CALIFORNIA STATE UNIVERSITY, CALIFORNIA

TECHNIQUES FOR DENTAL HEALTH EDUCATION

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Science in

Public Health

by

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgements</td>
<td></td>
<td>iii</td>
</tr>
<tr>
<td>Table of Contents</td>
<td></td>
<td>iv</td>
</tr>
<tr>
<td>List of Tables</td>
<td></td>
<td>v</td>
</tr>
<tr>
<td>Abstract</td>
<td></td>
<td>vi</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statement of the Problem</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Hypotheses</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Definitions</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Literature Review</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Studies Dealing with Periodontal Disease</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Development of Preventive Dental Health Program</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Justification for a School Program</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Results of Preventive Dental Health Surveys</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>Methods</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Formulation of the Program</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Education of Teachers and Parents</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Pretest Screening</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Educational Approach</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Posttest Standards</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Scoring</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Community Involvement</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Evaluation by the Teachers</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Results</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Data Derived</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Hypotheses Tested</td>
<td>34</td>
</tr>
<tr>
<td>5</td>
<td>Conclusions and Recommendations</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Conclusions</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Limitations of the Study</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Recommendations</td>
<td>42</td>
</tr>
<tr>
<td>Bibliography</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Appendices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Survey Chart</td>
<td>50</td>
</tr>
<tr>
<td>B.</td>
<td>Letter to Parents of C Group</td>
<td>51</td>
</tr>
<tr>
<td>C.</td>
<td>Work Chart</td>
<td>52</td>
</tr>
<tr>
<td>TABLE</td>
<td>TITLE</td>
<td>PAGE</td>
</tr>
<tr>
<td>-------</td>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Sample Raw Data Score Sheet Based on Screening Results for Child #84 at the E School</td>
<td>27</td>
</tr>
<tr>
<td>2</td>
<td>Sample Researcher Index Score Sheet for Child #84 at the E School</td>
<td>28</td>
</tr>
<tr>
<td>3</td>
<td>Comparison of Dental Health Between Pre-examinations and Postexaminations</td>
<td>33</td>
</tr>
<tr>
<td>4</td>
<td>Individual Results Based on the Index of Improvement</td>
<td>34</td>
</tr>
<tr>
<td>5</td>
<td>Comparison of the Index of Improvement for Plaque Quantity in Individuals in the Experimental and Control Group</td>
<td>35</td>
</tr>
<tr>
<td>6</td>
<td>Comparison of the Index of Improvement for Gingival Health in Individuals in the Experimental and Control Group</td>
<td>35</td>
</tr>
<tr>
<td>7</td>
<td>Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Experimental Group</td>
<td>36</td>
</tr>
<tr>
<td>8</td>
<td>Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Control Group</td>
<td>36</td>
</tr>
<tr>
<td>9</td>
<td>Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Experimental Group Based on Percentages</td>
<td>38</td>
</tr>
<tr>
<td>10</td>
<td>Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Control Group Based on Percentages</td>
<td>39</td>
</tr>
</tbody>
</table>
ABSTRACT

TECHNIQUES FOR DENTAL HEALTH EDUCATION

By

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A cursory examination of the dental health of elementary age children was performed by volunteer dental personnel in a school setting. It was found that an improvement was needed. As a result, the program described in this paper was developed. This preventive dental health education program was devised by combining existing teaching techniques with the one-to-one relationship of doctor to patient employed in the dental offices. The combination of these two provided a viable behavioral study.

This program included a study which provided a control group that continued a traditional educational approach to preventive dental health while an experimental group supplemented this approach with overt behavior of brushing and flossing daily in the classroom.

After a period of eight weeks, a statistical analysis was performed that proved the approach used by the individuals in the experimental group helped achieve results that surpassed those of the children in the control group. As a result of this analysis, the school district in which the study was performed decided to expand the
superior approach to all of the schools within the district.

The Dental Society that supplemented the program also expanded its assistance to the cooperating school district and is currently promoting the program in additional school districts.
CHAPTER I
INTRODUCTION

It has long been recognized that there is a strong need for preventive dental care. In order to promote such care, organizations of professional personnel have been formed in order to cope with this problem. In spite of their efforts the problem has remained severe. A review of the literature suggested that different educational approaches were necessary.

In the State of California, the health curriculum for third grade students has included dental health. One of the objectives of the curriculum is to help the students understand the anatomy of teeth and the proper hygiene necessary to maintain them in good health. To explore the effectiveness of this program, this researcher arranged with the local dental society to provide volunteer dentists and/or dental hygienists to aid in an examination of children's teeth in a selected school district. All third grade students throughout the district were examined for cavities, proper cleaning habits, malocclusions, and any gum disease that might be evident. Each child was examined on an individual basis. The School District Nurse then reviewed the results to determine which child needed follow-up care and for what reasons.

The results of this evaluation were appalling. Most boys and girls of approximately eight years of age had very poor teeth. Many cavities were found, many teeth were in need of cleaning, and some children had malocclusions. The final result of this screening process showed that 95 percent of the students of this particular school district were in need of follow-up dental care.
This 95 percent figure indicated that the current educational programs were not sufficient and gave support to the premise that a better preventive dental health program might be developed to alleviate a portion of these problems.

In this study situation, there were other circumstances that might have contributed to the severity of the problem. The children in the school district came from various economic backgrounds. They ranged from the very poor (poverty stricken) to high-income brackets. Also, there were only a few dentists readily available. There were only four general dentists in the local community for a school population of approximately 2500 children of elementary age. In the surrounding communities, many more dentists were available. However, travel time to the other communities was approximately twenty minutes by automobile.

In addition to the local dentists, various clinics for low-income families were also available in the surrounding communities. Some of these clinics were in county hospitals, others were in private hospitals. The Public Health Service also had a dental clinic available in a neighboring city. However, the dental services available for low-income peoples took a waiting time period of six months to one year. Further, in many instances the services were not available for people in the 'test' community because of the qualification restrictions on finances and residence. Although emergency services were somewhat available, preventive care was almost nonexistent.

STATEMENT OF THE PROBLEM

As a result of the study, it was decided that an expanded dental health education program was needed to improve the dental health
of school-age children in a selected school district.

A project was developed to satisfy this need. The objectives of the project were:

1. To devise techniques to improve the dental condition of the students (and hopefully of the other members of their families).

