98	0.65	0.71	0.00	0.00	0.72
CA bladder (181)	Observed	0.00	0.00	1.00	8.00	14.00	5.00	1.00	29.00
	Expected	0.05	0.66	3.14	12.56	18.04	3.63	0.46	38.53
	SMR	0.00	0.00	0.32	0.64	0.78	1.38	2.19	0.75
CA brain (193)	Observed	0.00	1.00	2.00	11.00	10.00	0.00	0.00	24.00
	Expected	1.35	5.82	8.51	12.30	5.96	0.29	0.01	34.24
	SMR	0.00	0.17	0.24	0.89	1.68	0.00	0.00	0.70*

TABLE 17: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	1.00	9.00	14.00	18.00	18.00	3.00	0.00	63.00
	Expected	2.53	8.79	11.79	21.42	19.40	2.46	0.17	66.57
	SMR	0.40	1.02	1.19	0.84	0,93	1.22	0.00	0.95
Leukemia (204)	Observed	0.00	10.00	7.00	12.00	22.00	4.00	0.00	55.00
	Expected	1.50	5.02	7.00	14.73	17.09	3.14	0.33	48.81
	SMR	0.00	1.99	1.00	0.81	1.29	1.28	0.00	1.13
Other cancer (REM 140-205)	Observed	3.00	10.00	7.00	30.00	20.00	3.00	0.00	73.00
	Expected	3.19	11.87	20.11	44.52	41.20	7.10	0.90	128.88
	SMR	0.94	0.84	0.35	0.67	0.49	0.42	0.00	0.57*
Diabetes mellitus (260)	Observed	1.00	2.00	6.00	22.00	23.00	2.00	0.00	56.00
	Expected	1.82	7.08	10.90	27.98	34.59	7.15	0.79	90.31
	SMR	0.55	0.28	0.55	0.79	0.66	0.28	0.00	0.62*
Mental disorders (304-326)	Observed	0.00	1.00	0.00	0.00	1.00	0.00	0.00	2.00
	Expected	0.86	4,93	6.63	6.87	3.62	0.38	0.08	23.36
	SMR	0.00	0.20	0.00	0.00	0.28	0.00	0.00	0.09*
Cerebral vascular lesions (330-334)	Observed	1.00	9.00	24.00	72.00	119.00	36.00	6.00	267.00
	Expected	2.49	15.93	39.28	123.10	206.58	68.82	14.90	471.11
	SMR	0.40	0.57	0.61	0.58	0.58	0.52	0.40	0.57*
Hypertension with heart disease (440-443)	Observed	0.00	3.00	8.00	29.00	25.00	6.00	2.00	73.00
	Expected	0.36	3.88	13.04	41.72	55.86	14.79	2.89	132.54
	SMR	0.0	0.77	0.61	0.70	0.45	0.41	0.69	0.55*

TABLE 17: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Hypertension without heart disease (444-447)	Observed	0.00	1.00	3.00	3.00	3.00	0.00	1.00	11.00
	Expected	0.29	1.87	3.49	7.38	11.13	3.85	1.00	29.01
	SMR	0.00	0.53	0.86	0.41	0.27	0.00	1.00	0.38*
Other circulatory disease (400-439,448-468)	Observed	6.00	74.00	250.00	825.00	709.00	149.00	25.00	2038.00
	Expected	12.49	156.03	407.28	961.45	1072.47	233.00	44.94	2887.66
	SMR	0.48	0.47	0.61	0.86	0.66	0.64	0.56	0.71*
Non-malignant respiratory disease (470-527)	Observed	0.00	4.00	7.00	35.00	58.00	12.00	1.00	117.00
	Expected	2.63	15.41	35.45	103.55	137.39	30.17	5.93	330.53
	SMR	0.00	0.26	0.20	0.34	0.42	0.40	0.17	0.35*
Cirrhosis of the liver (581)	Observed	1.00	7.00	17.00	23.00	15.00	2.00	0.00	65.00
	Expected	1.73	18.36	35.35	44.96	27.17	2.22	0.14	129.93
	SMR	0.58	0.38	0.48	0.51	0.55	0.90	0.00	0.50*
Nephritis-nephroses (590-594)	Observed	1.00	1.00	4.00	7.00	9.00	0.00	0.00	22.00
	Expected	1.94	5.85	7.45	11.46	10.94	2.67	0.58	40.88
	SMR	0.52	0.17	0.54	0.61	0.82	0.00	0.00	0.54*
Ill defined causes (780-795)	Observed	0.00	3.00	3.00	6.00	4.00	1.00	0.00	17.00
	Expected	1.34	6.87	11.48	19.76	17.71	3.37	0.73	61.27
	SMR	0.00	0.44	0.26	0.30	0.23	0.30	0.00	0.28*
Accidents (800-962)	Observed	17.00	47.00	30.00	48.00	48.00	5.00	2.00	197.00
	Expected	39.24	88.90	75.38	79.49	55.72	11.30	2.43	352.45
	SMR	0.43	0.53	0.40	0.60	0.86	0.44	0.82	0.56*

TABLE 17: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Suicide (963,970-979)	Observed	8.00	35.00	24.00	39.00	16.00	1.00	0.00	123.00
	Expected	9.84	32.30	33.09	36.09	19.16	2.61	0.24	133.32
	SMR	0.81	1.08	0.73	1.08	0.84	0.38	0.00	0.92
All other causes (REM 001-999)	Observed	5.00	17.00	32.00	73.00	93.00	10.00	4.00	234.00
	Expected	13.21	52.21	78.42	146.32	155.26	31.68	5.79	482.89
	SMR	0.38	0.33	0.41	0.50	0.60	0.32	0.69	0.48*
Cause unknown	Observed	2.00	6.00	23.00	38.00	33.00	9.00	1.00	112.00

Number of cases - 78533

*Statistically significant ($P<0.05$).

TABLE 18: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	48.00	259.00	546.00	1523.00	1899.00	1117.00	470.00	5862.00
	Expected	100.07	478.16	923.77	2030.91	2713.55	1604.59	658.98	8510.02
	SMR	0.48	0.54	0.59	0.75	0.70	0.70	0.71	0.69*
All cancer (140-205)	Observed	6.00	49.00	114.00	303.00	363.00	162.00	60.00	1057.00
	Expected	11.82	68.55	166.52	420.59	518.50	224.84	55.85	1466.68
	SMR	0.51	0.71	0.68	0.72	0.70	0.72	1.07	0.72*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	3.00	6.00	5.00	2.00	4.00	20.00
	Expected	0.16	1.89	7.49	16.03	15.05	6.02	1.84	48.47
	SMR	0.00	0.00	0.40	0.37	0.33	0.33	2.17	0.41*
CA esophagus (150)	Observed	0.00	0.00	2.00	9.00	5.00	2.00	1.00	19.00
	Expected	0.03	0.83	4.14	11.58	12.82	4.76	1.11	35.28
	SMR	0.00	0.00	0.48	0.78	0.39	0.42	0.90	0.54*
CA stomach (151)	Observed	0.00	2.00	6.00	18.00	16.00	6.00	2.00	50.00
	Expected	0.36	3.55	9.58	26.42	41.41	22.19	5.48	109.00
	SMR	0.00	0.56	0.63	0.68	0.39	0.27	0.36	0.46*
CA intestines (152-153)	Observed	1.00	1.00	15.00	47.00	56.00	27.00	6.00	153.00
	Expected	0.64	5.03	12.75	35.76	53.30	27.45	7.00	141.94
	SMR	1.57	0.20	1.18	1.31	1.05	0.98	0.86	1.08
CA rectum (154)	Observed	0.00	3.00	5.00	15.00	15.00	6.00	2.00	46.00
	Expected	0.24	1.97	5.61	14.76	22.26	10.82	2.81	58.48
	SMR	0.00	1.52	0.89	1.02	0.67	0.55	0.71	0.79

TABLE 18: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	1.00	0.00	0.00	4.00	9.00	3.00	0.00	17.00
	Expected	0.12	0.83	2.72	8.74	10.48	4.04	0.94	27.87
	SMR	8.06	0.00	0.00	0.46	0.86	0.74	0.00	0.61
CA pancreas (157)	Observed	0.00	2.00	16.00	30.00	30.00	14.00	5.00	97.00
	Expected	0.25	3.23	9.74	25.81	31.86	13.04	2.93	86.87
	SMR	0.00	0.62	1.64	1.16	0.94	1.07	1.71	1.12
CA respiratory system (160-164)	Observed	0.00	9.00	30.00	69.00	79.00	20.00	6.00	213.00
	Expected	1.20	16.99	56.70	147.57	147.08	35.48	4.68	409.69
	SMR	0.00	0.53	0.53	0.47	0.54	0.56	1.28	0.52*
CA prostate (177)	Observed	0.00	0.00	1.00	19.00	35.00	34.00	23.00	112.00
	Expected	0.01	0.21	2.13	17.53	50.93	43.57	14.55	128.93
	SMR	0.00	0.00	0.47	1.08	0.69	0.78	1.58	0.87
CA kidney (180)	Observed	0.00	2.00	5.00	7.00	8.00	3.00	0.00	25.00
	Expected	0.18	1.87	5.12	10.85	11.72	3.80	0.57	34.09
	SMR	0.00	1.07	0.98	0.65	0.68	0.79	0.00	0.73
CA bladder (181)	Observed	0.00	0.00	1.00	8.00	19.00	12.00	4.00	44.00
	Expected	0.05	0.66	3.14	12.56	21.98	11.95	3.42	53.75
	SMR	0.00	0.00	0.32	0.64	0.86	1.00	1.17	0.82
CA brain (193)	Observed	0.00	1.00	2.00	11.00	10.00	2.00	0.00	26.00
	Expected	1.35	5.82	8.51	12.30	6.76	0.83	0.06	35.63
	SMR	0.00	0.17	0.24	0.89	1.48	2.40	0.00	0.73

TABLE 18: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	1.00	9.00	14.00	18.00	25.00	9.00	1.00	77.00
	Expected	2.53	8.79	11.79	21.43	23.03	7.70	1.28	76.54
	SMR	0.40	1.02	1.19	0.84	1.09	1.17	0.78	1.01
Leukemia (204)	Observed	0.00	10.00	7.00	12.00	26.00	12.00	1.00	68.00
	Expected	1.50	5.02	7.00	14.73	20.65	10.00	2.45	61.36
	SMR	0.00	1.99	1.00	0.81	1.26	1.20	0.41	1.11
Other cancer (REM 140-205)	Observed	3.00	10.00	7.00	30.00	25.00	10.00	5.00	90.00
	Expected	3.19	11.87	20.11	44.52	49.16	23.19	6.74	158.79
	SMR	0.94	0.84	0.35	0.67	0.51	0.43	0.74	0.57*
Diabetes mellitus (260)	Observed	1.00	2.00	6.00	22.00	29.00	13.00	1.00	74.00
	Expected	1.82	7.08	10.90	27.98	42.10	23.27	5.94	119.09
	SMR	0.55	0.28	0.55	0.79	0.89	0.56	0.17	0.62*
Mental disorders (304-326)	Observed	0.00	1.00	0.00	0.00	1.00	0.00	0.00	2.00
	Expected	0.86	4.93	6.63	6.87	4.19	1.25	0.58	25.30
	SMR	0.00	0.20	0.00	0.00	0.24	0.00	0.00	0.08*
Cerebral vascular lesions (330-334)	Observed	1.00	9.00	24.00	72.00	182.00	172.00	77.00	537.00
	Expected	2.49	15.93	39.28	123.11	257.65	235.22	111.75	785.44
	SMR	0.40	0.57	0.61	0.58	0.71	0.73	0.69	0.68*
Hypertension with heart disease (440-443)	Observed	0.00	3.00	8.00	29.00	32.00	22.00	16.00	110.00
	Expected	0.36	3.88	13.04	41.73	69.15	50.88	21.76	200.79
	SMR	0.00	0.77	0.61	0.69	0.46	0.43	0.74	0.55*

TABLE 18: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Hypertension without heart disease (444-447)	Observed	0.00	1.00	3.00	3.00	7.00	13.00	6.00	33.00
	Expected	0.29	1.87	3.49	7.38	13.87	13.34	7.47	47.71
	SMR	0.00	0.53	0.86	0.41	0.50	0.97	0.80	0.69*
Other circulatory disease (400-439,448-468)	Observed	6.00	74.00	251.00	825.00	935.00	571.00	230.00	2892.00
	Expected	12.49	156.03	407.29	961.56	1298.62	777.43	336.80	3950.22
	SMR	0.48	0.47	0.62	0.86	0.72	0.73	0.68	0.73*
Non-malignant respiratory disease (470-527)	Observed	0.00	4.00	7.00	35.00	71.00	48.00	25.00	190.00
	Expected	2.63	15.41	35.45	103.56	165.79	99.39	44.74	466.97
	SMR	0.00	0.26	0.20	0.34	0.43	0.48	0. 56	0.41*
Cirrhosis of the liver (581)	Observed	1.00	7.00	17.00	23.00	19.00	4.00	0.00	71.00
	Expected	1.73	18.36	35.35	44.96	31.72	6.95	1.06	140.13
	SMR	0.58	0.38	0.48	0.51	0.60	0.58	0.00	0.51*
Nephritis-nephroses (590-594)	Observed	1.00	1.00	4.00	7.00	9.00	5.00	4.00	31.00
	Expected	1.94	5.85	7.45	11.46	13.39	9.16	4.34	53.59
	SMR	0.52	0.17	0.54	0.61	0.67	0.55	0.92	0.58*
Ill defined causes (780-795)	Observed	0.00	3.00	3.00	6.00	5.00	2.00	3.00	22.00
	Expected	1.34	6.87	11.48	19.76	21.03	11.15	5.40	77.03
	SMR	0.00	0.44	0.26	0.30	0.24	0.18	0.56	0.29*
Accidents (800-962)	Observed	17.00	47.00	30.00	48.00	61.00	26.00	8.00	237.00
	Expected	39.24	88.90	75.38	79.50	66.79	37.85	18.20	405.85
	SMR	0.43	0.53	0.40	0.60	0.91	0.69	0.44	0.58*

TABLE 18: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: MEMBERS, LIFE MEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Suicide (963,970-979)	Observed	8.00	35.00	24.00	39.00	18.00	9.00	0.00	133.00
	Expected	9.84	32.30	33.09	36.10	22.78	8.44	1.81	144.35
	SMR	0.81	1.08	0.73	1.08	0.79	1.07	0.00	0.92
All other causes (REM 001-999)	Observed	5.00	17.00	32.00	73.00	119.00	48.00	30.00	324.00
	Expected	13.21	52.21	78.42	146.34	187.98	105.43	43.28	626.87
	SMR	0.38	0.33	0.41	0.50	0.63	0.46	0.69	0.52*
Cause unknown	Observed	2.00	6.00	23.00	38.00	48.00	22.00	10.00	149.00

Number of cases - 83310

*Statistically significant (P<0.05).

TABLE 19: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: NONMEMBERS

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	13.00	28.00	103.00	417.00	886.00	906.00	448.00	2801.00
	Expected	19.45	46.43	101.08	421.91	1094.16	1206.11	768.67	3657.81
	SMR	0.67	0.60	1.02	0.99	0.81	0.75	0.58	0.77*
All cancer (140-205)	Observed	1.00	5.00	16.00	61.00	149.00	126.00	49.00	407.00
	Expected	2.30	6.64	18.30	87.33	206.65	166.25	65.13	552.60
	SMR	0.43	0.75	0.87	0.70	0.72	0.76	0.75	0.74*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	2.00	6.00	4.00	4.00	0.00	16.00
	Expected	0.03	0.18	0.83	3.26	5.98	4.51	2.16	16.96
	SMR	0.00	0.00	2.41	1.84	0.67	0.89	0.00	0.94
CA esophagus (150)	Observed	0.00	0.00	3.00	1.00	5.00	2.00	1.00	12.00
	Expected	0.01	0.08	0.46	2.39	5.12	3.52	1.30	12.87
	SMR	0.00	0.00	6.52	0.42	0.98	0.57	0.77	0.93
CA stomach (151)	Observed	0.00	0.00	0.00	1.00	4.00	4.00	0.00	9.00
	Expected	0.07	0.34	1.07	5.64	16.99	16.70	6.42	47.23
	SMR	0.00	0.00	0.00	0.18	0.24	0.24	0.00	0.19*
CA intestines (152-153)	Observed	0.00	0.00	2.00	8.00	17.00	21.00	11.00	59.00
	Expected	0.13	0.49	1.40	7.49	21.51	20.37	8.17	59.55
	SMR	0.00	0.00	1.43	1.07	0.79	1.03	1.35	0.99
CA rectum (154)	Observed	0.00	0.00	0.00	2.00	8.00	4.00	2.00	16.00
	Expected	0.05	0.19	0.62	3.14	9.01	8.07	3.28	24.36
	SMR	0.00	0.00	0.00	0.64	0.89	0.50	0.61	0.66

TABLE 19: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	1.00	5.00	2.00	0.00	8.00
	Expected	0.02	0.08	0.30	1.83	4.21	3.02	1.10	10.57
	SMR	0.00	0.00	0.00	0.55	1.19	0.66	0.00	0.76
CA pancreas (157)	Observed	0.00	0.00	0.00	9.00	16.00	6.00	0.00	31.00
	Expected	0.05	0.31	1.07	5.37	12.69	9.61	3.41	32.50
	SMR	0.00	0.00	0.00	1.68	1.26	0.62	0.00	0.95
CA respiratory system (160-164)	Observed	0.00	1.00	3.00	10.00	46.00	17.00	6.00	83.00
	Expected	0.23	1.63	6.24	30.38	57.01	25.23	5.42	126.14
	SMR	0.00	0.61	0.48	0.33	0.81	0.67	1.11	0.66*
CA prostate (177)	Observed	0.00	0.00	0.00	5.00	9.00	27.00	15.00	56.00
	Expected	0.00	0.02	0.24	3.82	21.15	32.83	16.98	75.04
	SMR	0.00	0.00	0.00	1.31	0.43	0.82	0.88	0.75*
CA kidney (180)	Observed	0.00	0.00	0.00	2.00	4.00	2.00	0.00	8.00
	Expected	0.03	0.18	0.56	2.23	4.61	2.76	0.66	11.03
	SMR	0.00	0.00	0.00	0.90	0.87	0.73	0.00	0.73
CA bladder (181)	Observed	0.00	0.00	2.00	0.00	4.00	9.00	3.00	18.00
	Expected	0.01	0.06	0.35	2.68	8.92	8.92	3.99	24.93
	SMR	0.00	0.00	5.69	0.00	0.45	1.01	0.75	0.72
CA brain (193)	Observed	1.00	2.00	0.00	2.00	4.00	1.00	1.00	11.00
	Expected	0.26	0.57	0.92	2.48	2.53	0.57	0.07	7.40
	SMR	3.81	3.52	0.00	0.81	1.58	1.75	15.01	1.49*

TABLE 19: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	0.00	1.00	1.00	4.00	5.00	4.00	2.00	17.00
	Expected	0.49	0.86	1.28	4.41	9.10	5.57	1.48	23.19
	SMR	0.00	1.17	0.78	0.91	0.55	0.72	1.35	0.73
Leukemia (204)	Observed	0.00	1.00	1.00	2.00	2.00	10.00	4.00	20.00
	Expected	0.29	0.49	0.76	3.08	8.31	7.30	2.84	23.08
	SMR	0.00	2.03	1.31	0.65	0.24	1.37	1.41	0.87
Other cancer (REM 140-205)	Observed	0.00	0.00	2.00	8.00	16.00	13.00	4.00	43.00
	Expected	0.62	1.16	2.19	9.14	19.50	17.28	7.85	57.75
	SMR	0.00	0.00	0.91	0.88	0.82	0.75	0.51	0.74
Diabetes mellitus (260)	Observed	1.00	0.00	0.00	10.00	20.00	14.00	3.00	48.00
	Expected	0.36	0.69	1.19	5.85	17.06	17.25	6.91	49.30
	SMR	2.79	0.00	0.00	1.71	1.17	0.81	0.43	0.97
Mental disorders (304-326)	Observed	0.00	0.00	0.00	0.00	1.00	2.00	0.00	3.00
	Expected	0.17	0.48	0.71	1.37	1.61	0.93	0.67	5.94
	SMR	0.00	0.00	0.00	0.00	0.62	2.16	0.00	0.51
Cerebral vascular lesions (330-334)	Observed	1.00	2.00	4.00	29.00	93.00	157.00	83.00	369.00
	Expected	0.49	1.54	4.34	26.20	107.08	179.45	130.51	449.60
	SMR	2.06	1.30	0.92	1.11	0.87	0.87	0.64	0.82
Hypertension with heart disease (440-443)	Observed	0.00	0.00	1.00	10.00	18.00	31.00	16.00	76.00
	Expected	0.07	0.37	1.46	8.92	28.61	39.11	25.60	104.14
	SMR	0.00	0.00	0.69	1.12	0.63	0.79	0.63	0.73

