PAULINE F. STEELE

Dimensions of

DENTAL HYGIENE

3rd Edition

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To My Parents

Preface

Professionally, dental hygiene has experienced extensive changes since its inception. These advancements have emerged from scientific research, legislative enactments, technologic innovations, and professional initiative. However, adopting these trends requires acquiring performance standards beyond the ordinary in order to establish acceptance by professionals. Therefore, the dental hygienist must be cognizant of what developments are expected to govern in this era of immense complexities and continuous interdependencies.

Although the quest for knowledge has been excelling, complacency with previous accomplishments should not be endorsed. It is perpetually necessary to perceive future developments. For development to occur, there must be growth, which demands acknowledging the evolutionary process of change. What has transpired has definitely affected the image of the dental hygienist's role, but it is formidable to anticipate what will happen in the future.

This edition attempts to incorporate the various influential decisions that have recently affected the profession. The text has been designed to encompass informative presentations for both dental hygiene students and practitioners.

> *"Our knowledge is the amassed thought and*
> *experience of innumerable minds."*
>
> —*Ralph Waldo Emerson*

Ann Arbor, Michigan   Pauline F. Steele

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Contents

CHAPTER 1

Community Oral Health Programs

DOLORES M. MALVITZ

Since entire textbooks have been devoted to community dental health (CDH)[3,5,23], this chapter cannot possibly treat all aspects of the discipline comprehensively. Rather, the attempt has been to introduce students to the processes, tools, and scope of the discipline, then to suggest sources of further information. Although the chapter is organized to follow the process used in CDH practice, in no instance has the subject been treated exhaustively. The guiding principle has been to provide essential information for understanding community dental health and for conducting programs of limited scope. It is assumed that more ambitious programs will be under the direction of persons with further education and experience in community dental health who will provide in-depth knowledge and appropriate guidance at each stage of the process.

Community dental health is a broad subject area, often defined in a diffuse way. Many synonyms have been used to capture the essence of this area of practice—community dentistry, social dentistry, ecologic dentistry, and dental public health. The latter term, adopted for the specialty of dentistry recognized by the American Dental Association, has been defined as follows:

> Dental public health is the science and art of preventing and controlling dental diseases and promoting dental health through organized community efforts. It is that form of dental practice which serves the community as a patient rather than the individual. It is concerned wth dental health education of the public, with applied dental research, and with the administration of group dental care programs, as well as the prevention and control of dental diseases on a community basis.[5]

While dental hygienists are not eligible for certification as specialists in dental public health, many have received advanced education in the discipline comparable to that received by dentists. Most dental health professionals desiring formal education in community dental health pursue graduate study in schools of public health. Some persons so prepared teach community health courses within programs preparing dental hygienists and

dentists. Others hold positions in agencies such as local or state health departments, voluntary health organizations (e.g., the local cancer society), research institutes, or groups that administer or finance dental care programs. Although the proportion of hygienists holding such positions is small, their employment in nonprivate practice settings appears to be increasing as administrators discover that dental hygienists have the skill and knowledge to assume responsibility for segments—sometimes large segments—of community programs.

Because attention to the oral cavity is only a small portion of a community's health concerns, and because principles underlying the practice of dental public health are shared with the parent discipline, public health, it seems appropriate to examine how community dental health is accommodated in the total scheme of health concerns. The constitution of the World Health Organization has provided a ringing, positive definition of the goal toward which the efforts of health professionals are directed. "Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity."[5] Public health also concerns itself with efforts to reach that goal. Winslow's definition of this discipline is oft-quoted and widely acknowledged. He suggests that public health is "the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through organized community effort. . . ."[10]