2. To set up an evaluation process of overt behavior in regard to dental health.

3. To help establish evaluation techniques for the other aspects of dental health education within the school district.

Further evaluations, to take place at the end of the program, were planned to determine:

1. Whether the project should be continued.

2. Whether, after a period of noninstruction, behavioral change actually took place.

3. Whether more reinforcement would be necessary.

HYPOTHESES

The hypotheses established were based on the results of each individual child's plaque quantity and gingival health in the pretests and posttests. The hypotheses are as follows:

1. The distribution of individuals in the Index of Improvement for plaque control is the same for both the control and experimental groups.

2. The distribution of individuals in the Index of Improvement for gingival health is the same for both the control and experimental groups.

3. There is no difference between the results of the
distribution of individuals in the Index of Improvement for the experimental group for plaque control and the distribution of individuals in the Index of Improvement for gingival health.

4. There is no difference between the results of the distribution of individuals in the Index of Improvement for the control group for plaque control and the distribution of individuals in the Index of Improvement for gingival health.

DEFINITIONS

Plaque - a white, mucoid material derived from bacterial breakdown of saliva.

Caries - otherwise known as cavities.

Calculus - a tenacious deposit resulting from hardened plaque, also known as tartar.

Disclosing tablets - harmless red colored vegetable dye in tablet form which selectively colors plaque.

Flossing - technique of using dental floss to remove plaque from crevices and between teeth.

Peridental disease, Periodontal disease, or Periodontal disease - a disease condition affecting the supporting structures of the tooth, resulting in eventual tooth loss if not treated.

Gingivitis - early stage of peridental disease.

Gingival sulcus - gum area around the base of each tooth.

Index of Improvement - a score based on a tabulation of the pretest and posttest raw data to determine improvement, no change, or no improvement on each individual tested.
CHAPTER 2

LITERATURE REVIEW

STUDIES DEALING WITH PERIDENTAL DISEASE

It is generally agreed that one of the factors in a build-up of plaque is poor oral hygiene (which may eventually result in caries and peridental disease). Plaque is

"the most destructive agent... a white, mucoid material derived from bacterial breakdown of saliva. Toxin-producing bacteria thrive in this matrix. Their enzymes and other products accumulate within the gingival sulcus, causing inflammation and bleeding. If the plaque remains on the teeth for longer than twenty-four hours, it begins to calcify, forming a hard, tenacious deposit known as calculus (tarter). Calculus, which has a consistency much like sandpaper, causes abrasions and ulcerations to the internal surface of the gingival sulcus in addition to the toxin-producing action of the bacterial plaque." (17:39)

Cumming and Löe have shown that the duration of plaque on the teeth is significant in the cause of peridental disease.

"Clearly, a description of the amount of plaque distributed throughout the mouth is insufficient to explain the occurrence of peridental destruction and must be coupled with information on the duration that plaque deposits remain in specific locations. Information concerning the consistency with which plaque occurs in various sites is not available." (26:95)

They further report upon the inconsistency of plaque location.

"The study also found that the pattern of plaque distribution was unique for each individual. From a plaque occurrence point of view three types of locations were found at the dentition: those which were consistently kept free of plaque (most commonly found on the facial surfaces of the anterior teeth); those which were inconsistent, sometimes plaque free and other times covered by plaque (the premolars commonly exhibited this inconsistency); and those which were regularly associated with plaque deposits (best examples being the interproximal surfaces particularly in the molar region). The amount of fluctuation observed in the inconsistent location is the same for both in consistent and inconsistent individuals, but the number of inconsistent locations was greater in persons whose total plaque situation varied from examination to examination. However, it must be remembered that even in individuals who are relatively inconsistent, areas were identified which for some reason were highly consistent
throughout the study." (26:99)

They contend that the relationship of plaque to periodontal disease is established.

"...The ability of plaque to cause gingivitis and periodontitis has been demonstrated (Löe et al 1965, Green and Vermillion, 1971). Furthermore, it has recently been shown in longitudinal experiments with the Beagle that periodontal pockets first develop in those locations which consistently demonstrated plaque throughout the study (Lindhe et al, 1972). Persons with poor oral hygiene, or persons with good oral hygiene, have locations in their dentition which are consistent; either clean or covered with plaque, that might have a different potential pathology than locations which are inconsistent." (26:99)

The research into caries and its cause have been going on for some time. An earlier study by the Health Examination Service (in 1965) was carried out on 7,119 children in the United States in a target population of 6-11 year old children. A high incidence of caries was evident by the sampling, even though approximately half of the sampling units were in fluoride areas where it would be expected that the prevalence of plaque was reduced. Unfortunately, this report gave no information on that point. (41)

"...caries-prevention research has undergone rapid, even spectacular, acceleration during the most recent ten years. This could not and did not occur until etiologic phenomena had been examined in painstaking detail and the possibility of various routes to prevention thereby suggested.

"Of course, the origin of caries is not fully understood. Much more laboratory-oriented research must proceed simultaneously with the current efforts to develop possible preventive methods to the point of widespread application. Furthermore, the development of these methods remains, in most instances, in an early and tentative stage, and the ultimate utility of different agents and techniques cannot yet be clearly perceived. Very possibly, continuing research in caries causation and pathogenesis will result in better routes to prevention than any now being pursued." (18)

Further studies have indicated how plaque builds up.

"First, there was a clean tooth and a healthy gingiva. Later, however, a pellicle from the saliva was deposited on this surface,
and soon bacteria clung tenaciously to the tooth to form the well-known dentobacterial plaque. The plaque is often composed of a hard part, which is mineralized, and a soft overlying part in which bacteria grow, live, and die. In so doing, the organisms elaborate chemical substances that are assumed to be harmful to the adjacent soft gingival tissues. According to this concept, the bacterial substances set off inflammation that one sees grossly as redness and swelling. Within the gingiva, however, the inflammatory process results in the localization of a fantastic array of many different biochemicals that can destroy not only invading bacteria, but also the host's own tissues. After months and years, the fibers making up the structural framework of the gingival tissues and the fibers that hold the teeth in the jaws, as well as the bone itself, all begin to melt away, and the tooth eventually becomes loose in its socket and is finally lost." (19:1019)