TABLE 19: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Hypertension without heart disease (444-447)	Observed	0.00	0.00	0.00	2.00	11.00	4.00	8.00	25.00
	Expected	0.06	0.18	0.38	1.57	5.76	10.24	8.72	26.91
	SMR	0.00	0.00	0.00	1.28	1.91	0.39	0.92	0.93
Other circulatory disease (400-439,448-468)	Observed	1.00	7.00	45.00	186.00	412.00	401.00	195.00	1247.00
	Expected	2.42	14.98	44.73	200.16	523.42	584.55	392.69	1762.96
	SMR	0.41	0.47	1.01	0.93	0.79	0.69	0.50	0.71*
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	1.00	23.00	34.00	47.00	23.00	128.00
	Expected	0.51	1.49	3.90	21.67	66.34	73.96	52.19	220.05
	SMR	0.00	0.00	0.26	1.06	0.51	0.64	0.44	0.58*
Cirrhosis of the liver (581)	Observed	0.00	3.00	4.00	10.00	13.00	11.00	2.00	43.00
	Expected	0.33	1.78	3.86	9.00	12.36	5.05	1.24	33.62
	SMR	0.00	1.69	1.04	1.11	1.05	2.18	1.61	1.28*
Nephritis-nephroses (590-594)	Observed	1.00	0.00	2.00	3.00	7.00	8.00	4.00	25.00
	Expected	0.37	0.57	0.81	2.35	5.47	7.02	5.10	21.70
	SMR	2.69	0.00	2.47	1.27	1.28	1.14	0.78	1.15
Ill defined causes (780-795)	Observed	2.00	1.00	1.00	6.00	5.00	5.00	8.00	28.00
	Expected	0.27	0.67	1.24	4.00	8.26	8.33	6.28	29.05
	SMR	7.54	1.49	0.81	1.50	0.61	0.60	1.27	0.96
Accidents (800-962)	Observed	3.00	2.00	7.00	19.00	16.00	14.00	12.00	73.00
	Expected	7.63	8.78	8.07	15.91	26.64	28.51	21.25	116.78
	SMR	0.39	0.23	0.87	1.19	0.60	0.49	0.56	0.63*

TABLE 19: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS BY MEMBERSHIP: NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Suicide (963,970-979)	Observed	2.00	4.00	12.00	10.00	10.00	5.00	1.00	44.00
	Expected	1.92	3.17	3.58	7.18	9.02	6.26	2.12	33.25
	SMR	1.04	1.26	3.36	1.39	1.11	0.80	0.47	1.32*
All other causes (REM 001-999)	Observed	0.00	3.00	5.00	30.00	67.00	53.00	32.00	190.00
	Expected	2.56	5.09	8.52	30.39	75.88	79.20	50.27	251.90
	SMR	0.00	0.59	0.59	0.99	0.88	0.67	0.64	0.75*
Cause unknown	Observed	1.00	1.00	5.00	18.00	30.00	28.00	12.00	95.00

Number of cases - 17832

*Statistically significant ($P<0.05$).

4. Combined Members, Life Members and Nonmembers

Combining all three groups of male dentists (Table 20) and using only white male deaths, the SMR for all causes was .71. As would be expected, there were significant deficits from expected in nearly all causes. Adding the nonwhite male deaths did not change the pattern.

Assuming all lost to trace were dead, the SMR would be .83. Significant deficits would be predicted in most areas. Cancer of the pancreas (SMR = 1.25), cancer of the intestines (SMR = 1.23) and suicides (SMR = 1.16) would show significant excess.

5. Comparison with Medical Societies

Standardized mortality ratios were calculated for the members of each of three medical societies using the white male dentists who were members or life members of the American Dental Association. The expected numbers of deaths were adjusted for age and calendar year.

In comparison with the members of the Radiological Society of North America (Table 21), the dentists exhibit significantly lower mortality from all causes of death. Much of this deficit could be attributed to cardiovascular disease.

In comparison to the American Academy of Physicians (Table 22) the dentists experienced significantly lower mortality from all causes. The physicians experienced significantly greater mortality from cancer of the brain (SMR = 2.10), cardiovascular disease (SMR = 1.20), non-caligrant respiratory diseases (1.86) and ill-defined causes (SMR = 4.55).

In comparison to ophthalmologists and otolaryngologists (Table 23), the dentists again experienced significantly lower mortaility from all causes. These physicians had significantly more deaths from cancer of the prostate (SMR = 1.56) and suicide (SMR = 2.42) than the dentists.

When all three groups are combined (Table 24), the physicians had significantly higher mortality from all causes, cancer of the brain, non-malignant respiratory diseases, cardiovascular disease, ill-defined causes and suicide.

TABLE 20: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS, BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	61.00	287.00	649.00	1940.00	2785.00	2023.00	918.00	8663.00
	Expected	119.52	524.59	1024.85	2452.81	3807.70	2810.70	1427.66	12167.83
	SMR	0.51	0.55	0.63	0.79	0.73	0.72	0.64	0.71*
All cancer (140-205)	Observed	7.00	54.00	130.00	364.00	512.00	288.00	109.00	1464.00
	Expected	14.13	75.19	184.82	507.93	725.15	391.09	120.98	2019.28
	SMR	0.50	0.72	0.70	0.72	0.71	0.74	0.90	0.73*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	5.00	12.00	9.00	6.00	4.00	36.00
	Expected	0.19	2.07	8.32	19.29	21.03	10.53	4.00	65.43
	SMR	0.00	0.00	0.60	0.62	0.43	0.57	1.00	0.55*
CA esophagus (150)	Observed	0.00	0.00	5.00	10.00	10.00	4.00	2.00	31.00
	Expected	0.04	0.91	4.60	13.97	17.94	8.29	2.40	48.15
	SMR	0.00	0.00	1.09	0.72	0.56	0.48	0.83	0.64*
CA stomach (151)	Observed	0.00	2.00	6.00	19.00	20.00	10.00	2.00	59.00
	Expected	0.43	3.89	10.65	32.06	58.40	38.89	11.90	156.22
	SMR	0.00	0.51	0.56	0.59	0.34	0.26	0.17	0.38*
CA intestines (152-153)	Observed	1.00	1.00	17.00	55.00	73.00	48.00	17.00	212.00
	Expected	0.76	5.51	14.15	43.25	74.82	47.82	15.17	201.49
	SMR	1.31	0.18	1.20	1.27	0.98	1.00	1.12	1.05
CA rectum (154)	Observed	0.00	3.00	5.00	17.00	23.00	10.00	4.00	62.00
	Expected	0.29	2.16	6.24	17.90	31.27	18.89	6.09	82.84
	SMR	0.00	1.39	0.80	0.95	0.74	0.53	0.66	0.75*

TABLE 20: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS, BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	1.00	0.00	0.00	5.00	14.00	5.00	0.00	25.00
	Expected	0.15	0.91	3.02	10.57	14.69	7.07	2.04	38.44
	SMR	6.78	0.00	0.00	0.47	0.95	0.71	0.00	0.65*
CA pancreas (157)	Observed	0.00	2.00	16.00	39.00	46.00	20.00	5.00	128.00
	Expected	0.30	3.54	10.81	31.17	44.55	22.65	6.34	119.37
	SMR	0.00	0.56	1.48	1.25	1.03	0.88	0.79	1.07
CA respiratory system (160-164)	Observed	0.00	10.00	33.00	79.00	125.00	37.00	12.00	296.00
	Expected	1.43	18.62	62.93	177.96	204.09	60.71	10.10	535.83
	SMR	0.00	0.54	0.52	0.44	0.61	0.61	1.19	0.55*
CA prostate (177)	Observed	0.00	0.00	1.00	24.00	44.00	61.00	38.00	168.00
	Expected	0.02	0.23	2.37	21.35	72.08	76.40	31.53	203.96
	SMR	0.00	0.00	0.42	1.12	0.61	0.80	1.21	0.82*
CA kidney (180)	Observed	0.00	2.00	5.00	9.00	12.00	5.00	0.00	33.00
	Expected	0.21	2.05	5.68	13.08	16.32	6.55	1.23	45.13
	SMR	0.00	0.98	0.88	0.69	0.74	0.76	0.00	0.73
CA bladder (181)	Observed	0.00	0.00	3.00	8.00	23.00	21.00	7.00	62.00
	Expected	0.05	0.72	3.49	15.23	30.90	20.86	7.41	78.68
	SMR	0.00	0.00	0.86	0.53	0.74	1.01	0.94	0.79
CA brain (193)	Observed	1.00	3.00	2.00	13.00	14.00	3.00	1.00	37.00
	Expected	1.61	6.39	9.43	14.78	9.30	1.40	0.12	43.04
	SMR	0.62	0.47	0.21	0.88	1.51	2.14	8.09	0.86

TABLE 20: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS, BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	1.00	10.00	15.00	22.00	30.00	13.00	3.00	94.00
	Expected	3.02	9.65	13.07	25.84	32.13	13.27	2.76	99.73
	SMR	0.33	1.04	1.15	0.85	0.93	0.98	1.09	0.94
Leukemia (204)	Observed	0.00	11.00	8.00	14.00	28.00	22.00	5.00	88.00
	Expected	1.80	5.51	7.77	17.81	28.97	17.30	5.29	84.44
	SMR	0.00	1.99	1.03	0.79	0.97	1.27	0.95	1.04
Other cancer (REM 140-205)	Observed	3.00	10.00	9.00	38.00	41.00	23.00	9.00	133.00
	Expected	3.81	13.03	22.30	53.66	68.67	40.47	14.60	216.54
	SMR	0.79	0.77	0.40	0.71	0.60	0.57	0.62	0.61*
Diabetes mellitus (260)	Observed	2.00	2.00	6.00	32.00	49.00	27.00	4.00	122.00
	Expected	2.18	7.77	12.09	33.83	59.16	40.52	12.85	168.40
	SMR	0.92	0.26	0.50	0.95	0.83	0.67	0.31	0.72*
Mental disorders (304-326)	Observed	0.00	1.00	0.00	0.00	2.00	2.00	0.00	5.00
	Expected	1.03	5.41	7.34	8.23	5.81	2.18	1.25	31.24
	SMR	0.00	0.18	0.00	0.00	0.34	0.92	0.00	0.16*
Cerebral vascular lesions (330-334)	Observed	2.00	11.00	28.00	101.00	275.00	329.00	160.00	906.00
	Expected	2.98	17.47	43.62	149.32	364.73	414.66	242.27	1235.04
	SMR	0.67	0.63	0.64	0.68	0.75	0.79	0.66	0.73*
Hypertension with heart disease (440-443)	Observed	0.00	3.00	9.00	39.00	50.00	53.00	32.00	186.00
	Expected	0.42	4.25	14.50	50.65	97.76	90.00	47.35	304.93
	SMR	0.00	0.71	0.62	0.77	0.51	0.59	0.68	0.61*

TABLE 20: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS, BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Hypertension without heart disease (444-447)	Observed	0.00	1.00	3.00	5.00	18.00	17.00	14.00	58.00
	Expected	0.35	2.05	3.87	8.95	19.63	23.58	16.20	74.62
	SMR	0.00	0.49	0.78	0.56	0.92	0.72	0.86	0.78
Other circulatory disease (400-439,448-468)	Observed	7.00	81.00	296.00	1011.00	1347.00	972.00	425.00	4139.00
	Expected	14.92	171.01	452.02	1161.73	1822.04	1361.98	729.49	5713.18
	SMR	0.47	0.47	0.65	0.87	0.74	0.71	0.58	0.72*
Nonmalignant respiratory disease (470-527)	Observed	0.00	4.00	8.00	58.00	105.00	95.00	48.00	318.00
	Expected	3.13	16.90	39.35	125.23	232.12	173.35	96.93	687.02
	SMR	0.00	0.24	0.20	0.46	0.45	0.55	0.50	0.46*
Cirrhosis of the liver (581)	Observed	1.00	10.00	21.00	33.00	32.00	15.00	2.00	114.00
	Expected	2.07	20.13	39.20	53.97	44.08	12.00	2.30	173.75
	SMR	0.48	0.50	0.54	0.61	0.73	1.25	0.87	0.66*
Nephritis-nephroses (590-594)	Observed	2.00	1.00	6.00	10.00	16.00	13.00	8.00	56.00
	Expected	2.31	6.43	8.26	13.81	18.86	16.18	9.43	75.29
	SMR	0.86	0.16	0.73	0.72	0.85	0.80	0.85	0.74*
Ill defined causes (780-795)	Observed	2.00	4.00	4.00	12.00	10.00	7.00	11.00	50.00
	Expected	1.60	7.54	12.72	23.76	29.29	19.48	11.69	106.08
	SMR	1.25	0.53	0.31	0.50	0.34	0.36	0.94	0.47*
Accidents (800-962)	Observed	20.00	49.00	37.00	67.00	77.00	40.00	20.00	310.00
	Expected	46.86	97.67	83.45	95.41	93.43	66.35	39.45	522.64
	SMR	0.43	0.50	0.44	0.70	0.82	0.60	0.51	0.59*

TABLE 20: STANDARDIZED MORTALITY RATIOS 1960-1965
MALE DENTISTS, BY MEMBERSHIP: MEMBERS, LIFE MEMBERS, NONMEMBERS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Suicide (963,970-979)	Observed	10.00	39.00	36.00	49.00	28.00	14.00	1.00	177.00
	Expected	11.76	35.47	36.66	43.28	31.80	14.70	3.93	177.60
	SMR	0.85	1.10	0.98	1.13	0.88	0.95	0.25	1.00
All other causes (REM 001-999)	Observed	5.00	20.00	37.00	103.00	186.00	101.00	62.00	514.00
	Expected	15.78	57.29	86.94	176.73	263.86	184.62	93.55	878.77
	SMR	0.32	0.35	0.43	0.58	0.70	0.55	0.66	0.58*
Cause unknown	Observed	3.00	7.00	28.00	56.00	78.00	50.00	22.00	244.00

Number of cases - 101142

*Statistically significant ($P<0.05$).

TABLE 21: STANDARDIZED MORTALITY RATIOS 1960-1965
RADIOLOGICAL SOCIETY OF NORTH AMERICA COMPARED TO DENTISTS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999	Observed	0.00	5.00	43.00	68.00	100.00	92.00	23.00	331.00
	Expected	0.6	12.7	36.3	62.6	72.6	34.0	14.0	232.7
	SMR	0.00	0.40	1.19	1.09	1.38	2.70	1.65	1.42*
All cancer (140-205)	Observed	0.00	1.00	5.00	18.00	16.00	14.00	2.00	56.00
	Expected	0.1	2.4	7.9	12.9	13.9	5.2	1.8	44.3
	SMR	0.00	0.41	0.63	1.40	1.15	2.67	1.11	1.26*
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.0	0.0	0.2	0.3	0.2	0.0	0.1	0.8
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.00
	Expected	0.0	0.0	0.2	0.4	0.2	0.0	0.0	0.7
	SMR	0.00	0.00	0.00	0.00	5.73	0.00	0.00	1.41
CA stomach (151)	Observed	0.00	0.00	1.00	1.00	1.00	1.00	0.00	4.00
	Expected	0.0	0.1	0.4	0.8	0.6	0.2	0.1	2.2
	SMR	0.00	0.00	2.50	1.26	1.58	6.03	0.00	1.86
CA intestines (152-153)	Observed	0.00	0.00	0.00	1.00	0.00	4.00	1.00	6.00
	Expected	0.0	0.1	1.1	2.2	2.1	1.0	0.2	6.6
	SMR	0.00	0.00	0.00	0.46	0.00	4.09	5.37	0.91
CA rectum (154)	Observed	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00
	Expected	0.0	0.1	0.3	0.6	0.6	0.1	0.1	1.8
	SMR	0.00	0.00	0.00	3.22	0.00	0.00	0.00	1.09

TABLE 21: STANDARDIZED MORTALITY RATIOS 1960-1965
RADIOLOGICAL SOCIETY OF NORTH AMERICA COMPARED TO DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	1.00	0.00	1.00	1.00	0.00	3.00
	Expected	0.0	0.0	0.0	0.2	0.3	0.1	0.0	0.6
	SMR	0.00	0.00	0.00	0.00	2.92	17.58	0.00	5.09
CA pancreas (157)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	2.00
	Expected	0.0	0.1	1.1	1.2	1.1	0.6	0.1	4.2
	SMR	0.00	0.00	0.00	0.00	0.90	1.74	0.00	0.47
CA respiratory system (160-164)	Observed	0.00	0.00	0.00	4.00	3.00	3.00	0.00	10.00
	Expected	0.0	0.4	2.1	2.9	3.0	0.8	0.2	9.4
	SMR	0.00	0.00	0.00	1.38	1.01	3.67	0.00	1.07
CA prostate (177)	Observed	0.00	0.00	0.00	1.00	2.00	2.00	0.00	5.00
	Expected	0.0	0.0	0.1	0.7	1.4	1.0	0.7	3.9
	SMR	0.00	0.00	0.00	1.33	1.39	2.07	0.00	1.28
CA kidney (180)	Observed	0.00	0.00	2.00	0.00	1.00	0.00	0.00	3.00
	Expected	0.0	0.1	0.3	0.3	0.3	0.1	0.0	1.1
	SMR	0.00	0.00	6.04	0.00	3.21	0.00	0.00	2.76
CA bladder (181)	Observed	0.00	0.00	0.00	1.00	0.00	1.00	0.00	2.00
	Expected	0.0	0.0	0.1	0.3	0.8	0.4	0.1	1.7
	SMR	0.00	0.00	0.00	3.27	0.00	2.55	0.00	1.19
CA brain (193)	Observed	0.00	0.00	0.00	1.00	0.00	0.00	1.00	2.00
	Expected	0.0	0.1	0.1	0.5	0.4	0.1	0.0	1.2
	SMR	0.00	0.1	0.00	1.92	0.00	0.00	0.00	1.71

TABLE 21: STANDARDIZED MORTALITY RATIOS 1960-1965
RADIOLOGICAL SOCIETY OF NORTH AMERICA COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	0.00	1.00	0.00	4.00	0.00	1.00	0.00	6.00
	Expected	0.0	0.5	1.0	0.8	1.0	0.3	0.0	3.6
	SMR	0.00	2.08	0.00	5.19	0.00	2.99	0.00	1.67
Leukemia (204)	Observed	0.00	0.00	0.00	1.00	4.00	0.00	0.00	5.00
	Expected	0.0	0.5	0.5	0.5	1.0	0.4	0.0	2.9
	SMR	0.00	0.00	0.00	2.05	4.00	0.00	0.00	1.71
Other cancer (REM 140-205)	Observed	0.00	0.00	1.00	2.00	2.00	0.00	0.00	5.00
	Expected	0.1	0.5	0.5	1.3	1.0	0.2	0.1	3.7
	SMR	0.00	0.00	1.91	1.57	2.06	0.00	0.00	1.36
Diabetes mellitus (260)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	2.00
	Expected	0.0	0.1	0.4	0.9	1.1	0.5	0.0	3.0
	SMR	0.00	0.00	0.00	0.00	0.91	2.18	0.00	0.66
Mental disorders (304-326)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cardiovascular-renal diseases (300-334,400-468)	Observed	0.00	2.00	22.00	38.00	70.00	64.00	15.00	211.00
	Expected	0.1	4.4	19.7	38.9	45.8	23.4	10.8	142.3
	SMR	0.00	0.45	1.12	0.98	1.53	2.74	1.50	1.48*
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	0.00	2.00	4.00	0.00	4.00	10.00
	Expected	0.0	0.2	0.5	1.5	2.9	1.9	0.8	7.5
	SMR	0.00	0.00	0.00	1.34	1.48	0.00	5.24	1.33

TABLE 21: STANDARDIZED MORTALITY RATIOS 1960-1965
RADIOLOGICAL SOCIETY OF NORTH AMERICA COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Cirrhosis of the liver (581)	Observed	0.00	0.00	2.00	1.00	0.00	1.00	0.00	4.00
	Expected	0.0	0.4	1.2	1.0	0.7	0.2	0.0	3.4
	SMR	0.00	0.00	1.73	1.00	0.00	5.85	0.00	1.16
Nephritis-nephroses (590-594)	Observed	0.00	0.00	1.00	0.00	1.00	1.00	0.00	3.00
	Expected	0.0	0.0	0.3	0.3	0.3	0.2	0.1	1.3
	SMR	0.00	0.00	3.23	0.00	2.89	4.61	0.00	2.22
Ill defined causes (780-795)	Observed	0.00	0.00	0.00	1.00	0.00	2.00	0.00	3.00
	Expected	0.0	0.2	0.2	0.0	0.3	0.2	0.1	1.0
	SMR	0.00	0.00	0.00	0.00	3.51	32.68	0.00	2.95
Accidents (800-962)	Observed	0.00	1.00	3.00	2.00	2.00	3.00	0.00	11.00
	Expected	0.2	2.3	2.1	2.1	2.4	1.0	0.3	10.3
	SMR	0.00	0.43	1.43	0.97	0.84	3.09	0.00	1.07
Suicide (963,970-979)	Observed	0.00	0.00	3.00	4.00	0.00	1.00	0.00	8.00
	Expected	0.1	1.7	1.7	1.6	0.7	0.2	0.0	6.0
	SMR	0.00	0.00	1.80	2.42	0.00	5.91	0.00	1.33
All other causes (REM 001-999)	Observed	0.00	1.00	5.00	2.00	6.00	2.00	2.00	18.00
	Expected	0.1	0.8	2.2	3.1	4.7	1.5	0.9	13.3
	SMR	0.00	1.21	2.24	0.64	1.28	1.34	2.18	1.35
Unknown causes	Observed	0.00	0.00	2.00	0.00	0.00	3.00	0.00	5.00

*Statistically significant ($P<0.05$).