Several elements of these definitions warrant comment. Public health, including dental public health, is both an art and a science, based in the biologic and social/behavioral sciences. Although attention may be directed toward treating pathology and repairing its effects (therefore prolonging life), public health efforts emphasize the general promotion of health and the specific prevention of disease. Often, distinctions are made among levels of prevention. Primary prevention results in complete prevention, i.e., the disease or condition never occurs. Examples of such preventive measures include wearing an appropriate sunscreen to minimize exposure of the lips to the sun, fluoridating the water, and wearing mouthguards while playing contact sports. In secondary prevention, the disease or condition is diagnosed early, in its incipient stage if possible, and damage to the individual is thereby minimized. Examples are such activities as scaling and root planing in patients with gingivitis, restoring carious lesions while they are still small, and placing space maintainers after the premature removal of primary teeth. Tertiary prevention includes efforts to restore and rehabilitate after extensive damage from the disease or condition. Thus, a complete denture reflects tertiary prevention because it restores oral function, but the prosthesis may also be considered primary or secondary prevention of nutritional problems. Most public health activities fall within the primary or secondary levels of prevention.

Although "traditional" public health activities such as immunization against communicable diseases or assurance of a safe supply of drinking water are usually cited, more recent efforts to enhance health are also in-

cluded in Winslow's definition of public health. Requirements that automobiles be crash-worthy, that schools make highly sugared snacks available only after the students' lunch periods, and that cigarette manufacturers include a warning about the health hazards of their products are all directed toward prolonging life, promoting health, and preventing specific health problems.

Distinctions are sometimes made among activities designed to educate for health, prevent diseases, and promote health. Green defines health education as ". . . any combination of learning experiences designed to facilitate voluntary adaptation of behavior conducive to health."[6] Disease prevention activities, usually focused on one specific problem, may or may not include an educational component. For example, the requirement that mouthguards be worn during contact sports may exist without the players' ever receiving an explanation of *why* the mouthguards should be worn. Ideally, activities designed to prevent specific health problems should also include an educational component. "Health promotion" is a more general term than "disease prevention" and acknowledges the substantial contributions to health of concerns not directly related to health, such as income, educational level, employment, housing, and the like. It is easier to live in ways that promote health if one's income and housing are adequate than if they are not.

Note that community health activities focus on the community as a whole—the entire group collectively—rather than on individuals. While clinical practice emphasizes the individual and modifications in usual practice necessary to provide appropriate care for that individual, community health practitioners view the individual only as part of the larger group, the community, to which the individual belongs. Efforts are then directed toward enhancing the welfare of the entire group. Attention is often given to those decisions, policies, and activities that must be accomplished by that larger group, which an individual could not accomplish on his own, such as water fluoridation. Since resources are limited, especially with regard to oral health services, the goal of public health specialists is to provide the greatest return for the resources expended while producing the greatest benefit for the largest number of people. Such goals generally mean that efforts focus on preventive measures that provide the most favorable cost:benefit ratios. For example, the cost:benefit ratio of water fluoridation is 1:60.[16] For each dollar spent fluoridating a community's water supply, $60 is saved and will not have to be spent restoring teeth that would have decayed had the water remained unfluoridated.

Although efforts may be concentrated on preventive programs, public health professionals also oversee programs that provide care, as well as those that emphasize education. Care programs are often limited to persons whose economic status or geographic location precludes their receiving care from private practitioners. Examples include dental clinics operated under the authority of health departments, the Indian Health Service (part of the U.S. Public Health Service, Department of Health and Human Services), and

neighborhood health centers. In recent years, however, as prepaid dental care has become more common and available, such a distinction has become less appropriate, since private practitioners may provide dental care, and then be reimbursed by the agency responsible (e.g., Project Head Start or Medicaid).

"Community" may be defined broadly or narrowly. In this chapter, the term is used to mean any group with common characteristics and a structure that holds it together. By such a broad definition, all of the following could be considered communities: New York City, the Iowa Education Association, employees of a nursing home, mothers of children enrolled in a day-care center, a local Rotary Club, volunteers at a hospital, and a neighborhood association or block club.