The prior study has been further substantiated by the use of the electron microscope. Studies utilizing the microscope have given concrete evidence of the build-up of plaque and growth of bacteria within this medium. (25,48)

We contends that

"Contrary to previously held concepts, it has become increas-
ingly evident during the past 25 years that systematic influences, malnutrition, and lack of specific dietary compounds play a minor role in the actual development of periodontal disease, and that bacterial plaque and its products form the primary link in the chain of events leading to destruction of the periodontium. Substantial evidence for this has been found in experi-
ments showing that, in man, gingivitis will develop within a few days after cessation of oral hygiene measures, and that it reverts to normal again after reinstitution of good oral hygiene." (20:1034)

He further states that

"There is also some basis for the opinion that mastication has a limiting effect on the occlusal or incisal growth of plaque. However, during mastication, the cervical areas of the teeth, the gingival margin, and most of the attached gingiva are not subjected to physical stress from food particles... Indeed, the presence or absence of plaque at the cervical circumference of the teeth is seemingly independent of the passing of food through the oral cavity." (20:1034)

This indicates to this researcher that the theories that had been held in regard to 'nature's' toothbrushes, namely carrots and
apples, are not valid.

Documentation about the use of dentifrice and its ability to remove plaque was not found by this researcher except for a study in regard to dentures. Here, it was found:

"An investigation of the plaque removing ability of eleven denture cleaning solutions has shown that only one is capable of removing plaque and other surface debris from removable dental prosthetic devices. This product, a sodiumhypochlorite-phosphate, is marketed under the trade name Hersene. Regular overnight soaking of the dentures in this solution has been shown to maintain them free of plaque without pitting or loss of surface finish. Further studies are being conducted to evaluate the role of denture borne plaque in the etiology of recurrent caries, periodontal destruction of abutment teeth and inflammatory papillary hyperplasia." (35:367)

In November of 1971, Federal regulations were changed in regard to a Medicaid Program and its affect on dental care. It was stressed that the regulations

"...required all states to provide early and periodic screening diagnosis and treatment services to children under age six by February 1, 1972, and under age twenty-one by June 1, 1973. This information will help inform all dentists about this program...As a minimum, dental services that must be provided include emergency services, preventive services, and therapeutic services for dental disease, which, if left untreated, may become acute dental problems or may cause irreversible damage to the teeth and the supporting structures. Services included in these categories in the state Medicaid fee schedule may be reimbursed when applied to children carrying a valid Medicaid identification." (36:146)

Although the services will be covered financially, there usually are not enough available sources to cover the care needed by the local community.

The lack of dental health services is a feature common to many communities in many parts of the world. A study done on Indian children in Northwestern Ontario, Canada, can be used as an example of need. The conclusions reached were:

"...It shows the urgent need for further sampling of the dental
health of the community with extensive dental neglect....It demonstrates the urgent need for commencing a practical preventive program." (46:713)

DEVELOPMENT OF PREVENTIVE DENTAL HEALTH PROGRAMS

The volume of literature on more effective programs in preventive dental health indicates that others have regarded the need to be great. In developing another new program it was essential to determine what had already been done and where room could be found for improvement.

"...several needs must be met to solidify and to expand the foundation of preventive dentistry on a national basis." (21:862)

Some of these needs are:

"--The need to change our own behavior patterns before we attempt to change the behavior of our patients. --The need for precise guidelines about what a preventive practice should include, as well as about the methods of achieving the desired results....--The need for preventive preponderence and educators alike to expand their efforts and to consolidate their methodology." (21:862)

For many years, dentists have been attempting to find ways to improve care as well as to promote dental health programs. Recently a program was developed by one of the leading manufacturers of toothpaste for use in the dental schools. It was a program based specifically on preventive dental health.

"Prevention has, to a large degree, virtually exploded to the forefront. As the result, many practitioners have indicated a need for educational programs which effectively synthesize the wealth of information becoming available on the theory and practice of preventive dentistry. Without such a program, there is a risk that confusion and inaction may grip some dentists. And numerous others may develop relatively ineffective prevention-oriented programs because they have grasped only partial solutions to the problem of controlling dental disease." (12:61)

It is for this reason that studies to increase the potentials of preventive dental health programs are necessary. The dentist is
only able to see a limited number of patients and to control and observe what they are doing. Through educational programs in the schools, where many are reached and at younger levels, more effective dental health programs may be developed.

"In view of the dental health of the country and present manpower shortages it is essential that training resources be developed so as to be concerned not only with the training of individual dental students but the concurrent education of all those who will have to be concerned in dental health." (30:51)

Shirley Pyke, a dental health educator, reviewed three types of programs. (39) The first one was a reported program carried out by the U. S. Army consisting of three parts: (1) preventive treatment consisting of the use of various prophylactics; (2) education by motivation using audiovisual materials and in-service education of the staff; and (3) research in clinical and evaluative studies. The second program she reviewed was the Cleveland model. This model provided sixth grade students with an understanding of how cavities develop and the meaning of periodontal disease. It also taught how the disease could be prevented, and finally, how the students were to duplicate behavioral changes, under direct supervision, in regard to oral hygiene for themselves and families. The third program she studied was the Toothkeeper Program. This Program was a dental health preventive approach that combined the efforts of the classroom teacher and the dental health educator. The philosophy of this program was

"Remember dentists can't! Parents can't! Teachers can!" (39:77)

The effect of these different programs varied and have all been reported in the literature.

"Although research on causative agents may still be needed, the programs described may be successful in creating an awareness
of oral health and disease in the limited populations which the programs served." (39:80)

The developer of a preventive health program ought to try to encompass all ways that a consumer might be contacted and motivated. Not only is the patient affected, but so is his entire family.

"An important source of existing standards is the patient's immediate family. Thus, it follows, that if other members of the patient's family become involved in supporting the professional standards, they would be more likely to be accepted. If only one member of a family is required to perform home care procedures while every other family member does not, these are less likely to remain as established habit patterns. The ultimate goal of the practitioner is to train his patient to maintain sound health habits even when he is no longer coming for care on a regular basis and thus not subject to the approval or disapproval of the practitioner. He won't say, 'I have an appointment today, therefore, I (had) better brush carefully.' Instead the patient should obligate himself to brush because his teeth and mouth would not feel right to him otherwise. In other words, the task is to start with the external means of patient motivation and teach the patient to internalize professional standards. Once these standards and norms have been internalized, they can become self-regulating. Deviations from these standards can produce self-corrective approaches. A person can be his own worst critic. Attainments that exceed personal standards of a worthy performance activate positive self-evaluation whereas inadequate accomplishments produce self-dissatisfaction.