TABLE 22: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF PHYSICIANS COMPARED TO DENTISTS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	0.00	20.00	80.00	157.00	230.00	183.00	66.00	736.00
	Expected	0.2	13.7	80.1	194.0	204.0	81.5	52.5	626.0
	SMR	0.00	1.46	1.00	0.81	1.13	2.24	1.26	1.18*
All cancer (140-205)	Observed	0.00	3.00	20.00	28.00	46.00	20.00	5.00	122.00
	Expected	0.0	2.5	17.7	39.7	39.7	12.7	6.8	119.1
	SMR	0.00	1.20	1.13	0.71	1.16	1.58	0.73	1.02
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	1.00	1.00	2.00	0.00	0.00	4.00
	Expected	0.0	0.0	0.5	0.8	0.5	0.0	0.4	2.3
	SMR	0.00	0.00	2.10	1.20	3.75	0.00	0.00	1.74
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Expected	0.0	0.0	0.3	1.1	0.5	0.0	0.1	2.1
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	8.92	0.48
CA stomach (151)	Observed	0.00	0.00	1.00	1.00	1.00	1.00	0.00	4.00
	Expected	0.0	0.1	0.9	2.4	1.8	0.4	0.2	5.8
	SMR	0.00	0.00	1.06	0.42	0.56	2.45	0.00	0.68
CA intestines (152-153)	Observed	0.00	0.00	3.00	1.00	10.00	4.00	2.00	20.00
	Expected	0.0	0.1	2.4	6.5	6.1	2.3	0.7	18.1
	SMR	0.00	0.00	1.23	0.15	1.63	1.74	2.94	1.11
CA rectum (154)	Observed	0.00	0.00	0.00	1.00	1.00	1.00	0.00	3.00
	Expected	0.0	0.1	0.8	1.9	1.6	0.3	0.2	4.9
	SMR	0.00	0.00	0.00	0.52	0.63	3.84	0.00	0.61

TABLE 22: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF PHYSICIANS COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.00
	Expected	0.0	0.0	0.0	0.5	1.0	0.1	0.0	1.7
	SMR	0.00	0.00	0.00	1.84	0.00	0.00	0.00	0.60
CA pancreas (157)	Observed	0.00	0.00	2.00	2.00	3.00	3.00	1.00	11.00
	Expected	0.0	0.2	2.4	3.7	3.2	1.4	0.6	11.4
	SMR	0.00	0.00	0.85	0.54	0.94	2.13	1.74	0.97
CA respiratory system (160-164)	Observed	0.00	0.00	4.00	5.00	14.00	1.00	0.00	24.00
	Expected	0.0	0.4	4.7	9.0	8.5	2.0	0.7	25.3
	SMR	0.00	0.00	0.85	0.56	1.64	0.50	0.00	0.95
CA prostate (177)	Observed	0.00	0.00	0.00	3.00	5.00	2.00	1.00	11.00
	Expected	0.0	0.0	0.2	2.4	4.0	2.4	2.6	11.5
	SMR	0.00	0.00	0.00	1.26	1.26	0.84	0.38	0.96
CA kidney (180)	Observed	0.00	0.00	0.00	3.00	0.00	0.00	0.00	3.00
	Expected	0.0	0.1	0.7	0.9	0.9	0.1	0.0	2.7
	SMR	0.00	0.00	0.00	3.23	0.00	0.00	0.00	1.11
CA bladder (181)	Observed	0.00	0.00	0.00	0.00	3.00	1.00	0.00	4.00
	Expected	0.0	0.0	0.1	1.0	2.2	0.9	0.5	4.6
	SMR	0.00	0.00	0.00	0.00	1.39	1.07	0.00	0.86
CA brain (193)	Observed	0.00	0.00	3.00	3.00	2.00	2.00	0.00	10.00
	Expected	0.0	0.0	0.3	1.6	1.1	0.3	0.0	3.2
	SMR	0.00	0.00	10.49	1.90	1.87	7.71	0.00	3.10*

TABLE 22: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF PHYSICIANS COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	0.00	1.00	4.00	3.00	0.00	0.00	0.00	8.00
	Expected	0.0	0.6	2.2	2.4	2.7	0.8	0.1	8.9
	SMR	0.00	1.60	1.82	1.25	0.00	0.00	0.00	0.90
Leukemia (204)	Observed	0.00	1.00	1.00	1.00	2.00	1.00	0.00	6.00
	Expected	0.0	0.3	1.0	1.5	2.9	1.1	0.1	7.1
	SMR	0.00	2.06	0.96	0.65	0.70	0.92	0.00	0.84
Other cancer (REM 140-205)	Observed	0.00	1.00	1.00	3.00	3.00	4.00	0.00	12.00
	Expected	0.0	0.4	1.1	3.9	2.8	0.6	0.6	9.4
	SMR	0.00	2.34	0.87	0.76	1.09	6.79	0.00	1.27
Diabetes mellitus (260)	Observed	0.00	1.00	0.00	2.00	3.00	1.00	0.00	7.00
	Expected	0.0	0.2	0.9	2.8	3.1	1.1	0.1	8.3
	SMR	0.00	6.61	0.00	0.71	0.95	0.92	0.00	0.85
Mental disorders (304-326)	Observed	0.00	0.00	0.00	1.00	1.00	1.00	0.00	3.00
	Expected	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1
	SMR	0.00	0.00	0.00	0.00	10.09	0.00	0.00	23.72
Cardiovascular-renal diseases (300-334,400-468)	Observed	0.00	8.00	39.00	98.00	141.00	132.00	52.00	470.00
	Expected	0.1	5.0	43.6	120.8	127.9	55.9	37.6	391.2
	SMR	0.00	1.59	0.89	0.81	1.10	2.36	1.38	1.20*
Non-malignant respiratory disease (470-527)	Observed	0.00	1.00	1.00	6.00	12.00	13.00	6.00	39.00
	Expected	0.0	0.2	1.1	4.6	7.7	4.5	2.8	20.9
	SMR	0.00	5.76	0.87	1.30	1.56	2.92	2.11	1.86*

TABLE 22: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF PHYSICIANS COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Cirrhosis of the liver (581)	Observed	0.00	0.00	1.00	1.00	3.00	0.00	0.00	5.00
	Expected	0.0	0.5	2.6	3.1	2.1	0.4	0.0	8.5
	SMR	0.00	0.00	0.39	0.33	1.44	0.00	0.00	0.59
Nephritis-nephroses (590-594)	Observed	0.00	0.00	0.00	2.00	1.00	1.00	0.00	4.00
	Expected	0.0	0.1	0.6	0.9	1.0	0.5	0.5	3.6
	SMR	0.00	0.00	0.00	2.15	1.00	1.93	0.00	1.11
Ill defined causes (780-795)	Observed	0.00	1.00	0.00	2.00	5.00	2.00	2.00	12.00
	Expected	0.0	0.2	0.5	0.9	0.6	0.2	0.3	2.6
	SMR	0.00	4.07	0.00	2.34	8.74	12.58	5.88	4.55*
Accidents (800-962)	Observed	0.00	4.00	9.00	7.00	4.00	4.00	0.00	28.00
	Expected	0.0	2.5	4.5	6.4	6.8	2.3	0.9	23.4
	SMR	0.00	1.60	2.00	1.09	0.59	1.72	0.00	1.19
Suicide (963,970-979)	Observed	0.00	0.00	4.00	2.00	2.00	2.00	0.00	10.00
	Expected	0.0	1.7	3.5	5.1	2.0	0.4	0.0	12.8
	SMR	0.00	0.00	1.13	0.39	1.02	4.83	0.00	0.78
All other causes (REM 001-999)	Observed	0.00	2.00	4.00	8.00	12.00	7.00	1.00	34.00
	Expected	0.0	0.8	4.9	9.6	13.2	3.6	3.4	35.5
	SMR	0.00	2.59	0.82	0.84	0.91	1.94	0.29	0.96
Unknown causes	Observed	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00

*Statistically significant ($P<0.05$).

TABLE 23: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY COMPARED TO DENTISTS

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	3.00	15.00	66.00	142.00	184.00	123.00	35.00	568.00
	Expected	1.1	18.1	66.4	143.0	154.5	56.9	24.5	464.4
	SMR	2.79	0.83	0.99	0.99	1.19	2.16	1.43	1.22*
All cancer (140-205)	Observed	2.00	2.00	6.00	18.00	30.00	22.00	5.00	85.00
	Expected	0.2	3.5	14.7	29.3	30.2	8.7	3.2	89.6
	SMR	11.55	0.58	0.41	0.61	0.99	2.52	1.59	0.95
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	0.00	2.00
	Expected	0.0	0.0	0.4	0.6	0.4	0.0	0.2	1.6
	SMR	0.00	0.00	0.00	0.00	2.48	0.00	0.00	1.23
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.0	0.0	0.3	0.8	0.4	0.0	0.1	1.5
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CA stomach (151)	Observed	0.00	1.00	0.00	1.00	1.00	1.00	0.00	4.00
	Expected	0.0	0.1	0.8	1.8	1.3	0.3	0.1	4.4
	SMR	0.00	7.08	0.00	0.56	0.74	3.53	0.00	0.90
CA intestines (152-153)	Observed	0.00	0.00	2.00	2.00	1.00	1.00	2.00	8.00
	Expected	0.0	0.1	2.0	4.8	4.7	1.6	0.3	13.5
	SMR	0.00	0.00	1.01	0.41	0.21	0.61	6.12	0.59
CA rectum (154)	Observed	0.00	0.00	0.00	2.00	0.00	1.00	1.00	4.00
	Expected	0.0	0.2	0.6	1.4	1.2	0.2	0.1	3.8
	SMR	0.00	0.00	0.00	1.40	0.00	4.95	8.67	1.05

TABLE 23: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00
	Expected	0.0	0.0	0.00	0.4	0.8	0.1	0.0	1.3
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.78
CA pancreas (157)	Observed	0.00	0.00	0.00	2.00	2.00	1.00	0.00	5.00
	Expected	0.0	0.2	1.9	2.7	2.5	0.9	0.2	8.5
	SMR	0.00	0.00	0.00	0.73	0.81	1.07	0.00	0.59
CA respiratory system (160-164)	Observed	0.00	1.00	1.00	3.00	11.00	5.00	0.00	21.00
	Expected	0.0	0.6	3.9	6.6	6.5	1.3	0.3	19.2
	SMR	0.00	1.65	0.26	0.45	1.70	3.83	0.00	1.09
CA prostate (177)	Observed	0.00	0.00	0.00	0.00	5.00	7.00	0.00	12.00
	Expected	0.0	0.0	0.1	1.7	3.0	1.6	1.2	7.7
	SMR	0.00	0.00	0.00	0.00	1.68	4.37	0.00	1.56*
CA kidney (180)	Observed	0.00	0.00	1.00	1.00	1.00	0.00	0.00	3.00
	Expected	0.0	0.1	0.6	0.7	0.7	0.1	0.0	2.1
	SMR	0.00	0.00	1.79	1.47	1.53	0.00	0.00	1.41
CA bladder (181)	Observed	0.00	0.00	0.00	0.7	0.7	1.6	0.2	3.3
	Expected	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SMR	0.00	0.00	0.00	1.41	0.00	1.49	0.00	0.60
CA brain (193)	Observed	0.0	0.1	0.3	1.2	0.8	0.2	0.0	2.5
	Expected	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
	SMR	0.00	0.00	0.00	1.73	1.23	0.00	0.00	1.20

TABLE 23: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY COMPARED TO DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	2.00	0.00	1.00	2.00	3.00	0.00	0.00	8.00
	Expected	0.0	0.7	1.9	1.8	2.1	0.6	0.1	7.0
	SMR	81.58	0.00	0.54	1.14	1.44	0.00	0.00	0.14
Leukemia (204)	Observed	0.00	0.00	1.00	2.00	1.00	1.00	1.00	6.00
	Expected	0.0	0.7	0.9	1.1	2.2	0.8	0.0	5.7
	SMR	0.00	0.00	1.11	1.78	0.46	1.33	0.00	1.05
Other cancer (REM 140-205)	Observed	0.00	0.00	0.00	0.00	3.00	3.00	0.00	6.00
	Expected	0.1	0.7	1.0	2.9	2.1	0.4	0.3	7.4
	SMR	0.00	0.00	0.00	0.00	1.43	8.28	0.00	0.81
Diabetes mellitus (260)	Observed	0.00	0.00	0.00	1.00	2.00	4.00	1.00	8.00
	Expected	0.0	0.1	0.8	2.0	2.4	0.8	0.1	6.2
	SMR	0.00	0.00	0.00	0.49	0.84	5.21	10.00	1.30
Mental disorders (304-326)	Observed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Expected	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1
	SMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cardiovascular-renal diseases (300-334,400-468)	Observed	0.00	4.00	36.00	92.00	117.00	76.00	22.00	347.00
	Expected	0.2	6.2	36.2	89.0	96.8	39.1	17.5	285.00
	SMR	0.00	0.64	0.99	1.03	1.21	1.94	1.25	1.22*
Non-malignant respiratory disease (470-527)	Observed	0.00	0.00	1.00	2.00	9.00	2.00	2.00	16.00
	Expected	0.0	0.3	0.9	3.4	5.8	3.2	1.3	14.9
	SMR	0.00	0.00	1.11	0.59	1.55	0.63	1.53	1.08

TABLE 23: STANDARDIZED MORTALITY RATIOS 1960-1965
AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Cirrhosis of the liver (581)	Observed	0.00	1.00	0.00	1.00	2.00	0.00	1.00	5.00
	Expected	0.0	0.5	2.1	2.3	1.6	0.3	0.0	6.8
	SMR	0.00	1.97	0.00	0.44	1.27	0.00	0.00	0.73
Nephritis-nephroses (590-594)	Observed	0.00	0.00	0.00	0.00	1.00	1.00	1.00	3.00
	Expected	0.0	0.1	0.5	0.7	0.8	0.4	0.2	2.7
	SMR	0.00	0.00	0.00	0.00	1.32	2.57	4.62	1.13
Ill defined causes (780-795)	Observed	0.00	0.00	0.00	1.00	0.00	2.00	0.00	3.00
	Expected	0.0	0.2	0.4	0.6	0.4	0.1	0.1	1.9
	SMR	0.00	0.00	0.00	1.57	0.00	23.29	0.00	1.57
Accidents (800-962)	Observed	0.00	3.00	6.00	8.00	3.00	4.00	1.00	25.00
	Expected	0.3	3.4	3.7	4.8	5.1	1.6	0.4	19.3
	SMR	0.00	0.89	1.61	1.68	0.59	2.46	2.38	1.29
Suicide (963,970-979)	Observed	1.00	3.00	9.00	8.00	4.00	2.00	0.00	27.00
	Expected	0.2	2.5	2.9	3.8	1.5	0.3	0.0	11.2
	SMR	4.97	1.19	3.08	2.12	2.70	7.03	0.00	2.42*
All other causes (REM 001-999)	Observed	0.00	1.00	8.00	10.00	14.00	9.00	2.00	44.00
	Expected	0.1	1.3	4.1	7.1	10.0	2.5	1.6	26.6
	SMR	0.00	0.80	1.93	1.41	1.40	3.67	1.24	1.65*
Unknown causes	Observed	0.00	1.00	0.00	1.00	2.00	1.00	0.00	5.00

*Statistically significant ($P<0.05$).

TABLE 24: STANDARDIZED MORTALITY RATIOS 1960-1965
ALL GROUPS COMBINED COMPARED TO DENTISTS

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
All causes (001-999)	Observed	3.00	40.00	189.00	367.00	514.00	398.00	124.00	1635.00
	Expected	1.8	44.5	182.8	399.6	431.1	172.4	91.0	1323.1
	SMR	1.67	0.90	1.03	0.92	1.19	2.30	1.36	1.24*
All cancer (140-205)	Observed	2.00	6.00	31.00	64.00	92.00	56.00	12.00	263.00
	Expected	0.3	8.4	40.3	81.9	83.8	26.6	11.8	253.0
	SMR	6.67	0.71	0.77	0.78	1.10	2.11	1.01	1.04
CA of buccal cavity and pharynx (140-148)	Observed	0.00	0.00	1.00	1.00	3.00	1.00	0.00	6.00
	Expected	0.0	0.0	1.1	1.7	1.1	0.0	0.8	4.7
	SMR	0.00	0.00	0.91	0.59	2.73	0.00	0.00	1.28
CA esophagus (150)	Observed	0.00	0.00	0.00	0.00	1.00	0.00	1.00	2.00
	Expected	0.0	0.0	0.8	2.3	1.1	0.0	0.2	4.3
	SMR	0.00	0.00	0.00	0.00	0.91	0.00	5.00	0.46
CA stomach (151)	Observed	0.00	1.00	2.00	3.00	3.00	3.00	0.00	12.00
	Expected	0.0	0.3	2.1	5.0	3.7	0.9	0.4	12.4
	SMR	0.00	3.33	0.95	0.60	0.81	3.33	0.00	0.97
CA intestines (152-153)	Observed	0.00	0.00	5.00	4.00	11.00	9.00	5.00	34.00
	Expected	0.0	0.3	5.5	13.5	12.9	4.9	1.2	38.2
	SMR	0.00	0.00	0.91	0.30	0.85	1.84	4.17	0.89
CA rectum (154)	Observed	0.00	0.00	0.00	5.00	1.00	2.00	1.00	9.00
	Expected	0.0	0.4	1.7	3.9	3.4	0.6	0.4	10.5
	SMR	0.00	0.00	0.00	2.51	1.28	3.33	2.50	0.85

TABLE 24: STANDARDIZED MORTALITY RATIOS 1960-1965
ALL GROUPS COMBINED COMPARED TO DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
CA liver (155.0,156.1)	Observed	0.00	0.00	1.00	1.00	1.00	1.00	1.00	5.00
	Expected	0.0	0.0	0.0	1.1	2.1	0.3	0.0	3.6
	SMR	0.00	0.00	0.00	0.91	0.48	3.33	0.00	1.41
CA pancreas (157)	Observed	0.00	0.00	2.00	4.00	6.00	5.00	1.00	18.00
	Expected	0.0	0.5	5.4	7.6	6.8	2.9	0.9	24.1
	SMR	0.00	0.00	0.37	0.53	0.88	1.72	1.11	0.75
CA respiratory system (160-164)	Observed	0.00	1.00	5.00	12.00	28.00	9.00	0.00	55.00
	Expected	0.0	1.4	10.7	18.5	18.0	4.1	1.2	53.9
	SMR	0.00	1.40	0.47	0.65	1.55	2.20	0.00	1.02
CA prostate (177)	Observed	0.00	0.00	0.00	4.00	12.00	11.00	1.00	28.00
	Expected	0.0	0.0	0.4	4.8	8.4	5.0	4.5	23.1
	SMR	0.00	0.00	0.00	0.83	1.43	2.20	0.22	1.21
CA kidney (180)	Observed	0.00	0.00	3.00	4.00	2.00	0.00	0.00	9.00
	Expected	0.0	0.3	1.6	1.9	1.9	0.3	0.0	5.9
	SMR	0.00	0.00	1.88	2.11	1.05	0.00	0.00	1.52
CA bladder (181)	Observed	0.00	0.00	0.00	2.00	3.00	3.00	0.00	8.00
	Expected	0.0	0.0	0.3	2.0	4.6	2.0	0.8	9.6
	SMR	0.00	0.00	0.00	1.00	0.65	1.50	0.00	0.83
CA brain (193)	Observed	0.00	0.00	3.00	6.00	3.00	2.00	1.00	15.00
	Expected	0.0	0.0	0.7	3.3	2.2	0.6	0.0	6.9
	SMR	0.00	0.00	4.28	1.82	1.37	3.33	0.00	2.17*

TABLE 24: STANDARDIZED MORTALITY RATIOS 1960-1965
ALL GROUPS COMBINED COMPARED TO DENTISTS (Cont.)