Obviously, groups share different degrees of common interests and members exhibit varying amounts of influence over other members of the community. Within large communities, such as New York City and the Iowa Education Association, there may be many smaller groups, which might also be considered communities. For this reason, it is important that community dental health professionals define carefully the group(s) with which they plan to work on a given project. It should be clear that community dental health personnel must obtain as much information as possible about these group(s) so the community will be defined appropriately, and so plans for projects can be developed, consistent with the expectations and values of the community.

ASSESSING THE NEEDS OF THE COMMUNITY

The first step in any project related to community dental health is assessing the needs of the community, just as deciding which dental hygiene services should be provided a patient depends upon evaluating that patient's needs. For an individual patient, data gathered to make such a decision probably include complete medical and dental histories (including the patient's "chief complaint"), chartings of the hard and soft tissues of the oral cavity, radiographs, and oral hygiene status and practices. Likewise, the assessment of a community's needs should include current oral health status, as well as the community's perception of its problem (its "chief complaint"). Dental health professionals accomplish little by attempting to impose their own ideas on a community that has an entirely different perception of the "real" problem. Until the individual or community can be educated to see other dimensions of the problem, it is futile to impose the professionals' view of the problem and ready-made solutions on the community. For example, a group of nursing home aides viewed the chief dental problem of their patients as the need to have dentures marked, so that lost or misplaced appliances could be identified immediately. However, the dental hygienists working with the aides saw the chief problem as a lack of regular oral hygiene care of patients. Until dentures were marked, or until aides perceived the lack of daily oral hygiene care as an important problem, it would have been a misuse of time

and resources to attempt to teach the aides how to remove plaque in the patients' mouths. Of course, the dental hygienists did plan educational efforts to help create an awareness of the problem of these unmet oral hygiene needs. Marking the patients' dentures was, however, the primary focus of the initial efforts with this group.

Information about a community's oral health needs may already be available, such as from the local department of health, or a Health Systems Agency responsible for the area. Needs may also be estimated from data gathered in the National Health Survey, by comparing the demographic characteristics of the community with the Survey's findings for groups with similar characteristics. In some instances, it will be necessary to gather data from the community. Often, it may be easier to examine a sample of the population rather than the entire group. Generally, the sample should be selected by some random means, that is, each person in the population should have a known and, ideally, an equal chance of ending up in the sample that is ultimately chosen. The manner in which the sample is selected determines whether the data can be generalized back to the population. Unless accomplished by a truly random method (e.g., a random number table), such generalization—which is precisely the purpose of examining a sample—is not allowed.

Dental health professionals should seek the assistance of experts prior to beginning data-gathering efforts. Statisticians, epidemiologists, survey research experts, and social scientists can provide invaluable assistance in designing appropriate data-gathering instruments and procedures. If data-gathering has begun and it is then discovered that a method being used is misleading or does not elicit the appropriate information, it may be too late to modify data collection. Sometimes, such errors may not be discovered until after data collection is complete. Consulting experts early can prevent much misguided or wasted effort.

Indices.   The presence, or prevalence, of disease is usually expressed by a rate, that is, the number of cases of the disease or condition per 1000 or 100,000 population. Because dental caries and periodontal diseases are nearly universal, such rates would be almost meaningless and they would reveal little about the severity of the disease or the degree to which the population has received treatment. Less prevalent oral conditions, however, such as oral clefts or head and neck malignancies, are usually reported as a number of cases per 1000 or 100,000.

Several indices are used widely in summarizing oral health status. While these indices do not provide the detailed information required for diagnosing an individual patient's needs, their level of precision can be helpful in characterizing the oral status of a population and, thereby, in indicating possible priorities for programs in that community. In the discussion that follows, attention is directed toward the information needed to interpret findings accurately, rather than how to score indices. Detailed instructions for such scoring can be found elsewhere.[5, 7, 8, 13, 18, 19, 20, 23] The student is

cautioned that accurate scoring of indices requires substantial instruction, guided practice, and efforts to calibrate scoring, so it is comparable to that of a skilled, calibrated examiner.