"There are several methods for achieving such internalized standards. The first step requires the dentist to view the patient as an active participant in the therapeutic process, as the job of the dentist is to train his patient in self-regulative activities. These include such things as record keeping, self-imposed environmental control, e.g., no T.V. until after brushing and training and self-reinforcement." (24:497)

With these criteria in mind, there is still another aspect of a preventive dental health program that must be considered, and that is the development of parameters. Garnick says that in

"...evaluating the success of a patient's plaque control program, the hygienist uses indexes such as the modified Loe gingivitis and plaque indexes. The hygienist examines six teeth (the maxillary right first molar, left central incisor, and left first premolar; and the mandibular left first molar, right central incisor, and right first premolar) and assigns
indexes. These indexes are used to assess the amount of inflammation present in the marginal gingival tissues and the amount of plaque at the cervical margins. Together they serve as the indicators of plaque control." (23:1325)

"...There has been a considerable amount of confusion about proper methods for the statistical analysis of indices such as the Oral Hygiene Index-Simplified (OHI-S) and the Periodontal Index (PI). These indices are scoring systems in which an observable qualitative trait is assigned to score. These scores are averaged within persons and personal averages then are averaged; this yields a mean score per sample." (43:37)

An adaptation of the PI was used by this researcher in developing the Index of Improvement. (See Appendix A.)

Finally, the goals of a program must be developed. Some methods that could be utilized are stated in a World Health Organization (WHO) report, which lists desirable capabilities of the teacher in the health professions as follows.

"a. In educational planning, the ability to:
   i. Define instructional objectives that are consistent with the students' health service role upon completion of training;
   ii. Define instructional objectives that are consistent with the school's educational philosophy and mission;
   iii. Formulate objectives in terms of final expected student behavior;
   iv. Involve students in the process of defining objectives;
   v. Apply accepted principles of adult learning in the design of instructional strategies;
   vi. Provide varied learning experiences for achieving objectives;
   vii. Seek and use the assistance of educational specialists for planning when appropriate;
   viii. Select appropriate content from a large body of expanding knowledge;
   ix. Organize course content in a fashion that is understandable to students;

b. In programme implementation, the ability to:
   i. Use varied teaching techniques (e.g., a lecture, group discussion of role playing, case study, individual supervision and educational media) with appropriate skill in situations that capitalize upon their effectiveness in facilitating learning;
   ii. Make a commitment to self-assessment through peer review or student feedback.
c. In programme evaluation, the ability to:
   i. Utilize diagnostic as well as certifying evaluation procedures;
   ii. Select or construct evaluation procedures that assess knowledge, attitudes, and skills;
   iii. Use and interpret the results of standardized tests;
   iv. Identify the literature areas for personal study and medical education, both for himself and for students;
   v. Understand basic statistical concepts that facilitate communication with specialists." (27:10-1)

JUSTIFICATION FOR A SCHOOL PROGRAM

It has been found that

"Periodontal disease can be prevented and successfully controlled when detected early and treated promptly. School based periodontal programs are needed now to determine the best ways of applying what we know about periodontal disease among children and youths. Such prototype programs would provide the experience for wider application in the future." (2:12)

"It is estimated that only forty percent of the American people visit the dentist during the course of a year. Dentists may be expected to assume the responsibility for the other sixty percent. The largest single captive audience that could be reached within the remaining sixty percent is the school population. Dental educational programs presented in some school systems consist of single lectures once a year with tooth brushing demonstrations, and at the end of such a lecture, toothbrushes and toothpastes are distributed to the students. It has been found, however, that this once-a-year approach does not change the behavioral patterns of the children toward improved oral health. Though it is felt that the classroom is the appropriate place to base a program for preventive care, there must be a change in the method in which it is taught." (4:26)

During the initial survey done by this researcher, the foregoing was found to be true. Instead of a dentist giving the lecture, it was done by the District Nurse, with demonstration followed by a question-and-answer period. The children were aware of what they should be doing, but the survey showed in fact that they were not properly caring for their teeth.

Other researchers have also found the foregoing to be correct, even as far away as Alaska.
"Gingivitis was present in all children; half of them had scores that indicated generalized or even severe gingivitis. In individuals over thirteen years of age, there was a trend toward a higher prevalence of more severe periodontal disease with age, although Chi Square analysis failed to prove that this trend was statistically significant...Questions during interviews about toothbrushing habits showed that none of the individuals brushed their teeth regularly, 28 brushed their teeth 'sometimes,' and 47 did not brush their teeth at all. Oral hygiene conditions, therefore, were poor." (42:795)

The problem of poor oral hygiene is evident. The question, however, is where does the responsibility lie for the presentation of preventive health programs? Does poor oral hygiene result from a lack of education, lack of dental personnel, or lack of funds? The Medicaid bill of 1971 (36) allowed funding for low-income families, but this does not take into consideration the attitude of the consumer.

"Whereas the higher-income persons tend to believe improvement in one's health generally is possible, lower income persons tend to accept ailments as inevitable and a natural process of living and aging. 'Thus teeth are left without dental care, and later there is often small interest in dentures, whether free or not.' But most important, this fatalistic orientation to the deterioration of health is extended to the children of the lower-income family. A child's disability or malfunction is often viewed with a degree of resignation and tolerance. A lack of health education combined with the availability of an endless array of ethnic-folk remedies for each particular ailment reinforces the financial separation from the traditional health delivery system experienced by the lower-income family." (28:45)

The author of the previous article goes on to say,

"The delivery of dental health care for the children of the poor cannot escape these realities of the 1970's. The projects that would be developed under the auspices of any Children's Dental Health Act considered by Congress must somehow come to grips with these and many more complexities. Thus, while the primary focus of the projects would be to evaluate a variety of dental health delivery models for the poor, a major component of their activities must include the educational efforts that have been the raison d'être for publicly supported dental clinics. Supposedly, according to the traditional theory, this exposure to publicly supported dental support will imbue the indigent child with the proper dental health care habits; which will have a long-term affect; and which, in turn,
will serve as a catalyst for the individual to seek continued
dental health service in the private sector—once he is beyond
the eligibility of the publicly supported program." (28:46)

As mentioned earlier, this researcher found that the publicly
supported dental clinics in the study community had no preventive pro-
grams, and unless an emergency arose, the waiting lists were six months
to a year.