Cause		Age Group: Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Malignant lymphomas (200-203,205)	Observed	2.00	2.00	5.00	9.00	3.00	1.00	0.00	22.00
	Expected	0.0	1.8	5.0	4.9	5.8	1.7	0.2	19.5
	SMR	0.00	1.11	1.00	1.83	0.86	0.59	0.00	1.13
Leukemia (204)	Observed	0.00	1.00	2.00	4.00	7.00	2.00	1.00	17.00
	Expected	0.0	1.7	2.4	3.2	6.0	2.3	0.2	15.8
	SMR	0.00	0.59	0.83	1.25	1.17	0.87	5.00	1.08
Other cancer (REM 140-205)	Observed	0.00	1.00	2.00	5.00	8.00	7.00	0.00	23.00
	Expected	0.2	1.6	2.6	8.1	5.8	1.2	1.0	20.5
	SMR	0.00	0.62	0.77	0.62	1.38	5.83	0.00	1.12
Diabetes mellitus (260)	Observed	0.00	1.00	0.00	3.00	6.00	6.00	1.00	17.00
	Expected	0.0	0.4	2.1	5.7	6.6	2.3	0.2	17.5
	SMR	0.00	2.50	0.00	0.53	0.91	2.61	5.00	0.97
Mental disorders (304-326)	Observed	0.00	0.00	0.00	1.00	1.00	1.00	0.00	3.00
	Expected	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.3
	SMR	0.00	0.00	0.00	0.00	5.00	0.00	0.00	8.75
Cardiovascular-renal diseases (300-334,400-468)	Observed	0.00	14.00	97.00	228.00	328.00	272.00	89.00	1028.00
	Expected	0.4	15.6	99.4	248.7	270.5	118.3	65.1	818.5
	SMR	0.00	0.90	0.98	0.92	1.21	2.30	1.37	1.26*
Non-malignant respiratory disease (470-527)	Observed	0.00	1.00	2.00	10.00	25.00	15.00	12.00	65.00
	Expected	0.0	0.6	2.6	9.5	16.2	9.5	4.9	43.3
	SMR	0.00	1.67	0.77	1.05	1.54	1.58	2.45	1.50*

TABLE 24: STANDARDIZED MORTALITY RATIOS 1960-1965
ALL GROUPS COMBINED COMPARED TO DENTISTS (Cont.)

Cause		Age Group Under 35	35-44	45-54	55-64	65-74	75-84	Over 85	Total
Cirrhosis of the liver (581)	Observed	0.00	1.00	3.00	3.00	5.00	1.00	1.00	14.00
	Expected	0.0	1.3	5.8	6.3	4.4	0.9	0.0	18.8
	SMR	0.00	0.77	0.52	0.48	1.14	1.11	0.00	0.74
Nephritis-nephroses (590-594)	Observed	0.00	0.00	1.00	2.00	3.00	3.00	1.00	10.00
	Expected	0.0	0.2	1.4	1.9	2.1	1.1	0.8	7.6
	SMR	0.00	0.00	0.71	1.05	1.43	2.73	1.25	1.32
Ill defined causes (780-795)	Observed	0.00	1.00	0.00	4.00	5.00	6.00	2.00	18.00
	Expected	0.0	0.6	1.1	1.8	1.2	0.3	0.6	5.6
	SMR	0.00	1.67	0.00	2.22	4.17	20.00	3.33	3.23*
Accidents (800-962)	Observed	0.00	8.00	18.00	17.00	9.00	11.00	1.00	64.00
	Expected	0.5	8.2	10.3	13.3	14.2	4.9	1.6	53.1
	SMR	0.00	0.98	1.75	1.28	0.63	2.24	0.62	1.21
Suicide (963,970-979)	Observed	1.00	3.00	16.00	14.00	6.00	5.00	0.00	45.00
	Expected	0.3	6.0	8.1	10.5	4.1	0.9	0.0	29.9
	SMR	3.33	0.50	1.98	1.33	1.46	5.55	0.00	1.50*
All other causes (REM 001-999)	Observed	0.00	4.00	17.00	20.00	32.00	18.00	5.00	96.00
	Expected	0.2	2.8	11.3	19.8	27.8	7.6	6.0	75.4
	SMR	0.00	1.43	1.50	1.01	1.15	2.36	0.83	1.27*
Unknown causes	Observed	0.00	1.00	4.00	1.00	2.00	4.00	0.00	12.00

*Statistically significant ($P<0.05$).

DISCUSSION AND CONCLUSION

The preliminary analysis using PMR's suggests several problem areas. Milham (1976) demonstrated much the same proportional mortality pattern.

The excesses suggested by the PMR's were not borne out by the SMR's. The findings are consistent. The PMR for a particular cause will equal the SMR for that cause only if the overall SMR is 1.

$$PMR_{cause} \cong SMR_{cause}/SMR_{total}$$

This relationship shows that the PMR has the ironic ability to single out nonexistent excess relative risks if the study population has a lower mortality rate than the comparison population and not single out excess risks if the study population has a higher overall rate than the comparison population.

Only under the most extreme assumption that all lost to trace are dead are any significant excess mortality rates noted and these excesses are contributed by the dentists who are not members of the ADA. The cluster of the possibility of excess suicide, cirrhosis, and nephritis-nephroses suggests that this group is less healthy in general than other dentists.

It might be concluded that there are no excesses of cancer among dentists in general and that the suicide rate, purportedly such a risk among dentists, is approximately equal to that of the general population for dentists in general.

ACKNOWLEDGMENTS

The success of this study was achieved only through the encouragement and support of numerous persons and organizations. Two individuals deserve special mention: Drs. Patricia P. Breslin and J. William Lloyd; the latter for his conceptualizations and assistance in the initiation of the study and Dr. Breslin for her active participation in every phase of the study. Persons directly responsible for day-to-day activities include Rene Kalman, Linda Mathieu, Audrey McLaughlin, Marian Heid and Hugh W. Rush. The administration, staff, and faculty of Temple University School of Dentistry was particularly helpful at all times. The Division of Dentistry, HRA, BHM, DHEW, made valuable records available. The American Dental Association, the Bureaus of Data Processing Services and Membership Records, and Economic Research and Statistics and especially Dr. Helen Gift were always of assistance. Dr. Genevieve M. Matanoski generously made available data supported under grant OH 00465 from the National Institute for Occupational Safety and Health. Applied Management Sciences, Inc. of Silver Spring, Maryland assisted actively in computer support and provided the services of Jim Bremer and Mike Consiglio. Finally, a great debt of gratitude is due C.O.O.

REFERENCES

American Dental Association, Bureau of Economic Research and Statistics. 1956. Mortality of Dentists, 1951-1954. JADA, 52:65-72.

American Dental Association, Bureau of Economic Reseach and Statistics. 1962. Mortality of Dentists, 1955-1960. JADA, 65:107-114.

American Dental Association, Bureau of Economic Research and Statistics. 1963. Survey of Dentists over 60. II Illness and Injuries. JADA, 67:539-548.

American Dental Association, Council on Dental Research and Council on Dental Materials and Devices. 1967. Radiation Hygiene and Practice in Dentistry II. JADA, 75:1197-1198.

American Dental Association, Bureau of Economic Research and Statistics. 1968a. Mortality of Dentists, 1961 to 1966. JADA. 76:831-834.

American Dental Association. American Dental Directory. 1968b. American Dental Association. Chicago, Illinois.

American Dental Association, Council on Dental Materials and Devices and Council on Dental Research. 1971. Significance to Health of Mercury Used in Dental Practice: Review. JADA, 82:1401-1407.

American Dental Association, Council on Dental Materials and Devices. 1974a. Recommendations in Mercury Hygiene. JADA, 88:392.

American Dental Association, Council on Dental Materials and Devices. 1974b. Status Report on Dental Operating Handpieces. JADA, 89:1162-1170.

American Dental Association, Bureau of Economic Research and Statistics. 1975. Mortality of Dentists, 1968 to 1972. JADA, 90:195-198.

American Dental Association, Council on Dental Materials and Devices. 1976. Recommendations in Mercury Hygiene. JADA, 92:1217.

American Dental Association, Council on Dental Therapeutics. 1976. Type B (Serum) Hepatitis and Dental Practice. JADA, 92:153-159.

Arndt, D. 1975. Fatal Skin Epithelioma. Berufsdematosen, 23:201-206.

ASOS, Committee on Anesthesia. 1974. ASOS Anesthesia Morbidity and Mortality Survey. J. Oral Surg., 32:733-738.

Austin, L. T. and Kruger, G. O. 1947. Common Ailments of Dentists: A Statistical Study. JADA, 35:797-805.

Ayer, W. A., Getter, L., Machen, J. B. and Haller, G. R. 1976. Hand Steadiness and Mercury Blood Levels Among Practicing Dentists: Preliminary Findings. JADA, 92:1208-1210.

Barber, T. and Reisbick, M. H. 1973. Amalgam: Past, Present and Future. JADA, 86:863-869.

Bartels, H. A. 1969. Oral Microbial Contamination of the Dentist's Fingers. N.Y. State D. J., 35:531-533.

Battistone, G. C., Hefferren, J. J., Miller, R. A. and Cutright, D. E. 1976. Mercury: Its Relation to the Dentist's Health and Dental Practice Characteristics. JADA, 92:1182-1188.

Belting, C. M., Haberfelde, G. C. and Juhl, L. K. 1964. Spread of Organisms from Dental Air Rotor. JADA, 68:648-651.

Bernstein, A. and Balk, J. L. 1953. The Common Diseases of Practicing Dentists. JADA, 46:525-529.

REFERENCES (Cont.)

Biller, F. E. 1946. The Occupational Hazards in Dental Practice. Oral Hyg., 36:1194-1201.

Blachly, P. H., Osterud, H. T. and Josslin R. 1963. Suicide in Professional Groups. New Eng. J. Med., 268:1278-1282.

Brady, J. M., Cutright, D. E., Beasley, J. D. III and Perez, B. 1976. Findings in 1,724 Buccal Smears from Dentists. JADA, 92:1211-1212.

Brooks, J. M. and Allingham, P. M. 1974. Mercury Hazards in Dentistry. New Zeal. Dent. J., 70:166-180.

Bruce, D. L., Eide, K. A., Linde, H. W. and Eckenhoff, J. E. 1968. Causes of Death Among Anesthesiologists: A 20-Year Survey. Anesthesiology, 29:565-569.

Buchwald, H. 1972. Exposure of Dental Workers to Mercury. Amer. Industr. Hyg. Assn. J., 83:492-502.

Campbell, M. J. A., Coillet, K. R., Fary, W. E., and Kenny, A. J. 1971. An Activity Survey of Dentists. Aust. Dent. J., 16:22-24.

Chandler, H. H., Rupp, N. W. and Paffenbarger, G. C. 1971. Poor Mercury Hygiene from Ultrasonic Amalgam Condensation. JADA, 82:553-557.

Chybowski, V. 1971. Mercury—A Biological Hazard to Auxiliary Personnel? Dent. Assist., 40:13-16.

Clark, A. 1974. Bacterial Colonization of Dental Units and the Nasal Flora of Dental Personnel. Proc. Roy. Soc. Med., 67:1269-1270.

Cleaton-Jones, L. 1974. Inhalation Sedation—Is This a Potential Health Hazard for the Dentist and His Staff. J. Dent. Assn. S. Afr., 29:521-523.

Cloutman, G. W. 1963. The Problem of Fatigue in Dentistry. Brit. Dent. J., 114:317-321.

Cohen, E. N., Brown, B. W., Jr., Bruce, D. L., Cascorbi, H. F., Corbett, T. H., Jones, T. W. and Whitcher, C. E. 1975. A Survey of Anesthetic Health Hazards Among Dentists. JADA, 90:1291-1296.

Cook, T. A. and Yates, P. O. 1969. Fatal Mercury Intoxication in a Dental Surgery Assistant. Brit. Dent. J., 127:553-555.

Crawford, J. J. 1975. New Light on the Transmissibility of Viral Hepatitis in Dental Practice and Its Control. JADA, 91:829-835.

Cureton, T. K. 1961. Health and Physical Fitness Tests of Dentists (with Implications). J. Dent. Med., 16:211-222.

Cuzacq, G., Comproni, E. M. and Smith, H. L. 1971. Mercury Contamination in the Dental Office. J. Mass. Dent. Soc., 20:254-261.

Dean, G. 1969. The Causes of Death of South African Doctors and Dentists. S. Afr. Med. J., 43:495-500.

Deverall, A. 1969. The Health of Dentists in South Africa. J.D.A.S.A., 24:368-371.

Dickinson, F. G. and Martin, L. W. 1956. Physician Mortality, 1949-1951. JAMA, 162:1462-1468.

Djerassi, E. 1971. Some Problems of the Occupational Diseases of Dentists. Int. Dent. J., 21:252-269.

Dublin, L. I. and Spiegelman, M. 1947. The Longevity and Mortality of American Physicians, 1938-1942. JAMA, 134:1211-1215.

REFERENCES (Cont.)

Dublin, L. I. and Spiegelman, M. 1948. Mortality of Medical Specialists, 1938-1942. JAMA, 137:1519-1524.

Dyce, J. M. and Dow, J. A. 1965. F.D.I. Special Commission on Dentist's Health, Diagnosis and Stress in Dentistry. A Study in Stress. Int. Dent. J., 15:405-416.

Eames, W. B., Gaspar, J. D. and Mohler, H. C. 1976. The Mercury Enigma in Dentistry. JADA, 92:1199-1203.

Eccles, J. D. and Powell, M. 1967. The Health of Dentists, A Survey in South Wales 1965/1966. Brit. Dent. J., 120:379-387.

Emerson, H. and Hughes, H. E. 1926. Death Rates of White Male Physicians in the United States, by Age and Cause. Amer. J. Public Health, 16:1088-1093.

Farber, M. and Schwartz, A. 1969. The Health of the Dentist—Orthopedics, Orthopedic Problems of Dentists. Bull. Union County Dent. Soc., 48:9.

Feldman, R. E. and Schiff, E. R. 1975. Hepatitis in Dental Professionals. JAMA, 232:1228-1230.

Fox, J. G. and Jones, J. M. 1967. Occupational Stress in Dental Practice. Brit. Dent. J., 123:465-473.

Federico, A. N. 1968. Occupational Hazards in Dentistry. J. N.J. State Dent. Soc., 40:73-79.

Freese, A. S. 1973. The Venous System—Occupational Hazard? Tic., 32:7-9.

Frick, J. R. 1973. Infectious Disease Hazards. N.C. Dent. J., 56:10-12, passim.

Gasersic, D., Stegnar, P. and Ravnik, C. 1973. Mercury Uptake and Its Distribution in Some Tissue from Workers in Dental Surgeries. Zabozkrav. Vestn., 28:5-11.

Gennari, U. and Galli, S. 1971a. Occupational Diseases of Dentists—Statistical Study. Riv. Ital. Stomat., 26:379-394.

Gennari, U. and Galli, S. 1971b. Occupational Diseases of Dentists—Osteo-Muscular. Riv. Ital. Stomat., 26:475-489.

Gennari, U. and Galli, S. 1971c. Occupational Diseases of Dentists—Visual Disturbances from Illumination and Foreign Objects Wounds. Riv. Ital. Stomat., 26:747-755.

Gennari, U. and Galli, S. 1971d. Occupational Diseases of Dentists—Occupational Dermatitis. Riv. Ital. Stomat., 26:757-760.

Gennari, U. and Galli, S. 1971e. Occupational Diseases of Dentists—Traumatic Lesions of the Hands. Riv. Ital. Stomat., 26:801-804.

Gennari, U. and Galli, S. 1971f. Occupational Diseases of Dentists—X-Ray Lesions. Riv. Ital. Stomat., 26:805-814.

Gennari, U. and Galli, S. 1971g. Occupational Diseases of Dentists—Nervous Disorders. Riv. Ital. Stomat., 26:815-820.

Gennari, U. and Galli, S. 1971h. Occupational Diseases of Dentists—Internal Diseases. Riv. Ital. Stomat., 26:821-840.

Gillette, W. B. 1966. Chairside Safety for Periodontists. J. Perio., 37:198-199.

Glass, R. L. 1966. Mortality of New England Dentists, 1921-1960. U.S. Department of Health, Education and Welfare. Public Health Service, Division of Radiological Health, Washington, D. C.

REFERENCES (Cont.)

Glazer, R. I., Spatz, S. S. and Catone, G. A. 1973. Viral Hepatitis: A Hazard to Oral Surgeons. J. Oral. Surg., 31:504-508.

Goldwater, L. J. 1964. Occupational Exposure to Mercury, The Harben Lectures, 1964, Lecture 1 Historical Background. J. Roy. Inst. Public Health, 27:279-301.

Goldwater, L. J., Ladd, A. C. and Jacobs, M. B. 1964. Absorption and Excretion of Mercury in Man. VII. Significance of Mercury in Blood. Arch. Environ. Health, 9:735-741.

Goodman, L. J. 1975. The Longevity and Mortality of American Physicians, 1969-1973. Milbank Memorial Fund Quarterly, 53:353-375.

Gronka, P. A., Bobkoskie, R. L., Tomchick, G. J., Bach, F. and Rakow, A. B. 1970. Mercury Vapor Exposures in Dental Offices. JADA, 81:923-925.

Grossman, L. I. and Dannenberg, J. R. 1949. Amount of Mercury Vapor in Air of Dental Offices and Laboratories. J. Dent. Res., 28:435-439.

Guralnick, L. 1962. Mortality by Occupation and Industry Among Men 20-64 Years of Age: U.S., 1950. Vital Statistics Special Report, 53:51-92.

Guralnick, L. 1963a. Mortality by Occupation and Cause of Death Among Men 20-64 Years of Age: U.S., 1950. Vital Statistics Special Report, 53:95-339.

Guralnick, L. 1963b. Mortality by Occupational Level and Cause of Death Among Men 20-64 Years of Age: U.S., 1950. Vital Statistics Special Report, 53:439-612.

Gutwirth, S. W. 1968. You Can Control Tension. Dent. Survey, 44:41-44.

Haden, J. L. 1969. A Preliminary Aerobic Bacterial Study of Rebounded Spray from Utilization of the Air Rotor Handpiece. J. Kan. State Dent. Assn., 53:10-13.

Haenszel, W., Loveland, D. and Sirken, M. G. 1962. Lung Cancer Mortality as Related to Residence and Smoking History: I. White Males. J. Nat. Cancer Inst., 28:947.

Harris, R. W., Kehrer, A. F. and Isacson, P. 1969. Relationship of Occupation to Risk of Clinical Mumps in Adults. Amer. J. Epid., 89:264-270.

Hart, J. T. 1972. Data on Occupational Mortality, 1959-63, Too Little and Too Late. Lancet, 1:192-193.

Hefferren, J. J. 1976. Usefulness of Chemical Analysis of Head Hair for Exposure to Mercury. JADA, 92:1213-1216.

Heinrich, E. 1970. Psychic Health of the Dentist. Quint. Int., 1:95-101.

Hicks, H. H. 1967. Hazards of Radiation from X-Ray Exposure. JADA, 75:1194-1195.

Hill, G. B. and Harvey, W. 1972. The Mortality of Dentists. Brit. Dent. J., 132:179-182.

Hoover, A. W. and Goldwater, L. J. 1966. Absorption and Excretion of Mercury in Man. X: Dental Amalgams as a Source of Urinary Mercury. Arch. Environ. Health, 12:506-508.

Howkins, C. H. 1935. Mortality and Occupational Diseases of Dental Surgeons. Oral Health, 25:593-598.