DENTAL CARIES.   Indices of dental caries can be divided into those used for the primary teeth and those for the permanent dentition. Furthermore, the indices can express either the number of teeth or the number of surfaces affected. All caries indices reflect the cumulative experience of the individual(s) examined, and do not indicate whether the caries process is active at the time of examination. Since carious teeth cannot repair themselves but must be restored professionally to prevent progression of the disease, it is possible that all the teeth (or surfaces) were afflicted initially years prior to the examination.

For children up through age six or seven, the *def* index is usually used. This index counts the number of primary teeth or surfaces that are *decayed*, that are *indicated for extraction*, or that are *filled*. Since teeth indicated for extraction because of advanced caries are, in fact, decayed, the index is sometimes scored as if it were simply *df*. Missing teeth are ignored. For this reason, a population that has experienced a high level of caries but has received dental care, especially extractions and space maintenance, may exhibit a lower *def* score than a population that has experienced fewer carious lesions. For the same reason, it would be possible for a *def* score to decrease after treatment.

For older children with mixed dentitions, the *dmf* index may be used to summarize the status of primary teeth. This index counts the number of primary molar or canine teeth (or surfaces) that are *decayed*, *missing*, or *filled*. If a tooth is absent prior to its normal time of exfoliation, the examiner assumes this is because of dental caries.

The index used for the permanent dentition is the *DMFT* or *DMFS*, which denotes the number of *decayed*, *missing*, or *filled* teeth or surfaces. In scoring this index, the examiner notes the condition of each tooth, and no tooth is counted more than once. For example, a tooth that exhibits recurrent caries around an existing restoration is scored as decayed. Often, it is possible to elicit from the person why a tooth is absent. This is important, for teeth that are unerupted, congenitally missing, or extracted for orthodontic purposes are not usually counted as missing. Because third molars are usually excluded, the maximum *DMFT* count is 28 and the maximum *DMFS*, 140. To score the latter index most accurately, bitewing radiographs are considered necessary. The *DMFT* can be scored more rapidly and, for that reason, it is usually chosen when large groups are examined.

The total *DMFT* and *DMFS* reflect the caries history throughout the individuals' lifetimes and will therefore only increase. Consequently, mean (average) *DMF* scores are usually computed only for a given age group and not, for example, for a group of third-graders and high school students combined. In addition, the proportion of decayed, missing, or filled teeth is masked by the total score. For that reason, and to provide more detailed data,

individual ratios for each of the three components may be reported. For example *D/DMF*, the proportion of decayed teeth, indicates the amount of treatment currently needed by a group, while *F/DMF*, the proportion of filled teeth, expresses the amount of treatment obtained by a group in the past. Ideally, the proportion of filled teeth would be high and the proportions of decayed or missing teeth, low.

A study using the *DMF* may focus on the increment of new decay that occurs during the study period, called the incidence. Incidence differs from prevalence in that the latter is the amount of disease present at a given point in time, whereas incidence is the amount of *new* disease during a given period of time. Therefore, incidence requires measurements at two different times. Suppose a group of 100 ten-year-olds was examined using the *DMFT* index. The average (mean) score for the group was 6. Two years later, the same 100 children were again examined, and the new average *DMFT* was 11. One could state that the prevalence of *DMFT* in this group at the first examination was 6, and at the second examination, 11. The incidence of *DMFT* (or the increment of new decay) during the two-year period was 5.

PERIODONTAL DISEASE. Several indices of periodontal disease are used widely. Because the determination of whether disease is present becomes more difficult when assessing the supporting tissues, it is more difficult to achieve reliability—either with one examiner or with more than one—in scoring these indices. Reliability is the ability to reproduce results, to obtain the same score consistently when measuring a condition. In a perfectly reliable index, two examiners would independently assign the same score to one subject, or one examiner, rescoring the same subject at a later time, would assign the same score as the initial assessment.That an index is reliable says nothing about its validity. A valid index truly and accurately measures what it purports to measure. An index, or any measuring instrument, may be reliable but not valid; however, it must be reliable (reproducible) in order to be valid.