Other researchers found in their studies that

"...conventional methods of instruction brought about insigni-
nificant change in the behavior of the children in the con-
trols as reflected in the varying amount of plaque identified
on their teeth from the time the study was initiated until its comple-
tion. For the children studied, however, instruction
plus sustained motivation (emphasis is mine) paralleled a
substantial lowering in scores for plaque. The mouths of these
children remained relatively free of plaque six months after
instruction and motivational exercises were terminated, and the
data suggests that good oral habits were maintained once they
were established soundly. The children in this study are being
studied further to determine whether any inhibition in the
incidence of carious lesions has followed in the observed
diminution of plaque in their mouths." (38:74)

While it is evident that intensive educational programs are
needed, there is also not a sufficient number of dentists to care for
routine and emergency needs of the public.

"Considering that almost 100 percent of persons over twelve-
fourteen years of age in the U.S.A. have gingivitis and about
80 percent of the middle-aged have destructive peridontal
disease (periwontitis) (Green, 1972) and many countries had
even higher prevalence and incidence, the need for preventive
peridontal care assumes staggering dimensions." (31:306)

Therefore, it is apparent that the next place of preventive
programs to be utilized is within the school system itself. Already
it has been seen that teachers are becoming involved in preventive
programs. They are teaching oral hygiene and nutrition as well as
encouraging the use of fluoride preparation. But this present
activity isn't enough, as the surveys are showing.
"In the future a complex of health education comprising dental health education and training could be integrated with the school programme and the public dentists would then mainly initiate and evaluate these activities." (32:356)

A recent study done in Samoa shows that

"...the average western Samoan has lost eleven-twenty teeth due to periodontal disease and had 0.77 teeth requiring extraction for this reason; comparable figures for dental caries are 0.42 and 1.62 teeth." (47:337)

As a result of that survey, the authors and those involved in the program concluded that

"...a toothbrushing programme in schools is the most effective approach, being planned to achieve desirable behavioral changes and not merely to disseminate information. This programme is gradually being extended to cover all primary schools and it involves the...equipment needed for the program and the necessary educators, such as dental officers, teachers, nurses, and parents." (47:339)

In order to bring a preventive dental health program into the schools, the educators of the students will need instruction. A survey was conducted of elementary school teachers in Bowling Green, Kentucky in 1972, testing their knowledge of dental equipment and use. The questionnaire was divided into four sections dealing with: disclosing tablets; toothbrushes; flossing; and bacteria as a causal agent in dental diseases. The results of the study showed

"The mean dental IQ score was 40.6%. 18 of the respondents (12%) scored 0%. When the respondent was required to answer all three questions correctly in each part of the questionnaire to score 25%, the average dental IQ score dropped to 8.5%. Using this method of scoring, 98 respondents (68%) scored 0%." (11:60)

Based on that study, the need of educating the teacher in small group sessions appears to be vital. The educator cannot be expected to instruct the students in a classroom situation until that educator has been educated.

In summary, as indicated by the references above, the literature
gives evidence that there is a need for school programs in dental prevention. The literature also points out that the present manpower and education programs are not sufficient and that new areas must be explored.

RESULTS OF PREVENTIVE DENTAL HEALTH SURVEYS

Motivation and instruction for improved dental health make a great demand on professional dental personnel that cannot be met in any country at present.

"Therefore, the existing mechanical procedures for plaque control do not offer a complete solution to the problem. This is of course unfortunate since today mechanical cleaning of teeth is the only known method that can be widely applied for the prevention of this disease." (20:1035)

The mechanical means referred to are toothpicks and dental floss. There are also antibacterial agents. These were employed in

"...short-term studies (which) demonstrated that, in the absence of any form of mechanical hygiene, two daily mouth rinsings with 0.2% chlorhexidine gluconate completely inhibited the development of plaque and gingivitis. Formation of supragingival calculus was prevented, and smooth surface caries did not develop. Heavy accumulation of plaque disappeared, and overt clinical gingivitis resolved." (20:1036)

A study by Duomi and associates showed that the plaque could be highlighted by using staining tablets. (22) Such highlighting assists in recognizing plaque in studies relating to various methods or frequencies of removal, as in the following:

"Recent evidence indicates that plaque, once completely removed, requires approximately twenty-four hours to form to maturity,...This finding suggests that a thorough cleaning of all dental surfaces may not be necessary more frequently than once every twenty-four hours. A person, therefore, may not need to brush after every meal, as so often has been suggested. It is essential, on the other hand, that plaque be removed thoroughly and completely if practiced but once a day. Additional research is needed to establish whether motivating an individual to clean his teeth once daily is easier than when asking him to brush two or three times daily, with less concern for the thoroughness of the procedure.
"At present, toothbrushing is the method commonly recommended for removing plaque....Long term studies are needed to provide information on the successes in removal of plaque by different methods of toothbrushing.

"Twenty minutes has been suggested recently as the minimum per day that is required for a patient to perform the cleaning of his teeth. Ariaudo suggests further that dental and gingival brushing can be performed without a dentrifice while one watches television or reads. Probably some time would be required to adjust people to the acceptance of such a practice in their homes. The suggestion may have merit, however, and if the techniques and materials can be modified to make it possible to clean their teeth with little or no more effort and conspicuousness than in using a toothpick, the idea might flourish." (37:4)

Another study dealt with a particular program for children 9 to 13 years of age in a fluoride-deficient community in Western New York. (40) The children were checked on frequency of brushing. Too, an assessment was made of their oral hygiene and gingival condition as well as of caries activity. The findings of the studies (40) showed no significant difference in the frequency of brushing related to age and sex of the children. However, the oral hygiene tested, as related to the frequency of brushing, did show a significant difference between boys and girls. The gingival condition did not show a significant difference between the sexes. However, the caries activity was definitely related to the frequency of brushing.