Hyland, J. R., Kevorkian, J. and Cento, D. P. 1971. Total Mercury Levels in Human Tissues--A Preliminary Study. Lab. Med., 8:46-49.

REFERENCES (Cont.)

Jacobs, M. B., Goldwater, L. J. and Gilbert, H. 1961. Ultramicrodetermination of Mercury in Blood. Amer. Industr. Hyg. Assn. J., 21:276-279.

Jacobs, M. B., Ladd, A. C. and Goldwater, L. J. 1964. Absorption and Excretion of Mercury in Man. VI. Significance of Mercury in Urine. Arch. Environ. Health, 9:454-463.

Joselow, M. M., Goldwater, L. J., Alvarez, A. and Herndon, J. 1968. Absorption and Excretion of Mercury in Man. XV. Occupational Exposure Among Dentists. Arch. Environ. Health, 17:39-43.

Kajland, A., Lindvall, T. and Nilsson, T. 1974. Occupational Medical Aspects of the Dental Profession. Work Environ. Health, 11:100-107.

Katberg, J. W. 1974. Cross-Contamination via the Prosthodontic Laboratory. J. Prosth. Dent., 32:412-419.

Kazantzis, G. 1961. Air Contamination from High-Speed Drills. Proc. Roy. Soc. Med., 54:242-244.

Kevorkian, J., Cento, D. P., Hyland, J. R., Bagozzi, W. M. and van Hollebeke, E. 1972. Mercury Content of Human Tissues During the Twentieth Century. AJPH, 62:504-513.

Kimmel, K. 1973. Stress Situations in Dental Practice. Ergonomic and Pract. Admin., 11:1-6.

Knapp, D. E. 1963. Hazards of Handling Mercury, JADA, 67:79-81.

von Krammer, R. 1968. High Speed Equipment and Dentists' Health. J. Pros. Dent. 19:46-50.

Larato, D. C. 1966. Emergency Treatment and Prevention of Eye Injuries in Dental Practice. N.Y. State Dent. J., 32:8-13.

Larato, D. C. 1968. Hand Protection in Dental Practice. N.Y. State Dent. J., 34:95-96.

Lazarus, R. S. 1966. Some Principles of Psychological Stress and Their Relation to Dentistry. J. Dent. Res., 45:1620-1626.

Li, F. P., Fraumeni, J. F., Mantel, N. and Miller, R. W. 1969. Cancer Mortality Among Chemists. J. Nat. Cancer Inst., 42:1159.

Lenihan, J. M. A., Smith, H. and Harvey, W. 1973. Mercury Hazards in Dental Practice, Assessment and Control by Activation Analysis. Brit. Dent. J., 135:365-369.

Lindhardt, M., Frandsen, E., Hamtoft, H., and Mosbech, J. 1963. Causes of Death Among the Medical Profession in Denmark. Danish Med. Bull., 10:59-64.

Line, E. 1956. The Dentist and His Health. D. Mag. and Oral Topics, 73:85-88.

Lintz, W. 1935. Prevention and Cure of Occupational Diseases of the Dentist. JADA, 22:2071-2081.

Lytle, J. J. 1974. Anesthesia Morbidity and Mortality Survey of the Southern California Society of Oral Surgeons. J. Oral Surgery, 32:739-744.

MacFarlane, T. W. and Mason, D. K. 1972. The Dentist and the Prevention of Serum Hepatitis. Brit. Dent. J., 132:487-489.

Madden, R. M., Hausler, W. J., Jr. and Leaverton, P. E. 1969. Study of Some Factors Contributing to Aerosol Production by the Air-Turbine Handpiece. J. Dent. Res., 48:341-345.

REFERENCES (Cont.)

Mantanoski, G. M., Seltser, R., Sartwell, P. E., Diamond, E. L. and Elliott, E. A. 1975a. The Current Mortality Rates of Radiologists and Other Physicians: Specific Causes of Death. Amer. J. Epidem., 101:199-210.

Mantanoski, G. M., Seltser, R., Sartwell, P. E., Diamond, E. L. and Elliott, E. A. 1975b. The Current Mortality Rates of Radiologists and Other Physician Specialists: Deaths from All Causes and from Cancer. Amer. J. Epid., 101:188-198.

Mantel, N. and Haenszel, W. 1969. Statistical Aspects of the Analysis of Data from Retrospective Studies of Disease. J. Nat. Cancer Inst., 43:719

Mantyla, D. G. 1973. Protection of Dental Personnel Through Proper Mercury Hygiene. Dent. Survey, 49:58-62.

Mantyla, D. G. and Wright, O. D. 1976. Mercury Toxicity in the Dental Office: A Neglected Problem. JADA, 92:1189-1194.

McCord, C. P. 1961. Mercury Poisoning in Dentists. Industr. Med. and Surg., 30:554.

McGinnis, J. P. Mincer, H. H. and Hambree, J. H., Jr. 1974. Mercury Vapor Exposure in a Dental School Environment. JADA, 88:785-788.

Mayer, A. 1962. Mercury Poisoning, A Potential Hazard to Dental Personnel. Dent. Prog., 2:190-191.

Milham, S. 1972. Vol. II. Occupational Mortality in Washington State, 1950-1971. NIOSH Research Report.

Millard, R. I. and Corbett, T. H. 1974. Nitrous Oxide Concentrations in the Dental Operatory. J. Oral Surg., 32:593-594.

Mosley, J. W. and White, E. 1975. Viral Hepatitis as an Occupational Hazard of Dentists. JADA, 90:992-997.

Nixon, G. S. 1972. Occupational Hazards in Dentistry. Comm. Health (Bristol), 3:221-225.

Nixon, G. S. and Smith, H. 1965. Hazard of Mercury Poisoning in the Dental Surgery. J. Oral Ther. and Pharmacol., 1:512-514.

Nixon, G. S. and Tilston, D. R. G. 1965. Inhalation of Oil Particles from Air Turbine Handpieces. Brit. Dent. J., 119:114-117.

Nixon, G. S. and Rowbotham, T. C. 1971. Mercury Hazards Associated with High Speed Mechanical Amalgamators. Brit. Dent. J., 131:308-311.

Noe, F. E. 1959. Mercury as a Potential Hazard in Medical Laboratories. New Eng. J. Med., 261:1002-1006.

Nord, P. J., Kadaba, M. P. and Sorenson, J. R. J. 1973. Mercury in Human Hair. Arch. Environ. Health, 27:40-45.

Opton, E. M., Jr. 1969. Psychological Stress and Coping Processes in the Practice of Dentistry. Int. Dent. J., 19:415-427.

Pagnotto, L. D. and Comproni, E. M. 1976. The Silent Hazard: An Unusual Case of Mercury Contamination of a Dental Suite. JADA, 92:1195-1198.

Paul, E. 1969. The Elimination of Stress and Fatigue in Operative Dentistry. Brit. Dent. J., 127:37-41.

Pearson, E. S. and Hartley, H. O. (eds.). 1958. Biometric Tables for Statisticians. 2nd edition, Vol. I. Cambridge University Press.

REFERENCES (Cont.)

Pelleu, G. B., Jr., Shreve, W. B. and Wachtel, L. W. 1969. Reduction of Microbial Concentrations in Air of Dental Operatory Rooms by Hepa Filtration. U.S. Navy Med. News Lett., 54:41.

Pelleu, G. B., Jr., Shreve, W. B. and Wachtel, L. W. 1970. Reduction of Microbial Concentration in Air of Dental Operatory Rooms I High-Efficiency Particulate Air Filters. J. Dent. Res., 49:315-319.

Powell, M. and Eccles, J. D. 1970. The Health and Work of Two Professional Groups: Dentists and Pharmacists. Dent. Practit. and Dent. Rec., 20:373-378.

R. L. Polk Company. 1928. Polk's Dental Register and Directory of the United States and Canada, 14th Edition. R. L. Polk Company, Chicago, Illinois.

Rackson, C. B. 1973. Hand Controls: A Revolutionary Approach to Health and Production. JADA, 88:1322-1324.

Registrar General for England and Wales, The Registrar General's Decennial Supplement, England and Wales, Occupational Mortality, 1921. 1927. Her Majesty's Stationery Office. London, England.

Registrar General for England and Wales, The Registrar General's Decennial Supplement, England and Wales, Occupational Mortality, 1931. 1938. Her Majesty's Stationery Office. London, England.

Registrar General for England and Wales, The Registrar General's Decennial Supplement, England and Wales, Occupational Mortality, 1951. 1958. Her Majesty's Stationery Office. London, England.

Registrar General for England and Wales, The Registrar General's Decennial Supplement, England and Wales, Occupational Mortality, 1961. 1971. Her Majesty's Stationery Office. London, England.

Rolofson, J. W., Harmel, A. and Stewart, H. F. 1969. Radiation Isoexposure Curves About a Dental Chair During Radiography. JADA, 78:310-319.

Rose, K. D. and Rosow, I. 1973. Physicians Who Kill Themselves. Arch. Gen. Psychiatry, 29:800-805.

Rothe, V. W. 1975. Radiation Protectors. 1975. Stomatol. DDR. 25:43-47.

Russek, H. I. 1962. Emotional Stress and Coronary Heart Disease in Amer. Physicians, Dentists and Lawyers. Amer. J. Med. Sc., 243:716-726.

Scheer, R. B. 1971. Mercury Toxicology and the Dental Staff. Can. Forces Dent. Serv. Q., 12:2-3.

Schneider, M. 1974. An Environmental Study of Mercury Contamination in Dental Offices. JADA, 89:1092-1098.

Schwimmer, A. and Howitt, N. G. 1973. Hepatitis: A Review of the Disease and its Prevention. N.Y. J. Dent., 43:73-76.

Seltser, R. and Sartwell, P. E. 1965. The Influence of Occupational Exposure to Radiation on the Mortality of American Radiologists and Other Medical Specialists. Amer. J. Epidem., 81:2-22.

Silverman, C. and Seltser, R. 1971. Radiation Registry of Physicians. Radiology, 99:559-568.

REFERENCES (Cont.)

Selye, H. 1968. Stress and Dentistry. Amer. Inst. Oral Biology, 25:131-140.

Smith, N. J. D. 1972. The Hazard to the Dentist and His Staff from Dental Radiology. Dent. Practit. and Dent. Rec., 22:409-413.

Smith, N. J. D. 1973. Radiography and Radiology for the Dental Practitioner. Brit. Dent. J., 135:288-291.

Southam, J. C., Clarke, J. and Colley, I. T. 1968. Viral Diseases and the Dental Surgeon. Dent. Practit. and Dent. Rec., 19:45-49.

Spaulding, C. K. and Cowing, R. F. 1959. A Survey of Radiation Received by Dentists and Dental Assistants. Amer. Industr. Hyg. Assn. J., 20:424-427.

Steppacher, R. C. and Mausner, J. S. 1974. Suicide in Male and Female Physicians. JAMA, 228:323-328.

Storlazzi, E. D. and Elkins, H. B. 1941. Significance of Urinary Mercury. I. Occupational Mercury Exposure II. Mercury Absorption from Mercury-Bearing Dental Fillings and Antiseptics. J. Industr. Hyg., 23:459-465.

Terranova, P. L. 1967. Adverse Conditions Found in the Use of Ultra High-Speed Equipment. N.Y. State Dent. J., 33:143-148.

Thomas, C. B. 1969. Suicide Among Us: Can We Learn to Prevent It? Johns Hopkins Med. J., 125:276-285.

Tressler, D. 1957. Varicose Veins: An Occupational Hazard of Dentists. Rev. Franc. Odontostomat., 3:1279-1286.

Ulrich, H. 1946. The Incidence of Leukemia in Radiologists. New Eng. J. Med., 234:45-46.

U.S. Bureau of the Census. U.S. Census of the Population, Subject Reports. 1964. Characteristics of Professional Workers. Final Report (PC-Z-7E). U.S. Government Printing Office. Washington, D.C.

Vergilio, J. P. 1971. Occupational Hazards of Dentistry. Dent. Stud., 49:77-78.

Ward, W. D. and Holmberg, C. J. 1969. Effects of High-Speed Drill Noise and Gunfire on Dentists' Hearing. JADA, 79:1383-1387.

Warren, S. 1956. Longevity and Causes of Death from Irradiations in Physicians. JAMA, 162:464-468.

Warren, S. and Lombard, O. M. 1966. Survey of Radiation Exposure of Massachusetts Dentists. J. Mass. Dent. Soc., 15:223-224.

Warren, S. and Lombard, O. M. 1970. Mortality and Radiation Exposures of Massachusetts Dentists. JADA, 80:329-330.

Weil, R. B. and Bernstein, B. 1975. Viral Hepatitis: Its Importance to Dentists. N.Y. State Dent. J., 41:467-470.

White, R. R. and Brandt, R. L. 1976. Development of Mercury Hypersensitivity among Dental Students. JADA, 92:1204-1207.

Willee, A. W. 1967. How to Avoid the Occupational Hazards of Dentistry. Aust. Dent. J., 12:348-359.

Williams, S. V., Mumford, R. S., Colton, T., Murphy, D. A. and Poskanzer, D. C. 1971. Mortality Among Physicians: A Cohort Study. J. Chron. Dis., 24:393-401.

REFERENCES (Cont.)

World Health Organization. 1957. Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death, 7th Revision of the International List. World Health Organization, Geneva, Switzerland.

Yates, P. O. and Cook, T. A. 1970. Fatal Mercury Intoxication in a Dental Surgery Assistant. Brit. Dent. Surg. Assis., 28:167-passim.

Zampak, H. and Smerelj, S. 1974. Professional Diseases Affecting Dentists. Acta. Stomat. Croat., 8:147-151.

APPENDIX A

NOTES ON DENTIST STUDY PROCEDURES

MATCHING ADA DEATH CERTIFICATES, ADA DEATH NOTIFICATIONS AND JADA OBITUARIES TO CREATE ALPHABETICAL DEATH RECORDS FILE AND STATE REQUEST FILE

I. Alphabetizing Death Records Provided by American Dental Association

A. File certificates and notification in alphabetical order. For records with the same name, order by city, state, and birthdate.

B. Individual death notifications should be xeroxed and:

1. File xerox copy alphabetically with certificates.

   a. If a death certificate is already in file, the xerox copy of the notification should be matched with its original and filed in "Completed Materials."

2. File original in appropriate state folder in "State Request File."

C. Hold any ADA lists of notifications until all individual certificates and notifications are alphabetized. Then read notification lists against file and:

1. If record is in file, X-out on notification list.

2. If record is not in file, type dummy and carbon and check off list.

   a. File carbon alphabetically with certificates and notifications.

   b. File original in appropriate state folder in "State Request File."

3. Finished notification lists should be filed for future reference in "Completed Materials."

NB: If more than one name appears on any death record, make a "See _____" cross index sheet and file alphabetically. To be sure that both records are pulled later, original document should be marked with a red square to indicate that there is a cross reference sheet.

II. Preparation of ADA Journal Obituary Lists and Matching to Death Records

A. Individual obituary pages for ADA journals for each year 1960-1966 should be Xeroxed. The first few months of 1967 have been scanned and obituaries copied on separate sheet for deaths occurring before 1-1-66. (None found, Jan./June.)

B. Deaths occurring before 1-1-60 or after 12-31-65 should be crossed off Xerox copy in yellow. Obituaries without date of death are also crossed off Xerox copy in yellow.

C. Read obituaries against death records.

1. If obituary matches a record, cross off obituary list in red.

2. If obituary doesn't match a record, make a dummy sheet and carbon.

a. File carbon with death records. The "Alphabetical Death Records File" is now established.

b. File original in appropriate state folder in "State Request File."

c. Check in red name on obituary list.

D. Finished obituary sheets should be filed with "Completed Materials."

CREATING COHORT DATA TAPE, MATCHING DIRECTORIES AND DEATH RECORDS TO CREATE COHORT DEATH RECORD FILE AND FOLLOW-UP FILE

III. Creating 1960 Cohort File

A. Keypunch 1960 ADA Directory.

B. Edit all input and correct "fatal" errors in Master File.

C. Check for duplicate records.

D. Alphabetize (sort) Master File by last name, first name, middle initial, year of birth, dental school and year of graduation, making sure distinct records are defined. Assign ID number.

IV. Initial Automated Comparison of 1960 and 1968 ADA Directories

A. Run a matching program to produce three listings and a set of punched cards.

1. Listing I - This will be a listing of dentists who were in the 1960 Directory, but not in the 1968 Directory. It will also include dentists in the 1960 Directory who had uncertain matches in the 1968 Directory. The former will have a mark 1, and the latter will have a mark R. The computer will, in addition, produce a set of punched cards for each dentist on the list (Deck I). (This group of dentists should cover all the decedents in the study. It may, however, contain some dentists who lived through the study period, including those who died after 12-31-65.) Deck I will be used to select an update card for the computer status code for these dentists. All dentists with a mark 1 will have a mark 2, a mark 3, and mark 9 card (mark 9 means a Listing III dentist was later found to be a true match). All dentists with a mark R will have a mark 1, mark 2, mark 3, and a mark 9 card (mark 9 means the computer match was verified by hand). The single card representing the final mark given to a dentist on Listing I will be selected to update the file. If a dentist started off as mark 1 and did not change, no card would be entered. All mark R's should be resolved.

2. Listing II - This will be a listing of dentists who matched in the 1960 and 1968 Directories.

3. Listing III - This will be a listing of dentists in the 1968 Directory who were not matched in the 1960 Directory, but whose date of graduation was 1960 or earlier.

B. Produce a "Listing of Missing Data and Fatal Errors" from the Master File containing asterisks at all points of missing data. This listing will be used at some point to collect missing information from Chicago or elsewhere. (This step should be performed after Step VI has been completed.)

V. Comparing Listing I to "Alphabetized Death Record File"

A. Check every entry on Listing I marked 1 or R. (On mark R entries, compare only to the first of the pair of names.) Beware of discrepancies in alphabetization between Listing I and the death record file.* (See Exhibit I, Criteria for Matching Death Records to List I.)

1. If matching death record is found:

a. Enter 8-digit ID on death record in upper left hand corner (white pen on black or black pen on white) and move the record to a new file (the Cohort Death File).

b. If associated Listing I record is a mark R, change it to mark 1 in blue.

2. If matching death record is not found:
...enter mark 2 in green on Listing I record and proceed. (No mark R should remain after this process.)

---

*The automated routine compressed blanks out of each name before alphabetizing. This results in ADAMSON, FRANK coming before ADAMS, RALPH contrary to common practice. In addition, name suffixes like Jr., Sr., etc. were appended to the last name which may cause a Jr. and Sr. to be widely separated, especially with very common surnames.

B. Make another pass through List I of those certificates, dummies, and/or notifications not found to be definite matches by previous criteria.

1. If missing information prevents a definite match, put in pencil the 8 digit I.D. number in the right hand corner of the certificate, dummy, and/or notification. (Do not change status.)

2. Put in pencil in the right hand margin of List I, "Possible Match." (To be resolved when missing information is gathered.)

3. The certificates not definitely identified are placed in the "Possible Match File." The obituaries not definitely identified make up the "Addendum File" to be ordered from the states.

4. See procedure VI "Requesting Death Certificates from States."

5. Certificates returned from states as a result of the "Addendum File" are routed to "Possible Match File."

6. "Possible Match File" to be resolved at a later date.

C. Death records remaining in original file when matching is completed should be exclusions from the study.

1. All death records found that do not appear on List I, check 1960 and 1968 Directories. Those that appear in 1960, but not 1968 and not on List I set aside in the "Addition Folder" of a "Problem File." (Do not have an I.D. number.) Those that appear in 1960 and in 1968, but not on List I are set aside in the "Problem File." (May or may not have an I.D. number.) These are to be resolved at a later date. Any notification or dummy sheet should have its analogue removed from the "State Request File."

2. Remaining death records were reviewed to determine if they seemed appropriate for exclusion (recent graduates, etc.). If so, they should be labeled "Non-study Decedents to be Reviewed" and filed in "Completed Materials." Any notification or dummy sheet remaining in this file should have its analogue removed from the "State Request File." After procedure VI is performed, this file should be checked against Listing III to see what makes up this file.

D. Cohort Death File is now established. All certificates available at this point should be shipped to nosologist for cause-of-death coding.

VI. Requesting Death Certificate from States

(Assuming that, for each State, dummy sheets and notifications have been sequenced by month and year of death and subsorted alphabetically, the following tasks should be undertaken.)