The Gingival Index (GI) of Löe attempts to distinguish clearly between the presence or absence of gingival inflammation.[13] Scores are: 0, normal gingiva; 1, mild inflammation (slight change in color, slight edema, no bleeding on probing); 2, moderate inflammation (redness, edema, bleeding on probing); and 3, severe inflammation (marked redness and edema, ulceration, tendency to spontaneous bleeding). Although the Gingival Index characterizes the degree of gingivitis present, it does not reflect underlying destructive periodontal disease. Also note that the GI score is reversible, that is, a person or group with a score of 3 could, if proper care is achieved, obtain a score of 0 at some time in the future.

Russell's Periodontal Index (PI) classifies the periodontium surrounding each tooth on a weighted scale,[20] ranging from 0, the absence of inflammation, tendency to spontaneous bleeding). Although the Gingival Index characterizes the degree of gingivitis present, it does not reflect underlying greater amounts and severity of inflammation and destruction of supporting

tissues. The Periodontal Index is not designed to diagnose periodontal disease in the individual patient, but Russell concluded that a general correspondence exists between the clinical status of a group and the average PI score for that group. Those with clinically normal tissues score in the range of 0 to 1.2; those with gingivitis, 0.1 to 1.0; those with established destructive disease, 1.5 to 5.0; and those in the terminal stages of periodontal disease, 4.0 to 8.0. Note that these ranges overlap and that one can expect such lack of precision with the subjective judgements required for this index. The greatest value of the PI is in characterizing and comparing disease levels of populations.

The Periodontal Disease Index (PDI) of Ramfjord,[19] which has been used extensively in the Michigan studies of periodontal disease and treatment, records seven different characteristics of six specific teeth. Measurements are made regarding the following: the condition of the gingiva; the amount of calculus present; mobility; the depth of periodontal pockets; attrition; the lack of contact of the teeth; and the amount of plaque. Because there are specific and detailed directions for each of these measurements, it seems obvious that examiners must be carefully trained and calibrated if they are to obtain accurate, reproducible data.

ORAL HYGIENE.   Indices discussed thus far assess the presence and severity of the two major oral diseases. Indices of oral hygiene status—which is closely associated with the health of the periodontium—do not reflect health or disease. Rather, they are a valuable measure of a factor believed to be instrumental in the etiology of oral diseases. These indices have been useful in evaluating dental health educational programs, and may be used in the private office to assess a patient's oral hygiene status.

The Oral Hygiene Index (OHI) was developed by Greene and Vermillion,[7] who later adapted it as the Simplified Oral Hygiene Index (OHI-S).[8] Both indices have been used extensively in studies relating oral cleanliness to periodontitis; and National Health Survey evaluations of oral status used the DMF, Periodontal Index, and Oral Hygiene Index. Both the OHI and OHI-S involve two components. The Debris Index (DI) is the portion that assesses the amount of debris or stain apparent on the buccal and lingual surfaces of the designated teeth. The amount of calculus, the Calculus Index (CI), is the other portion of the index, and is evaluated for these same teeth. Both components are scored with a subjective scale ranging from 0, no debris/stain or calculus, to 3, which indicates debris or calculus covering more than two-thirds of the exposed surface, or a solid, heavy band of subgingival calculus around the tooth. Because debris and calculus are readily visible, it is not necessary to use a disclosing agent to score the OHI. Since the mean CI and mean DI are added to obtain the total OHI, the maximum score is 6.0.

Figure 1-1 displays the PI, DI, CI, and total OHI scores of a group of males aged 11 to 17. Among those who brushed less than once per day, both components of the OHI, the total OHI, and the PI were larger than for those who reported brushing more frequently.