Between 1968 and 1971, a study was done in the Boston, Massachusetts area on elementary-age school children in grades one, four, and six, as well as on ninth grade students. The study did not include the techniques utilized but was able to prove to the community the need for additional dental services. (45)

A plaque control program was also initiated at the Hadassah School of Dental Medicine in Jerusalem, Israel. This program was done on freshmen students at that university and significant results were
obtained. The program utilized the Bass technique of brushing and flossing, and it tested results by using staining tablets. As a result of this program, the University staff decided to implement it in their dental clinic. (44)

Since flossing of teeth appears to be an important preventive measure, it is important to know whether or not children can be successfully taught how to floss their teeth. A study done by Terhune showed that "...the tabulated data revealed that all of the 8-, 9-, 10-, 11-year-old children were able to learn how to effectively clean their teeth with dental floss within ten, seven, six, and five days respectively." (51:1336) This study helped to support the selection of the target group (ages 7-9) used for the project in this paper.

The foregoing literature review, together with the initial survey conducted in the study area, substantiated the premise that further educational tools were needed. It was also obvious that these tools should reach the largest possible number of people at the least possible cost to both the sponsoring organizations and the recipients of the program.
CHAPTER 3
METHODS

FORMULATION OF THE PROGRAM

The work of developing the program was initiated by meetings that involved the local dental society, the School Superintendent, and the District Nurse, along with members of a Health Curriculum Committee from a selected school district.

The purpose of the program was: (1) to improve the dental condition of the students; (2) to set up an evaluation process of overt behavior; and (3) to help establish evaluation techniques for other aspects of dental health education. These objectives were presented by this researcher to the local school board and were approved for implementation within the district.

The approach decided upon to help eliminate plaque production was to utilize two different methods of teaching dental health, one being the current traditional approach and the other being an experimental program to be developed. Selected classes in one school would be exposed to one teaching method and similar classes in another school would be exposed to a different method. The former would be regarded as a control group to serve as a basis for comparison for results of the experimental method.

Two schools were selected for the project on the basis of geographical proximity, relatively comparable economic background of the students' families, and comparable population size. The experimental school had the lowest level of dental health in the district. This was determined by an initial screening that had been conducted earlier in the year, indicating that 98 percent of the third grade students...
had poor dental health. This screening also showed that the control school selected had better results, with only 85 percent of the students in need of further dental care. With the exception of the difference in dental condition, these schools were quite similar and suitable as a target population.

Since both schools were set up on a combination second-third, straight third, and combination third-fourth grade levels, it was decided to apply the program to boys and girls ranging in age from seven through nine years.

The program eventually developed was based on a study conducted at the University of Texas Dental Branch. (15) This program began in 1969 and was evaluated for a two-year period. The concept of this program dealt with the origin of dental disease in childhood and the major dental diseases (which include tooth decay and gum disease). The program utilized various research findings and past experiences of dentists within the U.S. Public Health Service in the development of a preventive dental health program.

The Texas study led to the careful structuring of a specialized program of daily brushing and flossing of teeth in the classroom, films, overlay presentations, and demonstration and reinforcement by the teacher and school nurse. As finally developed, the experimental program utilized in the study consisted of the following steps:

1. Prescreenings and postscreenings by dental teams;
2. Workshops for teachers given by a dentist and school nurse;
3. Actual classroom demonstration by the teacher;
4. Daily oral hygiene for the students with reinforcement
by educational materials;

5. Discussions by the school nurse.

This entire program was scheduled to cover an eight-week period. It was designated for use at the experimental school, hereafter referred to as the E group. The normal third grade teaching retained in both schools served as the control method in the control school, hereafter referred to as the C group.

The normal curriculum used the state textbook for health and included content about the anatomy of the teeth, proper brushing techniques, and special foods that might aid in keeping the teeth clean. With the advent of the school nurse in the district, a new resource was added to the curriculum. In addition to teacher presentations, the school nurse demonstrated proper brushing techniques and encouraged proper nutrition. Various materials, such as pictures for anatomy identification, were also used in this control curriculum.

Before the pretest, a letter was sent home to the parents of each of the third grade children in both C and E schools, asking their permission to have the child involved in a pretest and posttest by a dentist who would employ red staining tablets to aid in observation. (See letter, Appendix B.) The teachers in the program from the E group were then asked to participate in a special in-service education workshop.

EDUCATION OF TEACHERS AND PARENTS

The in-service education for teachers regarding brushing and flossing was done in the same manner as that used by a training dentist in his private practice. This procedure has been recommended by dentists specializing in periodontics. All of the teachers were
trained to actively participate in the program along with their students in order to emphasize the importance of proper technique. This meant that the teachers were to brush and floss their teeth in the classroom at the same time as the students.

Two workshops were arranged for two hours each where all materials to be used in the program were presented. Lectures were given by a dentist and a question-and-answer period followed each demonstration. Also, the teachers were required to demonstrate to the dentist and the school nurse the proper brushing and flossing technique so that they in turn would be able to teach this procedure in the proper manner. The teachers were also requested to use the staining tablets after they had finished brushing and flossing their teeth so that they would see the areas that they had missed and thereby know how to correct these errors.

In order to better facilitate the program, parents from the local Parent-Teacher Association were also asked to assist. These women helped in the screening process and, on occasion, in the classroom.

PRETEST SCREENING

A pretest screening examination was established to determine the areas on the teeth and gums that had plaque deposits. This examination gave a baseline from which to work.

On the day of the examination, two teams consisting of a dentist and a dental hygienist came to each of the schools. The children who had parental permission were given a disclosing tablet and asked to chew it with a little water, and to swish this red food coloring around in their mouths. Then each child was examined by a
dentist and the results of his findings were recorded by a dental
hygienist. Forty-eight teeth surfaces and twenty-four gum surfaces
were examined on each of the 225 students. (See Appendix A.)

The measurements were recorded as follows: the amount of
plaque on the tooth surfaces was listed as 1 for a slight amount of
plaque, 2 for moderate amount of plaque, 3 for heavy quantity of
plaque. The gingival health was recorded as A for good, B for fair,
C for poor, as related to each tooth. (23) The results were then
tabulated for each child.

EDUCATIONAL APPROACH

The educational program for the E school employed the follow-
ing teaching sequence:

1. Anatomy and names of teeth from the state textbook.
2. Proper nutrition for a healthy mouth.
3. Film on "Mr. Plaque."
4. Demonstration on model teeth regarding brushing and
   flossing.
5. Teacher demonstration on self.
6. Student practice sessions.
7. Use of staining tablets.
8. Overlays showing plaque formulation.
9. School nurse support and participation.