A. Type listing (and carbon) of deaths according to format of Exhibit II.

1. Add names from Addendum file to bottom of list in same format and head "Addendum."

B. Type covering letter (and carbon) to State requesting certificates.

1. Original letter and list to State.

2. File carbon of letter and list in a State folder with dummies and notifications.

VII. Resolution of Mark R Entries on Listing I

Make a pass through Listing I examining all original mark R entries. These will appear between lines of asterisks.

A. Valid Match - If the match is determined to be valid by criteria developed (Exhibit III, Criteria for Resolution of R-Pairs), the following items will pertain.

1. The original mark R should have been changed to a mark 2. If it was changed to a mark 1, investigator should be consulted immediately. (This means a death was noted for a dentist who still appeared in 1968.)

2. Circle the matching pair in red. Change the mark 2 to a mark 9.

B. Invalid Match - The match may be determined to be invalid by established criteria or a retraction message printed below the potential matching pair.

1. If message "Ignore Match on 1960 Record No. XXXXXXXX" appears, completely line out the record pair after moving the 1968 record to its proper spot on Listing III. (If you have a mark 1, review with investigator.)

2. If message "Ignore Match on 1968 Record No. XXXXXX" appears, line out the 1968 record.

3. If developed criteria indicate a mismatch, move the 1968 record to its proper spot on Listing III, after lining it out (leave 1960 as is).

VIII. Comparison of Mark 2 Entries on Listing I with Listing III and 1966-67 Obituaries

A. Ignore completely lined out mark R entries. Read mark 2 entries against Listing III. If there is a match (see Exhibit I), change to mark 9 in black and note RN68 (the 1968 record number) on Listing I. Draw line through Listing III entry (everyone left on Listing III should be checked thoroughly against the "Non-Study Decedent File" as mentioned in V, C, 2).

B. Read remaining mark 2 entries against 1966 and 1967 obituaries.

1. If match for a mark 2, but no date of death on obituary, enter a mark 3 in red.

2. If no match for a mark 2 record, enter a mark 3 in red.

IX. Selection of Update Card and Update of Master File

A. Make a final pass on Listing I and select the appropriate mark update card from Deck I. If a record has an original mark 1, no update card need be selected. A card must be selected in all other cases except where a 1960 record was deleted (lined out).

Any time a mark 9 card is selected, make sure the proper 1968 record number is entered to RN68. If not, mark the RN68 on the card clearly in pencil and set the card aside in a separate pile. Write RN68 in the extreme upper right hand corner of the card.

B. Send the two sets of cards to Rockville for Master File updating. Save leftover cards for pick up from Rockville.

C. Rockville will print out all information on mark 3 individuals for follow-up. (One sheet per individual since this will be used as a working document.)

D. See Exhibit IV, "Mark" Definitions (for computer purposes).

RECOVERY OF DEATH CERTIFICATES FROM STATES AND PROCESSING, CODING AND UPDATING OF DEATH INFORMATION

X. Processing Certificates Returned by States

A. Check certificates against carbon list in state request file.

1. For certificates received, check off on carbon list and paperclip certificate to dummy or notification.

2. For those not returned, copy notes from states on list and dummy. On dummy, note state and date not found.

B. New York City (search performed by staff and certificates requested by mail.)

1. Remove dummy from N.Y.C. file of those not found in search.

a. On those with information from N.Y.C., enter information and date in red on yellow carbon of original state request list and on original dummy.

b. If no information from N.Y.C., enter no information and date in red on yellow carbon of original state request list and on original dummy.

2. Pull carbon of dummy from cohort file and staple both together.

a. Those with information reroute to appropriate state in "Second State Request File." Refer to XII, A, 1.

b. Those with no information refer to XII, A, 2.

XI. Filing Certificates in Cohort Death File

A. If certificate was received:

1. Dummies (Chicago list and obituary list)

   a. Pull second dummy from Cohort Death File.

   b. Enter ID Number and X on certificate and file certificate.*

   c. Carbon copy of dummy goes to "Completed Materials." Original can be discarded.

2. Notifications

   a. Pull second notification from Cohort Death File.

   b. Enter ID Number and X on certificate.

   c. Staple xerox copy of notification to back of certificate and refile.

   d. Original of notification goes to "Completed Materials."

3. Certificates received with date of death prior to 1960, or occupation other than dentist are filed in "Deletion Folder" of the "Problem File."

B. If certificate was not received:

1. Pull second dummy and/or notification. Enter notes from state and staple two copies together.

2. Route to "Death Information Clarification File."

---

*X designates certificates recovered from sources other than ADA.

XII. Death Information Clarification File (Consists of two sub-files.)

A. "Second State Request File" which is constituted in the same manner as Section VI.

1. If state returned request with information that the certificate is located in another state, reroute two copies of the dummy and/or notifications to "Second State Request File" to be reordered from that new state.

2. If state returned request with no information:

a. Check original information.

1) If we sent wrong information, correct and reroute two copies of dummy and/or notification to "Second State Request File."

2) If we sent correct information:

a) All those requests are checked against the 1960 Directory. Those who died after 1960, checked against the directories up to and including the year of death, plus the year after death.

1. If change of address found in more than one directory, the address in the most recent directory preceding death used to reroute request to "Second State Request File."

2. If no change of address found, see XII, B.

B. "Dead End File" which is constituted as below:

All those State Requests returned with no information that were then checked against the 1960 to 1965 Directories and found to have no change of address. (This includes Possible Match Addendums requested but for which no information was received.)

XIII. Routing Certificates to Rockville, Coding and Updating of Death Information

A. After procedure V was completed, certificates on hand were shipped to Rockville for cause-of-death coding. When a sufficient number of additional certificates is accumulated (>50), they also should be shipped. At this stage certificates awaiting shipment should be kept in separate folder in file.

B. Demographic information (sex, race, autopsy, and state of death), and causes of death (up to underlying plus 5) coded by nosologist. (Nosologist will write general rules for exclusions.)

C. Coded certificates will be returned to Philadelphia for keypunch, key verify (according to Exhibit V, Death Update Card Format). When all update cards are complete, return certificates and cards to Rockville, Maryland.

FOLLOW-UP PROCEDURES

XIV. Collection of Missing Information (Phase I)

A. Print listing of all individuals with missing information (i.e., school of graduation, year of birth and year of graduation) by school of graduation. Delete listing if dental school is foreign or not continental United States.

1. Dental School Unknown

a. Mail listing to the National Board of Dental Examiners to be read against their records.

b. Read incomplete returns from NBDE against the 1972 and 1969 ADA Directories and the 1928 Polk's Dental Register.

2. Dental School Known But Defunct and No Successor

a. If no other record source known:

1) Update by reading against 1972, 1969 and 1964 ADA Directories and the 1928 Polk's Dental Register.

b. If other record source known:

1) Mail print-out to appropriate record source.

2) Read incomplete returns against 1972, 1969 and 1964 ADA Directories and the 1928 Polk's Dental Register.

3. Dental School or Successor Known

a. Mail print-out to appropriate record source.

1) Data collection performed gratis.

2) Data collection performed for fee.

3) Data collection performed by staff personnel.

b. Read incomplete returns against 1972, 1969 and 1964 ADA Directories and the 1928 Polk's Dental Register.

B. Information from dental schools (such as change in name, did not graduate, etc.) that result in identifying cohort members for deletion is recorded on a form and filed in "Deletion Folder" of the "Problem File."

C. All completed information key punched according to Exhibit VI, Key Word Update Card for computer update.

D. For data returned from dental schools after cut-off date see Section XV[1].

XV. Initial Follow-up and Collection of Missing Information (Phase II)

A. Order Master List alphabetically within the state.

B. Print Master List of all records that are mark 3 and/or have missing information with each record on a separate sheet (see Exhibit VII). The asterisk indicates missing information in one or more of five fields: year of birth, dental school, year of graduation, character of practice or membership code.

C. Read list against the "Register of Licensed Dental Manpower" maintained by the Manpower Development Branch of the Division of Dentistry, Bureau of Health Resources Development, DHEW, NIH, PHS, Bethesda, Maryland. This Register is of licensed dentists as of August 1971 but has been updated for some states as of 1972. All states but Pennsylvania and Indiana are represented. Change all status 03 to 04 when identification using criteria in Exhibit III.

D. Criteria for matching are the same as those developed for the resolution of R-Pairs. (See Exhibit III.)

E. When a valid match is made:

1. Missing information is placed in the appropriate spaces.

2. If a mark 3 is involved, renewal of the license is evidence that the individual lived through the study, and the information is reported in the space for the State Board of Dental Examiners.

F. If a match cannot be verified according to the established criteria but there is a suspicion of a match, all information is placed under the comment section. If there is a conflict in data, report that also in the comment section for later resolution.

G. Upon return from Bethesda, establish a "Master Record Follow-Up File" (Alphabetical within state), and a "Completed Master Record Follow-Up File." (All records to be filed alphabetically.)

H. Separate individual records and remove from the file the following groups:

Group 1. All mark 1*, mark 2*, and mark 9*, with no obvious missing information (i.e., year of birth, dental school, year of graduation).

Group 2. All mark 9*, with new information recorded (i.e., year of birth, dental school, year of graduation).

Group 3. Mark 3 or mark 3* - status confirmed or status confirmed and new information obtained.

I. File Group I in "Completed Master Record Follow-Up File."

J. Key punch Groups 2 and 3 according to Exhibit VI, Keyword Update Card. Remember that all mark 3's in Group 3 are updated to status of mark 4, so change all mark 3 to mark 4. All key punched data are circled in red. Send completed key punched cards to Rockville, Maryland for data bank update.

K. File completed records of Groups 2 and 3 in "Completed Master Record Follow-Up File." These are mark 9* and mark 4* which have all of the following elements completed: year of birth, dental school, and year of graduation; and of course, mark 4's.

L. Incomplete records are returned to the "Master Record Follow-Up File." This file now consists of mark 1*, mark 2*, mark 9*, mark 3*, mark 4*, and mark 3's.

XV[1]. Missing Information Returned from Dental Schools

(From XIV Collection of Missing Information (Phase I)).

A. Data returned from dental schools at this late date are entered on these records. Note where information came from. (Place D.S. after information.)

XVI. Recovery of Missing Records from the 1960 Data Bank

A. Print the 1960 ADA Directory as it constitutes the 1960 Data Bank in alphabetical order.

B. Read the print-out against the Index of the 1960 ADA Directory.

C. Record every record in both the Index and in the Geographical Section and not on the print-out.

D. These records are thus not included in the 1960 Data Bank.

E. Check each record against List III. If match is found assign status of mark 9. Remove record from List III and enter 1968 Record Number against name.

F. Check each record against the Problem Folder, Section V, C, 1.

G. If the status of a record is not determined after this procedure then proceed with steps V through VIII.

H. These records are to be assigned an I.D. number from Rockville, Maryland.

I. Key-punch the necessary data to enter a new record into the file and forward card to Rockville, Maryland.

J. For all mark 1*, 2*, 9*, 3*, and 3 prepare forms as facsimile of Exhibit VII for inclusion in "Master Record Follow-Up File" and for subsequent mailings.

XVII. Verification of Final Status Code on List I (Edit Check)

A. Rockville, Maryland will prepare a listing of all individuals with mark 1, 2, 3, and 4, ordered by I.D. number with status code appended.

B. Read listing against List I.

C. Errors will be dealt with in a manner to be determined.

XVIII. Follow-Up Collection of Missing Information (Phase III)

A. Print all mark 3 or other marks with one or more of the following data elements missing (year of birth, dental school, and year of graduation),

1. File Follow-Up Form (Exhibit VII) alphabetically within state. Print two on two part paper.

2. Any mark other than a mark 3 will have an asterisk appended to the status code to indicate that one or more of those data elements are missing.

3. Mark 3* may have one or more of the three data elements indicated in A above, and/or character of practice and/or membership code missing.

B. These printings should match the up-dated "Master Record Follow-Up File," record for record.

C. One set of Follow-Up Forms will be mailed to the State Board of Dental Examiners (original). The other to be mailed to the State Dental Association (duplicate).

D. All Follow-Up Forms will have a cover letter, a list of instructions, and a State Code Sheet.

1. State Board of Dental Examiners:

   a. Letter to Secretary of State Board of Dental Examiners, Follow-Up Forms, and list of instructions and Dental School Code Sheet. (See Exhibit VIII, Exhibit IX, and Exhibit X.)

   b. Carbon copy to State licensing agency where applicable.

2. State Dental Association:

   a. Letter to President of State Dental Association. (See Exhibit XI.)

   b. Carbon copy of letter, Follow-Up Forms and list of instructions and Dental School Code Sheet to Secretary of State Dental Association. (See Exhibit XII and Exhibit X.)

XVIII[1]. Additions to the Master File and Follow-Up Forms from the Dead End File

A. Read Dead End File against Master Record Follow-up File.

   1. If a corresponding record is found, put a D.E. in red under the stat code. Write in red on obituary "In Dead End File, Copy in Master Follow-up File."

   2. If no record is found see B.

B. Fill out a follow-up form (Exhibit VII) for all those in Dead End File not found in Master Record Follow-up File. Fill in (except in case of Possible Match) from List I, but if missing information, check against data from Dental Schools return.

   1. Portion I.

   2. I.D. Number.

   3. Designation D.E.

C. Xerox these forms in duplicate. (Three forms in all.)

D. Interleave alphabetically one copy in "Master Record Follow-up File" in appropriate state and hold duplicates for interleaving in mailings to State Board of Dental Examiners and State Dental Association.

XIX. Mail Out of All Follow-Up Forms

A. Upon completion of XVIII and XVIII[1] mail out Follow-up Forms.

B. Do not mail SBDE for Pennsylvania (special arrangements).

XX. Returns from State Board of Dental Examiners (SBDE) and State Dental Associations (SDA)

A. Establish cut-off date...all returns processed specially after this date.

B. Staple return to Master File Copy.

1. Less than 3 sheets...wait.

2. 3 sheets (at the point of stapling)

a. SECTION I...(Missing information could be YOB, DS, or YOG).

1) Record in green on Master File Copy if new information is from SBDE.

2) Record in black if information is from State Dental Association.

3) If same, put small black check beside green number.

4) If conflict, put a slash and then the conflicting SDA number in black beside it.

5) Any information which has been corrected, as opposed to entered new, should be seen by investigator.

b. SECTION II...

1) Circle II in green on Master File Copy.

2) Enter year of latest renewal and/or birth date if available.

3) Enter last known address if available...use "SAME AS I" if possible.

4) If date of birth conflicts with year of birth in SECTION I, write beside birth date "CONFLICTS I."

5) If any information conflicts with information from Division of Dentistry, see investigator.

c. SECTION III

1) Circle III in black on Master File Copy.

2) Enter latest membership year and birth date if available.

3) Enter last known address if available...as first choice, use "SAME AS I"; as second choice use "SAME AS II."

4) If date of birth conflicts with year of birth in SECTION I, write beside birth date "CONFLICTS I"; if it conflicts with SECTION II, write "CONFLICTS II"; if both, write "CONFLICTS I and II."

d. SECTION IV

1) If section is completed from SBDE, transfer information in green.

2) If same information from SDA, put small black check beside IV.

3) If conflict, write conflicting information to the side in black.

4) If from SDA and not from SBDE, put it in black.

e. Coding Missing Information...(From SECTION I only)

1) If no conflicts, code missing information on coding form in standard way.

2) If there are conflicts, investigator will resolve.

3) Circle all coded information in red.

f. If a D.E. with new address information in Sections II, III, IV, staple to D.E. File Copy, route to "Second State Request File," otherwise, staple to D.E. File Copy and leave in D.E. File.

g. If not a Mark 3...
File all 3 sheets in "Completed Master Record Follow-up File" (alphabetically).

h. If a Mark 3...

1) Put SBDE and SDA returns in "Completed Master Record Follow-up File."

2) Put Master File Copy in "Follow-up File."

XXI. Dealing with Master File after Cut-Off Date

A. Pull each Master File Copy...

1. If not a Mark 3...(Missing Information)

a. one sheet only...

1) If a D.E., staple to D.E. File Copy and leave in D.E. File.

2) If not in D.E., file in "Completed Master Record Follow-up File."

b. two sheets...

1) Code missing information onto standard coding form, circling coded information in red.

2) Any information which has been corrected, as opposed to entered new, should be seen by investigator first.

3) If a D.E....

a. With new address in Sections II, III, IV, staple to D.E. File Copy, route to "Second State Request File."

b. Without new address in Sections II, III, IV, staple to D.E. File Copy and leave in D.E. File.

4) File non-D.E. in "Completed Master Record Follow-up File."

2. If a Mark 3...(Vital Status Unknown)

a. one sheet only...Transfer to "Follow-up File"

b. two sheets...

1) Transfer any missing information to Master File Copy (SECTION I)

2) Same as A,1,b,1)

3) Same as A,1,b,2)

4) If return is from SBDE, circle II in green... if from SDA, circle III in black...enter information in appropriate section using "SAME AS I" for address if possible.

5) If YOB conflicts with SECTION I, write "CONFLICTS I."

6) Enter death information in SECTION IV.

7) File return in "Completed Master Record Follow-up File."

8) File Master File Copy in "Follow-up File."

B. Keypunch and verify all coded missing information accumulated to this juncture (XX and XXI). Send cards to Rockville for update.

C. Make a pass through the "Follow-up File."

1. If SECTION IV has been filled out...

a. If SECTION II or SECTION III indicates...year of renewal or year of membership beyond date of death, refer to investigator.

b. If there was a conflict in SECTION IV, refer to investigator (both green and black entries will exist).

c. Code STAT = 01 on a coding form in standard manner.

d. Initiate order of death certificate.

e. Transfer record to "Completed Master Record Follow-up File."

f. Keep a head count of the number of deaths determined by each source--keep a list of associated study numbers and call the list the Vital Status Source List.

g. If died prior to 1960, place in delete folder.

2. If SECTION IV is blank...

a. If SECTION II indicates a year of renewal of later than 1965, code STAT = 09 on a coding form...put entry in Vital Status Source List. Skip 2,b if STAT = 09 is coded in this section.

b. If SECTION III indicates a last membership date...

1) Earlier than 1965 inclusive, leave as mark 3.

2) If year of renewal is 1966 leave as mark 3.

3) If year of renewal 1967 or later.

a) Check membership in 1960 Directory, if membership code is a 3 leave STAT = 03.

b) If membership code is otherwise, go to 1967 Directory, if there, and if membership code is 3 - leave alone. If not 3, then make STAT = 09. (If not found in that Directory, go to Directory of year indicated by ADA membership renewal. If membership code is 3 - leave alone...other, change to STAT = 09. If not found in that Directory...leave as mark 3).

c. If status is changed to 09, code on standard coding form.

d. If at any time vital status changed, place entry in Vital Status Source List.

3. Keypunch and verify all Vital Status Information and send to Rockville for Computer Update.

XXII. Resolution of Addition and Deletion Folder of the Problem File

A. Addition Folder

1. These consist of records to be entered into the 1960 Data Bank.

a. Those in the 1960 ADA Directory and not in the 1968 ADA Directory and not on List I.

b. Those in both the 1960 and 1968 ADA Directories, not on List I or List II.

c. Those deleted previously as duplicates but confirmed as separate individuals.

2. Prepare an addition card in the original format of the 1960 Data Bank entry. (2 cards)

3. Forward to Rockville, Maryland.

B. Deletion Folder

1. These consist of records to be excluded from the 1960 Data Bank.

a. Cohort members known to have died prior to 1960.

b. Cohort members known to be duplicates.

1) Those found to be entered in the 1960 Data Bank but found to be duplicates of the same individual but originally having different information.

2) Those with name changes between 1960 and 1968 but first name entry not removed.

c. Cohort members not identified as dentists (not graduated or occupation on death certificate indicated as other than dentist).

2. Prepare a deletion card as per the Key Word Update Format Card (see Exhibit VI).

3. Forward to Rockville, Maryland.

XXIII. Resolution of the Problem File, Excluding the Addition and Deletion Folder

All entries are to be resolved by the investigator on the basis of existing information logically interpreted. All sources are to be used including commercial company follow-up, The American Dental Association, Bureau of Economics and Research records and telephone follow-up procedures. Updates are keypunched and forwarded to Rockville, Maryland.

XXIV. Resolution of the Possible Matches File

All entries should have been resolved by criteria established in Exhibit I. If resolution not possible by investigator, status remains an 03. All resolutions change status to 09; these updates are keypunched and forwarded to Rockville, Maryland.

XXV. Commercial Company Follow-up

A commercial company will be used as a subcontractor to perform follow-up on a 10 percent sample of records with status 03. Information from other sources takes precedence. Update to status 09 or 02 if only source and individual is identified by criteria in Exhibit I. Any other situation, record status remains 03. All updates are to be keypunched and forwarded to Rockville, Maryland.

XXVI. The American Dental Association, Bureau of Economics and Statistics Follow-up

A listing of remaining records with status 03 or with missing information is to be forwarded to the ADA for a final search of their records or correspondence. The two listings are to be alphabetical by name and city within state in alphabetical order. Update information to be forwarded to investigator and keypunched and forwarded to Rockville, Maryland.

XXVII. External Follow-up Consultant

An established authority in follow-up procedures will continue follow-up by phone with similar listings as in XXVI. Total phone coverage (Band 9) of the United States will be established in Pittsburgh, Pennsylvania at the Graduate School of Public Health, University of Pittsburgh for two (2) months. All updates are to be forwarded to investigator, keypunched and then forwarded to Rockville, Maryland.

XXVIII. Postal Follow-up

A selected sample (10 percent) of the individuals lost to trace are to be followed by use of the United States Post Office mailing-list correction service. If information determines vital status, then update is keypunched and forwarded to Rockville, Maryland. Other information that may be of use in follow-up is forwarded to XXVII.

XXIX. Final Follow-up by Staff

Telephone calls to professional associates are to be completed by the investigator in the final stages of the study. Updates are to be keypunched and forwarded to Rockville, Maryland.

XXX. Final Review of All Records - Edit Check

All records are to be edit-checked by computer programs. Inconsistencies will be resolved by investigator and staff.

EXHIBIT I, CRITERIA FOR MATCHING DEATH RECORDS TO LIST I

I. Death Certificates and Notifications

A. Class I Name Match:

1. Same city-state

a. Year of birth available*...allow ± 4 years.

b. Year of birth not available*...require exact street address.

2. Different city-state

a. Year of birth available*...allow ± 2 years.

b. Year of birth not available...

1) If year of graduation is available on listing subtract 25 from year of graduation for testing ± 2 years, otherwise mark 2.

2) If year of graduation not available, mark 2.

B. Class II Name Match:

1. Same city-state

a. Year of birth available*...allow ± 2 years.

b. Year of birth not available...require exact street address.

2. Different city-state

a. Year of birth available*...allow ± 1 year.

b. Year of birth not available...mark 2.

---

*Apply Rule 1 only if necessary.

II. Dummy Death Records

A. Class I Name Match:

1. Same city-state

a. Year of birth available*...allow ± 4 years.

b. Year of birth not available...require same Dental School.

2. Different city-state

a. Year of birth available* and Dental School the same...allow ± 2 years.

b. Year of birth not available**...accept if same Dental School and year of graduation are the same, otherwise Mark 2.

B. Class II Name Match:

1. Same city-state

a. Year of birth available*...allow ± 2 years.

b. Year of birth not available**...require same Dental School and year of graduation.

2. Different city-state

a. Year of birth available* and same Dental School...allow ± 1 year.

b. Year of birth not available**...accept if Dental School and year of graduation are the same, otherwise Mark 2.

---

*Apply Rule 1 only if necessary.
**If same Dental School let investigator resolve.

EXHIBIT I (Continued)

RULE 0: Anything not covered should be referred to investigator for resolution.

RULE 1: Year of Birth can be calculated by subtracting 25 from Year of Graduation, but only if you must.

RULE 2: On dummies you may calculate the Year of Birth by subtracting age from year of death.

RULE 3: When matching city-state against death certificates use either usual residence or place of death.

EXHIBIT I (Continued)

CLASS I NAME MATCH:

Charles L. Smith = Charles Lewis Smith
= Charles L. Smith

-Any Combination

CLASS II NAME MATCH: (any match where there is any question at all).

Charles Smith : C. L. Smith
Charles L. Smith: C. Louis Smith
etc...

-Any combination of this nature

If any logical single letter is off in the last name allow a Class II Match. This includes "reasonable" misspellings.

EXHIBIT II

Pennsylvania

Name	Date of Birth Mo/Yr	Date of Death Mo/Da/Yr	Place of Death
Wagner, Robert E.	02/94	04/01/60	Philadelphia
Sullivan, Albert	09/92	09/15/60	Allentown
Herbert, John C.	10/82	10/22/60	Lancaster
Ring, Allen G.	04/11	01/01/61	Harrisburg
Ryan, Charles M.	11/01	03/23/61	Scranton
Neilski (AKA Neils), John J.	02/22	05/26/61	Allentown
Ritter, Samuel	09/19	08/06/61	Gettysberg

EXHIBIT III, CRITERIA FOR RESOLUTION OF R - PAIRS

Class I Name Match: And YOB or YOG $\pm$3
Match on one or more variables.
a) Year of birth
b) Year of graduation
c) School of graduation
d) Address (street), city and state. Counts as one variables.

Class II Name Match: And YOB or YOG $\pm$3
Match on two or more variables.
a) Year of birth
b) Year of graduation
c) School of graduation
d) Address (street), city and state. Counts as two variables.

EXHIBIT III (Continued)

Class I Name Match (Almost an exact match.)

Charles L. Smith =	Charles Louis Smith
	Charles Lewis Smith
	Charles L. Smith
	Chas. L. Smith
	Chas. Louis Smith

Class II Name Match (A match where there is a question.)

Charles Smith =	C. L. Smith
	C. Louis Smith
	C. Lewis Smith
	Charles L. Smith
	C. Smith

If any logical single letter is off in the name (first, middle, last) allow a Class II Match. This includes "reasonable" misspellings.

EXHIBIT IV

"MARK" DEFINITIONS (FOR COMPUTER PURPOSES)

STAT = MARK

=1 ——→ Died between 1-1-60 and 12-31-65.

=2 ——→ Died after 12-31-65, but lived thru study.

=3 ——→ Uncertain vital status requiring follow-up.

=9 ——→ Lived thru study period.

=R ——→ Status uncertain; possible computer match must be resolved by hand.

=4 ——→ Vital status updated from 3, because individual known to have lived through study (see SECTION XV).

EXHIBIT V. DEATH UPDATE CARD FORMAT

Card Column(s)	Information
(8) 1 - 8	ID Number (right-justified)
9	blank
(6) 10 - 15	DOB - date of birth - YYMMDD (may have to subtract age from YOD; Keypunch est. YOD and 0000; otherwise 999999)
16	blank
(6) 17 - 22	DOD - date of death - YYMMDD
23	blank
(1) 24	Race (1 = white; 2 = nonwhite; 3 = not specified)
25	blank
(1) 26	Sex (1 = male; 2 = female; 3 = not specified)
27	blank
(4) 28 - 31	Cause of Death 1 (underlying) - must be on cert.
32	blank
(4) 33 - 36	Cause of Death 2
37	blank
(4) 38 - 41	Cause of Death 3
42	blank
(4) 43 - 46	Cause of Death 4
47	blank
(4) 48 - 51	Cause of Death 5
52	blank
(2) 53-54	State Code
55	blank
56	Autopsy designation (1 = yes; 2 = no; 3 = not specified)
57 - 80	

EXHIBIT VI

Keyword Update Card Format

Card Column(s)	Information
1 - 8	ID Number (right-justified)
9	Blank
10 - 80	keyword=update value,keyword=update value,

Comma is required to indicate the end of each update value field

Multiple cards may be required to update one record completely. In this event, each card must follow the format described.

The sequence of

keyword=update value,

may appear as many times as necessary but must not be split between cards.

EXHIBIT VI (Continued)

Keyword Table

Keyword	Field Updated	Field Length
STAT	Status Code	2 *
RN68	Record number in 1968 file	8 *
SUF	Suffix to name (Jr, Sr, III, etc.)	3
ADD	Street Address	35
YOB	Year of Birth	2 *
YOG	Year of Graduation	2 *
DS	Dental School	3 *
LNAM	Last Name	24
FNAM	First name and middle initial	15
CITY	City	35
STCD	State Code	2 *
MCOD	Member Code	1
CHOP	Character of Practice	2 *
DELETE	Deletion	6

Note: Fields with an * following the field length must be entered right-justified with leading zeros.

EXHIBIT VI (Continued)

Sample Keyword Update Cards

```
00018370 DS=130,
00024000 SUF=JR ,ADD=412 1/2 LINCOLN WAY,
00039590 SUF=   ,ADD=1128 N BRANK BLVD,
00045190 LNAM=ENGLUND,FNAM=ERIC A,ADD=201 N COAST BLVD,
00070350 CITY=OAKLAND,YOB=82,DS=024,YOG=11,MCOD=0,CHOP=00,STCD=05,
00088620 CITY=SAN DIEGO,YOB=93,DS=119,YOG=21,MCOD=0,CHOP=00,STCD=05,
00132110 CITY=HARTFORD,YOB=25,DS=036,YOG=53,MCOD=1,CHOP=00,STCD=08,
00133660 YOB=16,DS=006,YOG=39,MCOD=1,CHOP=30,CITY=NEW BRITAIN,STCD=08,
00142980 YOB=33,DS=092,YOG=59,MCOD=1,CHOP=00,STCD=09,CITY=BRIDGEVILLE,
00150820 SUF=JR ,ADD=4704 WISCONSIN AVE NW,
00162680 LNAM=KENWARD,FNAM=FRANKLIN M,YOB=19,DS=019,YOG=52,MCOD=1,CHOP=00,
00162680 ADD=3138 COMMODORE PLAZA(COCONUT GROVE),CITY=MIAMI,STCD=11,
00163500 YOB=24,DS=140,YOG=48,MCOD=1,CHOP=00,CITY=PORT ST JOE,STCD=11,
00174480 YOB=00,
00193250 YOB=25,DS=045,YOG=52,MCOD=1,CHOP=00,CITY=AMBOY,STCD=16,
00211680 YOB=09,DS=081,YOG=39,MCOD=1,CHOP=00,CITY=CHICAGO,STCD=16,
00236190 YOB=09,DS=050,YOG=31,MCOD=1,CHOP=30,CITY=GALESBURG,STCD=16,
00245750 YOB=93,DS=081,YOG=23,MCOD=1,CHOP=00,CITY=OAK PARK,
00270810 YOB=03,DS=103,YOG=28,MCOD=1,CHOP=00,CITY=LAFAYETTE,
00280950 LNAM=GRAY,FNAM=LEWIS B,ADD=908 TWELVTH ST N E,
00281580 YOB=02,DS=050,YOG=28,MCOD=1,CHOP=00,CITY=CENTERVILLE,
00293790 YOB=23,DS=030,
00293630 YOB=28,DS=138,YOG=58,MCOD=1,CHOP=00,CITY=ABILENE,
00304440 MCOD=3,
00312000 YOB=78,DS=124,YOG=00,MCOD=3,CHOP=00,CITY=LOUISVILLE,
```

99999999 EXHIBIT VII 99999999
3*

****
* DENTIST MORTALITY STUDY *
****

I NAME:

ADDRESS:

CITY:

YEAR OF BIRTH:

DENTAL SCHOOL:

YEAR OF GRAD:

****
****

STATE BOARD OF DENTAL EXAMINERS

II YR. OF LATEST RENEWAL: _____

BIRTH DATE: _____

LAST KNOWN ADDRESS: _____
_____

****

STATE DENTAL ASSOCIATION

III LATEST MEMBERSHIP YEAR: _____

BIRTH DATE: _____

LAST KNOWN ADDRESS: _____
_____

****

IV IF KNOWN TO BE DECEASED, PLEASE INDICATE:

DATE OF DEATH: _____

CITY & STATE: _____
_____

****

COMMENTS:

TEMPLE UNIVERSITY
HEALTH SCIENCES CENTER
SCHOOL OF DENTISTRY
3223 N. BROAD ST., PHILADELPHIA, PA. 19140

DEPARTMENT OF COMMUNITY DENTISTRY BA 9-6300

Exhibit VIII

Letter to State Board of Dental Examiners

The Department of Community Dentistry, Temple University School of Dentistry, under contract with the National Institute for Occupational Safety and Health, DHEW, CDC, is conducting an investigation entitled "The Mortality Study of Dentists." For this study, we have identified a group of dentists who by definition appeared in the 1960 American Dental Association Directory and whose mortality experience for the period January 1, 1960 to December 31, 1965 is being determined. To date, there are approximately 7,200 dentists from the original group whose status remains unresolved.

One aspect of the follow-up procedures we have developed is a request to each of the State Boards of Dental Examiners for information concerning those dentists assumed to be licensed in the respective state in 1960. The information requested includes:

1) Data about the year of birth, year of graduation and school of graduation when that data is missing from our files. (Information sources such as the American Dental Association and dental schools have already been exhausted.)

2) Latest year of license renewal.

3) Last known address.

4) And, if the dentist is known to be deceased, the date of death (day, month and year where possible) and the city and state where death was known to have occurred.

In your state there are approximately such dentists. We have taken the liberty of forwarding the list to you with the expectation that you forward the request and the covering letter to the State Licensing Agency where appropriate. Included are instructions as to how to complete the individual forms.

We sincerely request your cooperation and assistance in this task. The difficulty of the assignment will vary with the number of records, the condition of the records and the personnel available to complete the request. May we suggest that arrangements are possible with this office to provide personnel from our staff or to provide on-site persons to collect the data when necessary.

Most importantly, your cooperation (and that of the State Licensing Agency, where appropriate) is respectfully solicited. We believe that an important contribution can be made to the service of the dental profession from the data provided by the study. For those dentists in the group who have died during the study period, causes of death will be analyzed with the possibility that environmental hazards in the dental operatory may be revealed.

May I assure you that all information will be used for statistical purposes only and that no dentist will be identified individually.

If you have any further questions please feel free to contact our office by mail or telephone.

Sincerely,

Gerald Orner

Gerald Orner, D.D.S.,M.P.H.,Sc.D.
Associate Professor
Department of Community Dentistry

GO:lm
cc. State Licensing Agency
where necessary
enc.

EXHIBIT IX

Instructions for Follow-Up to State Board of Dental Examiners in Mortality Study of Dentists.

1. Identify the individual by information appearing in Section I. Remember that the dentist was listed as residing in your state in 1960. If the identification can be made, complete missing information in Section I if necessary. A code sheet of dental schools is included so you may read our sheets. Please write in the name of the school when that information is necessary.
2. Complete Section II.
3. Complete Section IV if necessary.
4. Add any comments that you think may be of use to us.

CODED LIST OF DENTAL SCHOOLS IN THE UNITED STATES, PUERTO RICO, CANADA AND THE PHILIPPINE ISLANDS

ALABAMA COLLEGE OF DENTAL SURGERY*
Bridgeport, Ala.

UNIVERSITY OF ALBERTA FACULTY OF DENTISTRY
Edmonton, Alberta, Canada

AMERICAN COLLEGE OF DENTAL SURGERY*
Chicago, Ill. - See 081

ATLANTA DENTAL COLLEGE*
Atlanta, Ga. - See 140

ATLANTA-SOUTHERN DENTAL COLLEGE*
Atlanta, Ga. - See 143

BALTIMORE COLLEGE OF DENTAL SURGERY
Dental School, University of Maryland
Baltimore, Md.

UNIVERSITY OF MARYLAND*
Dental Department
Baltimore, Md. - See 006

BALTIMORE MEDICAL COLLEGE*
Dental Department
Baltimore, Md. - See 006

BARNES DENTAL COLLEGE*
St. Louis, Mo.

BAYLOR UNIVERSITY COLLEGE OF DENTISTRY
Dallas, Texas

BIRMINGHAM DENTAL COLLEGE*
Birmingham, Ala.

BOSTON DENTAL COLLEGE*
Boston, Mass. - See 151

UNIVERSITY OF BUFFALO SCHOOL OF DENTISTRY
Buffalo, N. Y.

CALIFORNIA COLLEGE OF DENTAL SURGERY*
San Francisco, Calif.

UNIVERSITY OF CALIFORNIA COLLEGE OF DENTISTRY*
San Francisco, Calif. - See 159

CENTRAL COLLEGE OF DENTISTRY*
Indianapolis, Ind.

HOSPITAL COLLEGE OF MEDICINE DEPARTMENT OF DENTISTRY OF CENTRAL UNIVERSITY*
Richmond, Ky. - See 050

COLLEGE OF DENTISTRY, CENTRO ESCOLAR DE SENORITAS
Manila, Philippine Islands

CHICAGO COLLEGE OF DENTAL SURGERY*
Chicago, Ill. - See 142

CINCINNATI COLLEGE OF DENTAL SURGERY*
Cincinnati, Ohio

CINCINNATI COLLEGE OF MEDICINE AND SURGERY*
Dental Department
Cincinnati, Ohio

CLEVELAND UNIVERSITY OF MEDICINE AND SURGERY*
Dental Department
Cleveland, Ohio

COLLEGE OF DENTAL AND ORAL SURGERY*
New York, N. Y. - See 027

COLLEGE OF PHYSICIANS AND SURGEONS
School of Dentistry
San Francisco, Calif.

COLLEGE OF PHYSICIANS AND SURGEONS*
Dental Department
Boston, Mass.

COLORADO COLLEGE OF DENTISTRY*
Denver, Colo.

COLUMBIA UNIVERSITY SCHOOL OF DENTAL AND ORAL SURGERY OF THE FACULTY OF MEDICINE
New York, N. Y.

COLUMBIAN DENTAL COLLEGE*
Chicago, Ill. - See 045

COLUMBIAN UNIVERSITY DENTAL DEPARTMENT*
Washington, D. C.

CREIGHTON UNIVERSITY SCHOOL OF DENTISTRY
Omaha, Nebr.

DALHOUSIE UNIVERSITY FACULTY OF DENTISTRY
Halifax, Nova Scotia, Canada

DENVER COLLEGE OF DENTISTRY*
Denver, Colo.

UNIVERSITY OF DENVER SCHOOL OF DENTISTRY*
Denver, Colo.