The curriculum used at the C school consisted of the following
sequence:

1. Anatomy and names of teeth from the state textbook.
2. Proper nutrition for a healthy mouth.
3. School nurse support and participation.

The supplementary equipment used in the E group was furnished by the dental society. This consisted of a tray that held a toothbrush for each child with a place for his name, a metal hand mirror for every two children, large containers of dental floss, and staining tablets. Also included was an enlarged model of a section of teeth for demonstration purposes. The staining tablets were used to color the plaque and mucoid areas within the mouth, thereby clearly demonstrating the concentration of plaque. The society also furnished the film, overlays, and posters regarding plaque and its effect on teeth.

After the preparatory materials were shown, each child was given his own toothbrush. The teachers then demonstrated the proper procedure for brushing on the model and on herself. The children were then asked to chew a red staining tablet and rinse their mouths. After that, they each brushed their teeth in the manner they had just been taught. The teacher then distributed the mirrors and had the children check their teeth to see if all the red was removed. It was quite obvious to each child which area he did not brush properly, as well as where the toothbrush did not reach. The children were then given a piece of dental floss, and after a demonstration by the educator, were asked to floss their teeth. One child held the mirror while the other child flossed, thereby removing the remaining stain and simultaneously the plaque. The children then reversed roles and repeated the procedure.

The teacher demonstration and children participation took approximately one hour the first few days. This length of time was needed until the children become accustomed to the new technique and
handling of equipment. Later this time period was reduced to fifteen to thirty minutes. The staining tablets were used the first two days and once a week thereafter for reinforcement. In the subsequent use of the tablets, they were used after the procedure was done to show the child how he was doing and what he was actually accomplishing.

Such feedback is very important

"To enable the patient to get positive feedback on what he has done correctly, he must be seen frequently to reinforce home care (daily, weekly, monthly--what you deem best). Have the patient review his home care and then offer ways to make the home care better or easier instead of emphasizing what he has done wrong, e.g. "Your brushing is especially good in front. Let me show you an easier way to do a good job in back."

Not "You missed the back teeth." Always point out improvements and successes. Ask if the patient is having any difficulty following your instructions." (10;64)

The constant reinforcement is a necessity in order to encourage the students to continue to use the proper means most effectively and efficiently to achieve the best results possible. No set day was planned for this reinforcement, as it was desired to have a random time period so that the child would consistently brush and floss his teeth in the same manner daily. The overlays and the film were also used more than once for reinforcement only. The District Nurse randomly participated in the program to encourage and observe techniques used by both teacher and child.

A definite time of the day was scheduled for the program to aid in reinforcing consistency of habits. This period of time was blocked in after the lunch period with the objective in mind that should overt behavioral change take place, there would be an association with a meal time.

The E group program covered an eight-week period. Concurrently the C group was involved in a different program for four weeks. This
employed a blocked time period three days a week. This was the same
time period used by other third grade classes throughout the district.

POSTTEST STANDARDS

At the end of the eight-week period, three of the four original
dentists went back to the E and C schools to do a posttest screening
examination. The standards for the dentists were reviewed for rein-
forcement and the same procedure was followed for the postscreening
as for the prescreening.

The two dentists at the C school were the same for the posttest
as the pretest. One of the dentists at the E school was the same at
both the pre-examinations and the postexaminations.

SCORING

An Index of Improvement was established by this researcher in
the following manner. First, the data from each child’s mouth, as
supplied to this researcher from the dental society, were tabulated
as shown in Table 1.

Table 1

Sample Raw Data Score Sheet Based on Screening
Results for Child #84 at the E School

<table>
<thead>
<tr>
<th>Pretest</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Child</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>#84</td>
<td>14</td>
<td>2</td>
<td>18</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Second, the results in each column on the pretest were subtracted from
the corresponding column of the postexamination. This left a dif-
ference with either a positive or negative number for each column, as
shown in Table 2.
Third, from these numbers this researcher established an arbitrary guideline, called the Index of Improvement, that was used as the standard to further evaluate the results of this study. This guideline follows:

**POSITIVE RESULTS**

1. Teeth surfaces (gum surfaces) showing negative number in columns two, three (B, C) and a plus in column one (A) of same total or higher in test show improvement.

2. Teeth surfaces (gum surfaces) showing negative in column three (C) with number moving towards one and two (A, B) show improvement.

3. Teeth surfaces showing negative in column three (C), negative/positive in column two (B), positive in column one (A) show improvement.

**NO CHANGE**

1. Teeth surfaces (gum surfaces) showing negative number in column one, three (A, C) and positive number in column two (B) indicate no change.

**NEGATIVE RESULTS**

1. Teeth surfaces (gum surfaces) showing negative/positive in columns one, two (A, B) and positive in three (C) indicate worsening.

2. Teeth surfaces (gum surfaces) showing negative in column one (A),

### Table 2

Sample Researcher Index Score Sheet
For Child #84 at the E School

<table>
<thead>
<tr>
<th>Child</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>#84</td>
<td>34</td>
<td>-18</td>
<td>-16</td>
<td>10</td>
<td>-10</td>
<td>0</td>
</tr>
</tbody>
</table>
and positive in column two, three (B,C) show worsening.

In order to evaluate the data and see whether or not there was any significant improvement in individual results, several hypotheses were set up (see Introduction) and tested by using Chi Square statistics.

COMMUNITY INVOLVEMENT

While the educators and children were busy in the classroom working on their program at each school, activities throughout the community were also being planned and organized. The community activities included involvement with the District Nurse and the local PTA. The efforts of these two groups made the community aware of the special pilot program that was going on in their school. Volunteers from the PTA groups participated in assisting the teachers and the dentists during the prescreenings and the postscreenings, as well as assisting the teacher in the classroom in passing out equipment. The District Nurse also met with the PTA Board to inform them of the program and later spoke at a PTA meeting to elaborate on the program and why certain grade levels were selected for the particular program.