034 DES MOINES COLLEGE OF DENTAL SURGERY*
Des Moines, Iowa

035 DETROIT COLLEGE OF MEDICINE*
Department of Dental Surgery
Detroit, Mich.

036 UNIVERSITY OF DETROIT SCHOOL OF DENTISTRY
Detroit, Mich.

037 DRAKE UNIVERSITY COLLEGE OF DENTISTRY*
Des Moines, Iowa - See 050

038 GEORGETOWN UNIVERSITY SCHOOL OF DENTISTRY
Washington, D. C.

039 GERMAN-AMERICAN DENTAL COLLEGE*
Chicago, Ill.

040 HARVARD DENTAL SCHOOL*
Boston, Mass. - See 137

041 HOMEOPATHIC HOSPITAL COLLEGE DENTAL DEPARTMENT*
Cleveland, Ohio

042 HOWARD UNIVERSITY COLLEGE OF DENTISTRY
Washington, D. C.

043 ILLINOIS MEDICAL COLLEGE DENTAL DEPARTMENT*
Chicago, Ill.

044 ILLINOIS SCHOOL OF DENTISTRY*
Chicago, Ill. - See 043

045 UNIVERSITY OF ILLINOIS COLLEGE OF DENTISTRY
Chicago, Ill.

046 INDIANA DENTAL COLLEGE*
Indianapolis, Ind. - See 047

047 INDIANA UNIVERSITY SCHOOL OF DENTISTRY
Indianapolis, Ind.

048 INTERNATIONAL COLLEGE OF DENTAL SURGERY*
Chicago, Ill.

049 INTERSTATE DENTAL COLLEGE*
Kansas City, Mo.

050 UNIVERSITY OF IOWA COLLEGE OF DENTISTRY
Iowa City, Iowa

051 COLLEGE OF JERSEY CITY DEPTARTMENT OF DENTISTRY*
Jersey City, N. J.

052 KANSAS CITY DENTAL COLLEGE*
Kansas City, Mo. - See 138

053 KANSAS CITY-WESTERN DENTAL COLLEGE*
Kansas City, Mo. - See 138

054 KEOKUK DENTAL COLLEGE*
Keokuk, Iowa - See 050

055 SCHOOL OF DENTAL SURGERY, LAVAL UNIVERSITY*
Montreal, Quebec, Canada - See 076

056 LINCOLN DENTAL COLLEGE OF CONNER UNIVERSITY*
Lincoln, Nebr. - See 077

057 LOUISVILLE COLLEGE OF DENTISTRY*
Louisville, Ky. - See 058

058 UNIVERSITY OF LOUISVILLE SCHOOL OF DENTISTRY
Louisville, Ky.

059 LOYOLA UNIVERSITY SCHOOL OF DENTISTRY
New Orleans, La.

060 LICEO DE MANILA SCHOOL OF DENTISTRY*
Manila, Philippine Islands - See 095

061 MARION-SIMS DENTAL COLLEGE*
St. Louis, Mo. - See 103

062 MARION-SIMS COLLEGE OF MEDICINE DENTAL DEPARTMENT*
St. Louis, Mo. - See 103

063 MARQUETTE UNIVERSITY SCHOOL OF DENTISTRY
Milwaukee, Wis.

064 MARYLAND DENTAL COLLEGE*
Baltimore, Md.

065 McGILL UNIVERSITY FACULTY OF DENTISTRY
Montreal, Quebec, Canada

066 MEDICO-CHIRURGICAL COLLEGE OF PHILADELPHIA*
Philadelphia, Pa. - See 092

067 MEHARRY MEDICAL COLLEGE SCHOOL OF DENTISTRY
Nashville, Tenn.

068 UNIVERSITY OF MEMPHIS COLLEGE OF DENTAL SURGERY*
Memphis, Tenn. - See 116

069 MIAMI DENTAL COLLEGE*
Cincinnati, Ohio

070 UNIVERSITY OF MICHIGAN SCHOOL OF DENTISTRY
Ann Arbor, Mich.

071 MILWAUKEE MEDICAL COLLEGE DENTAL DEPARTMENT*
Milwaukee, Wis. - See 063

072 MINNESOTA COLLEGE HOSPITAL DENTAL DEPARTMENT*
Minneapolis, Minn. - See 073

073 UNIVERSITY OF MINNESOTA SCHOOL OF DENTISTRY
Minneapolis, Minn.

076 UNIVERSITY OF MONTREAL FACULTY OF DENTAL SURGERY
Montreal, Quebec, Canada

075 NATIONAL UNIVERSITY COLLEGE OF DENTISTRY
Manila, Philippine Islands

076 NATIONAL UNIVERSITY DENTAL DEPARTMENT*
Washington, D. C.

077 UNIVERSITY OF NEBRASKA COLLEGE OF DENTISTRY
Lincoln, Nebr.

078 NEW ORLEANS DENTAL COLLEGE*
New Orleans, La.

079 NORTH PACIFIC COLLEGE OF OREGON SCHOOL OF DENTISTRY*
Portland, Ore. - See 141

080 NORTHWESTERN COLLEGE OF DENTAL SURGERY*
Chicago, Ill. - See 081

081 NORTHWESTERN UNIVERSITY DENTAL SCHOOL
Chicago, Ill.

082 NEW YORK COLLEGE OF DENTISTRY*
New York, N. Y. - See 084

083 NEW YORK DENTAL SCHOOL*
New York, N. Y. - See 027

084 NEW YORK UNIVERSITY COLLEGE OF DENTISTRY
New York, N. Y.

085 OHIO COLLEGE OF DENTAL SURGERY, UNIVERSITY OF CINCINNATI*
Cincinnati, Ohio

086 OHIO MEDICAL UNIVERSITY COLLEGE OF DENTISTRY*
Columbus, Ohio - See 087

087 OHIO STATE UNIVERSITY COLLEGE OF DENTISTRY
Columbus, Ohio

088 OMAHA DENTAL COLLEGE*
Omaha, Nebr. - See 030

089 OREGON COLLEGE OF DENTISTRY*
Portland, Ore. - See 141

090 PACIFIC DENTAL COLLEGE*
Oakland, Calif.

91 PENNSYLVANIA COLLEGE OF DENTAL SURGERY*
Philadelphia, Pa. - See 092

92 UNIVERSITY OF PENNSYLVANIA SCHOOL OF DENTISTRY (THOMAS W. EVANS MUSEUM AND DENTAL INSTITUTE)
Philadelphia, Pa.

93 PHILADELPHIA COLLEGE OF DENTAL SURGERY*
Philadelphia, Pa. - See 092

94 PHILADELPHIA DENTAL COLLEGE*
Philadelphia, Pa. - See 114

95 PHILIPPINE DENTAL COLLEGE
Manila, Philippine Islands

96 UNIVERSITY OF PHILIPPINES COLLEGE OF DENTISTRY
Manila, Philippine Islands

97 PITTSBURGH DENTAL COLLEGE WESTERN UNIVERSITY OF PENNSYLVANIA*
Pittsburgh, Pa. - See 098

98 UNIVERSITY OF PITTSBURGH SCHOOL OF DENTISTRY
Pittsburgh, Pa.

99 DENTAL COLLEGE OF THE PROVINCE OF QUEBEC
Montreal, Quebec, Canada

100 ROYAL COLLEGE OF DENTAL SURGEONS SCHOOL OF DENTISTRY*
Toronto, Ontario, Canada - See 149

101 ST. LOUIS COLLEGE OF PHYSICIANS AND SURGEONS DENTAL DEPARTMENT*
St. Louis, Mo.

102 ST. LOUIS DENTAL COLLEGE*
St. Louis, Mo. - See 103

103 ST. LOUIS UNIVERSITY SCHOOL OF DENTISTRY
St. Louis, Mo.

104 ST. PAUL MEDICAL COLLEGE DENTAL DEPARTMENT*
St. Paul, Minn. - See 072

105 SAN FRANCISCO COLLEGE OF MEDICINE AND SURGERY DENTAL DEPARTMENT*
San Francisco, Calif.

106 SAN FRANCISCO DENTAL COLLEGE*
San Francisco, Calif.

107 UNIVERSITY OF SANTO THOMAS SCHOOL OF DENTISTRY*
Manila, Philippine Islands

108 SOUTHEASTERN DENTAL UNIVERSITY*
Atlanta, Ga.

109 UNIVERSITY OF SOUTHERN CALIFORNIA SCHOOL OF DENTISTRY
Los Angeles, Calif.

110 SOUTHERN DENTAL COLLEGE*
Atlanta, Ga. - See 140

111 STARLING-OHIO MEDICAL COLLEGE DEPARTMENT OF DENTISTRY*
Columbus, Ohio - See 087

112 STATE DENTAL COLLEGE*
Dallas, Texas - See 010

113 TACOMA COLLEGE OF DENTAL SURGERY*
Tacoma, Wash. - See 141

114 TEMPLE UNIVERSITY SCHOOL OF DENTISTRY
Philadelphia, Pa.

115 TENNESSEE MEDICAL COLLEGE DENTAL DEPARTMENT*
Knoxville, Tenn.

116 UNIVERSITY OF TENNESSEE COLLEGE OF DENTISTRY
Memphis, Tenn.

117 TEXAS DENTAL COLLEGE*
Houston, Texas - See 139

118 TOPEKA DENTAL COLLEGE*
Topeka, Kan.

119 UNIVERSITY OF TORONTO FACULTY OF DENTISTRY
Toronto, Ontario, Canada

120 TUFTS COLLEGE DENTAL SCHOOL*
Boston, Mass. - See 151

121 TULANE UNIVERSITY SCHOOL OF DENTISTRY*
New Orleans, La.

122 UNITED STATES DENTAL COLLEGE*
Chicago, Ill.

123 UNIVERSITY COLLEGE OF MEDICINE DENTAL DEPARTMENT*
Richmond, Va. - See 125

124 VANDERBILT UNIVERSITY SCHOOL OF DENTISTRY*
Nashville, Tenn.

125 MEDICAL COLLEGE OF VIRGINIA SCHOOL OF DENTISTRY
Richmond, Va.

126 MEDICAL COLLEGE OF VIRGINIA DENTAL DEPARTMENT*
Richmond, Va. - See 125

127 WASHINGTON DENTAL COLLEGE AND HOSPITAL OF ORAL SURGERY*
Washington, D. C. - See 038

128 GEORGE WASHINGTON UNIVERSITY DENTAL DEPARTMENT*
Washington, D. C.

129 UNIVERSITY OF WASHINGTON SCHOOL OF DENTISTRY
Seattle, Wash.

130 WASHINGTON UNIVERSITY SCHOOL OF DENTISTRY
St. Louis, Mo.

131 WESTERN COLLEGE OF DENTAL SURGEONS*
St. Louis, Mo.

132 WESTERN DENTAL COLLEGE*
Kansas City, Mo. - See 138

133 WESTERN RESERVE UNIVERSITY SCHOOL OF DENTISTRY
Cleveland, Ohio

134 UNIVERSITY OF WEST TENNESSEE DENTAL DEPARTMENT*
Memphis, Tenn.

135 WISCONSIN COLLEGE OF PHYSICIANS AND SURGEONS DEPARTMENT OF DENTAL SURGERY*
Milwaukee, Wis. - See 063

136 WISCONSIN COLLEGE OF DENTISTRY DEPARTMENT OF CARROLL COLLEGE*
Milwaukee, Wis. - See 063

137 HARVARD SCHOOL OF DENTAL MEDICINE
Boston, Mass.

138 UNIVERSITY OF KANSAS CITY SCHOOL OF DENTISTRY
Kansas City, Mo.

139 UNIVERSITY OF TEXAS SCHOOL OF DENTISTRY*
Houston, Texas - See 156.

140 EMORY UNIVERSITY SCHOOL OF DENTISTRY ATLANTA-SOUTHERN DENTAL COLLEGE
Atlanta, Ga.

141 UNIVERSITY OF OREGON DENTAL SCHOOL
Portland, Ore.

142 LOYOLA UNIVERSITY SCHOOL OF DENTISTRY, CHICAGO COLLEGE OF DENTAL SURGERY
Chicago, Ill.

143 FOREIGN

144 MISSOURI DENTAL COLLEGE*
St. Louis, Mo. - See 130

145 ATLANTA COLLEGE OF PHYSICIANS AND SURGEONS*
Atlanta, Ga.

146 NATIONAL MEDICAL UNIVERSITY OF ILLINOIS*
Illinois

147 UNIVERSITY OF ALABAMA SCHOOL OF DENTISTRY
Birmingham, Ala.

148 UNIVERSITY OF NORTH CAROLINA SCHOOL OF DENTISTRY
Chapel Hill, N. C.

149 COLLEGE OF MEDICAL EVANGELISTS SCHOOL OF DENTISTRY
Loma Linda, Calif.

150 WEST VIRGINIA UNIVERSITY SCHOOL OF DENTISTRY
Morgantown, - West Va.

151 TUFTS UNIVERSITY SCHOOL OF DENTAL MEDICINE
Boston, Mass.

152 FAIRLEIGH DICKINSON UNIVERSITY SCHOOL OF DENTISTRY
Teaneck, N. J.

153 SETON HALL UNIVERSITY COLLEGE OF DENTISTRY
Jersey City, N. J.

154 UNIVERSITY OF PUERTO RICO SCHOOL OF DENTISTRY
San Juan, Puerto Rico

155 UNIVERSITY OF CALIFORNIA SCHOOL OF DENTISTRY
San Francisco, Calif.

156 UNIVERSITY OF TEXAS DENTAL BRANCH
Houston, Texas

157 UNIVERSITY OF THE EAST COLLEGE OF DENTISTRY
Manila, Philippine Islands

TEMPLE UNIVERSITY
HEALTH SCIENCES CENTER
SCHOOL OF DENTISTRY
3223 N. BROAD ST., PHILADELPHIA, PA. 19140

DEPARTMENT OF COMMUNITY DENTISTRY

Exhibit XI

Letter to State Dental Association

The Department of Community Dentistry, Temple University School of Dentistry, under contract with the National Institute for Occupational Safety and Health, DHEW, CDC, is conducting an investigation entitled "The Mortality Study of Dentists." For this study we have identified a group of dentists who by definition appeared in the 1960 American Dental Association Directory and whose mortality experience for the period January 1, 1960 to December 31, 1965 is being determined. To date, there are approximately 7,200 dentists from the original group whose vital status remains unresolved.

One aspect of the follow-up procedures we have developed is a request to each of the State Dental Associations for information concerning those dentists assumed to have resided in the respective state in 1960. The information requested includes:

1) Data about year of birth, year of graduation and school of graduation when that data is missing from our files. (Information sources such as the American Dental Association and dental schools have already been exhausted.)

2) Latest membership year.

3) Last known address.

4) And, if the dentist is known to be deceased, the date of death (day, month and year where possible) and the city and state where death was known to have occurred.

In your state there are approximately such dentists. We have taken the liberty of forwarding the list to the offices of the State Dental Association with instructions as to how to complete the individual forms.

We sincerely request your cooperation and assistance in this task. The difficulty of the assignment will vary with the number of records, the condition of the records and the personnel available to complete the request. May we suggest that arrangements are possible with this office to either provide personnel from our staff or provide on-site persons to collect the data when necessary.

Most importantly, your permission is respectfully solicited. We believe that an important contribution can be made to the service of the dental profession from the data provided by this study. For those dentists in the group who have died during the study period, cause of death will be analyzed with the possibility that environmental hazards in the dental operatory may be revealed.

May I assure you that all information will be used for statistical purposes only and that no dentist will be identified individually.

If you have any further questions please feel free to contact us by mail or telephone.

Sincerely,

Gerald Orner

Gerald Orner, D.D.S., M.P.H., Sc.D.
Associate Professor
Department of Community Dentistry

GO:am
C.C. Executive Secretary of the Association
enc.

EXHIBIT XII

Instructions for Follow-up to State Dental Association in Mortality Study of Dentists.

1. Identify the individual by information appearing in Section I. Remember that the dentist was listed as residing in your state in 1960. Some of these dentists may be non-members of the State Association. If the identification can be made, complete missing information in Section I if necessary. A code sheet for dental schools is included so you may read our sheets. Please write in the name of the school when that information is missing.
2. Complete Section III.
3. Complete Section IV if necessary.
4. Add any comments that you think may be of use to us.

APPENDIX B

AN ABRIDGED INVENTORY OF DENTAL SUPPLIES BY BRAND NAME AND MANUFACTURER FROM ONE REPRESENTATIVE DENTAL SCHOOL

APPENDIX B

Item	Manufacturer
Acrilux Wax Eliminator	Coe
Alcosol	Carrol
Alginate Type II	Coe
Aluminum Graph Plates	Coble
Anesthetic Topical	Graham
Articulating Paper	Moyco
Articulating Paper	Mynol
Asbestos Roll	Whipmix
Beauty Cast 144-50 GM	Case
Beauty Cast 144-60 GM	Case
Bite Registration Paste	Kerr
Black Compound Cakes	Kerr
Bonfil Powder	Caulk
Burlew Ortho Foil	Jelenko
Carbocaine	Cookwaite
Cavit	Premier
Cavit	Premier
Cavit G	Premier
Cavitec	Kerr
Cavitec Applicator	Kerr
Ceramigold 144-60 GM	Whipmix
Ceramigold 144-90 GM	Whipmix
Cetacaine Spray	Cetylite
Citinest Forte	Astra
Citinest	Astra
Citricon Std.	Kerr
Cleaner-Dental Processor	Profexray
Cleaner Ultrasonic Denson	L&R
Clear Dip Qt.	Butler
Coe-Comfort	Coe
Coe-Flex	Coe
Coe-Lor Lab specify shade	Coe
Coe-Lor Powd. 5 lb	Coe
Coe-Lor Liq 1 qt.	Coe
Coe-Lor Liq 1 gal.	Coe
Coe-Pac	Coe
Coe-Sep. 16 oz. bottle	Coe
Coe Soft	Coe
Collits Developer	Buffalo
Concise # 1925	3 M
Copalite Thinner	Codesco
Copalite Varnish	Codesco
Crown Pak	Lactona
Densilk	Reliance
Dentcote	Dentsply
Denture Gloss	Westdent

APPENDIX B (Cont.)

Item	Manufacturer
Developer & Fixer	
Liquid X-ray Developer	Kodak
Rapid Fixer (A&B) to make	Kodak
RPXOMAT Developer Replenisher	Kodak
RPXOMAT Developer Starter	Kodak
RPXOMAT Fixer & Replenisher	Kodak
Dispersaloy	J&J
Dis-Plaque	Pacemaker
Duralay Liquid	Reliance
Duralay Powder	Reliance
Duraseal	Reliance
Duralon CD	Premier
Duralon Intro	Premier
Dycal	Caulk
EBA Cement	Teledyne
Ethyl Chloride	American Med.
Fitt	Kerr
Florident Gel	Premier
Flecks Cement Liquid	Mizzy
Flecks Cement Powder	Mizzy
Flour of Pumice	Mynol
Formatray Liquid	Kerr
Formatray Powder	Kerr
Fynal Cement	Caulk
Gamophen	J&J
Germicidal Concentrate	Codesco
Gingi Pak	Lactona
Green Stik Cmpd.	Kerr
Gutta Percha	Premier
Hemodent Cord	Premier
Hemodent Liquid	Premier
Hydrogen Peroxide	TanCredi
Hydroxylin	Taub
Inlay Investment	Kerr
Impregum	Premier
Impression Paste Type II Soft	S.S. White
Impression Wax (Iowa)	Kerr
IRM Blue	Caulk
IRM Ivory	Caulk
IRM Red	Caulk
Jeltrate	Caulk
Krex	Lee Smith
Lucitone Liquid	Caulk
Masque	Bosworth
Mercury	Codesco
Micro Alloy Pellets	Caulk

APPENDIX B (Cont.)

Item	Manufacturer
Microfilm	Kerr
Ney Indicating Spray	Ney
Nogenol	Coe
Nuva Fil Light Paste	Caulk
Omni Cleaner	Pelton & Crane
Omniflex	Coe
Opotow	Teledyne
Opotow EBA	Teledyne
Oral Soft	Teledyne
Orange Solvent	Reliance
Orthodontic Resin	
Pink	Caulk
Clear	Caulk
Orthodontic Resin Liq.	Caulk
Ortho Resin Powder	Caulk
Permlastic	Kerr
Permlastic Adhesive	Kerr
Permlastic (Free-Flo) syringe	Kerr
PIP Paste	Mizzy
Plaster #1 (100 lb drum)	Kerr
Proclave Detergent 1 pt. bottle	Kerr
Proclave Emulsion 1 pt. bottle	Kerr
Profexray Solution A	Profexray/Litton
Profexray Solution B	Profexray/Litton
Quartz Abrasive	Jelenko
Racord	Pascal
Red Compound Cakes	Kerr
Red Compound Stiks	Kerr
Repair Material (Liquid)	Caulk
Repair Material Lab	Caulk
Scutan (Temp. Acrylic)	Premier
Sed-A-Dent Paste	Durma
Sed-A-Dent Wick	Durma
Snap-A-Ray	Rinn
Spheraloy Z/F D.S.	Kerr
Stain Kit	Ceramco
Stain Off	H. R. Simon
Stainide	Premier
Super Soft	Coe
Super Soft Powder	Coe
Super Soft Liquid	Coe
Tab Liquid	Kerr
Tab Powder	Kerr
Tempak Liquid	Westward
Tempak Powder	Westward

APPENDIX B (Cont.)

Item	Manufacturer
Temporary Splint Material	Buffalo
Tin Foil TF3H	Dixon
Trace	Lorvic
Tray Material Bulk .080 Pink	Buffalo
Vapor Phase	Lorvic
Vaseline	TanCredi
Velmix	Kerr
Waxes:	
Aluwax Denture Wax	Aluwax
Base Plate	Dentsply
Base Plate	Hygienic
Bite Block Soft (U shape)	Hygienic
Boxing Stik	Kerr
Boxing Strip	Kerr
Casting Wax Sheets	Dentsply
Equilizing	Kerr
Inlay	Kerr
Ortho Tray Wax	Kerr
Ready Made Sprues	Kerr
Sticky	Kerr
Utility	Kerr
Utility Wax Strips	Hygienic
Wax Eliminator	
Waxed Cloth	Aluwax
Xylocaine	Astra
Xylocaine 1:50,000	Astra
Xylocaine 1:100,000	Astra

APPENDIX C

UPDATE CHANGES FOR SELECTED DATA ELEMENTS

APPENDIX C

Demographic Data

Col. 1-8	Col. 10-80
00044760	YOB = 95,
00098770	YOG = 59,
00248220	YOG = 14,
00390080	MCOD = 1,
00460110	YOB = 91,
00463710	YOB = 79, YOG = 02,
00507700	YOB = 26,
00518320	YOG = 02,
00529760	YOB = 79, YOG = 02,
00594600	YOG = 11,
00612290	YOB = 22,
00735220	YOB = 20,
00833240	YOG = 41,
00987630	YOB = 23,
00994320	YOB = 93,
01017750	YOG = 36,
01021480	YOG = 07,

Death Certificates

Col. 1-8	Col. 24	Col. 26	Col. 28-31
00214660	3	1	9890
00747700	3	1	9890