Pamphlets were sent home to the parents of the E school to inform them of the program. A letter explaining the objectives and finally a letter describing the results were also sent home. Encouragement was given to both pupils and parents to try the program at home and to involve other members of the family. Local publicity was arranged that results in articles being placed in the newspaper and the local PTA Bulletin. The community support and enthusiasm aided in making the program a success.
EVALUATION BY THE TEACHERS

At the conclusion of the program, a meeting was held with the District Nurse and the teachers involved in the E school program. At that time, a discussion was held on the problems that were encountered as well as the positive aspects of the program. Views for and against the program were discussed.

The educators were very impressed with the lesson plan that was given to them as well as the instruction booklet on procedures. They felt that there were better results from the children when the teacher was brushing with them and was the leader of the group than when they attempted to assign a student monitor to do the demonstration. It was also felt that the entrance of the school nurse into the program, demonstrating flossing technique on an individual basis to two or three children at a time, assisted in the teaching of flossing technique. In this manner the individual child's errors in flossing were picked up and improved upon.

The group also felt that the self-image of most of the children was greatly improved. The children were proud to be in the program, and felt very honored that they were selected to be a part of it. Their pride in themselves was evident on the days when the staining tablets were used. The boys and girls seemed to make certain that they had enough stain on their clothing so that the other boys and girls in the school would be aware that they were in a special program.

The visual aids were considered excellent and were used as a very positive reinforcement. Most of the teachers used the film at the beginning of the program and once again in the middle of it. The overlays were used approximately three times during the program. The
teachers stated that the artificial teeth helped in demonstrating the proper ways for brushing and flossing of teeth.

Some of the problems involved in the program were that a sink was definitely needed in order to help rinse the toothbrushes and to dispose of oral waste. Although the program ran approximately fifteen to thirty minutes per day, the teachers judged the time was necessary even though it cut into some of their other programs. This researcher found that the attitude of the teachers toward the program seemed to be in direct relation to their opinions as to whether or not cutting into the other teaching programs was a problem. However, the general recommendation by the teachers was that the program should be on a year around basis.

The teachers found that they were getting bored with the constant repetition but that the children in the primary grades were not bored. They reported that the children in the fourth grade did not seem to get the benefits from the program that the younger children received. They seemed to feel it was beneath them.

Another problem encountered was that not enough equipment was supplied, and it was felt that additional mirrors, extra staining tablets and flossing materials were necessary.
CHAPTER 4
RESULTS
DATA DERIVED

The reason a pretest and posttest screening was necessary was to permit a comparison of dental health and to see whether any change in dental health was attributable to teaching techniques. A further comparison was necessary in order to ascertain whether or not different teaching techniques showed different amounts of improvement in the dental health of the children.

Cursory examination of the results of the pretest and posttests seemed to show that there was no significant change within the control school, and a significant change in the experimental school. A comparison of the data follows, on next page.

A pronounced improvement in the experimental school in the tooth surfaces examined is discernible from the data in Table 3. A reduction from a heavy amount of plaque to a slight amount of plaque was evident. The range of results in gingival health was from a complete improvement in poor gingival health to good results in that area. In the control school the results showed no great changes between the pre-examinations and postexaminations as far as plaque was concerned, with some minor improvement in the gingival health of the children.

Each child, on an individual basis, was then graded according to the Index of Improvement. The forty-eight teeth surfaces were compared on the pre-examinations and postexaminations to see which way the results went. The twelve gum surfaces tested were also established on the pretests and posttests according to the Index of Improvement. The results are set up on work charts which were later computed and
Table 3

Comparison of Dental Health Between Preexaminations and Postexaminations

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>INITIAL EXAM</th>
<th>8 WEEK EXAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Plaque</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (slight)</td>
<td>1,297 surfaces</td>
<td>1,305 surfaces</td>
</tr>
<tr>
<td>2 (moderate)</td>
<td>1,810 surfaces</td>
<td>1,932 surfaces</td>
</tr>
<tr>
<td>3 (heavy)</td>
<td>1,283 surfaces</td>
<td>1,203 surfaces</td>
</tr>
<tr>
<td>Total</td>
<td>4,390</td>
<td>4,440</td>
</tr>
<tr>
<td>Gingival Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A (good)</td>
<td>232 areas</td>
<td>370 areas</td>
</tr>
<tr>
<td>B (fair)</td>
<td>570 areas</td>
<td>541 areas</td>
</tr>
<tr>
<td>C (poor)</td>
<td>313 areas</td>
<td>232 areas</td>
</tr>
<tr>
<td>Total</td>
<td>1,115</td>
<td>1,143</td>
</tr>
</tbody>
</table>

EXPERIMENTAL SCHOOL

| Amount of Plaque |                |             |
| 1 (slight) | 2,227 surfaces | 4,207 surfaces |
| 2 (moderate) | 2,342 surfaces | 836 surfaces |
| 3 (heavy) | 569 surfaces | 180 surfaces |
| Total | 5,138 | 5,223 |
| Gingival Health |                |             |
| A (good) | 354 areas | 975 areas |
| B (fair) | 912 areas | 413 areas |
| C (poor) | 24 areas | 0 areas |
| Total | 1,230 | 1,388 |
these calculations follow:

Table 4

<table>
<thead>
<tr>
<th>Teeth Surfaces</th>
<th>No. of Persons</th>
<th>Teeth Surfaces</th>
<th>No. of Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1 Positive</td>
<td>102</td>
<td>Positive</td>
<td>40</td>
</tr>
<tr>
<td>*2 No change</td>
<td>9</td>
<td>No change</td>
<td>11</td>
</tr>
<tr>
<td>*3 Negative</td>
<td>17</td>
<td>Negative</td>
<td>44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gingival Surfaces</th>
<th>No. of Persons</th>
<th>Gingival Surfaces</th>
<th>No. of persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>82</td>
<td>Positive</td>
<td>43</td>
</tr>
<tr>
<td>No change</td>
<td>26</td>
<td>No change</td>
<td>14</td>
</tr>
<tr>
<td>Negative</td>
<td>20</td>
<td>Negative</td>
<td>38</td>
</tr>
</tbody>
</table>

*1 Positive: Improvement in index occurred.
*2 No change: Index showed no change.
*3 Negative: Worsening in index occurred.

HYPOTHESIS TESTED

After gathering the raw data, it became evident to this researcher that the information was too unwieldy to handle and that a simpler method was needed in order to assess dental health status of each individual. On that basis, the Index of Improvement was developed. Chi Square statistics were computed by using the Index of Improvement relative to the various hypotheses. The results of this statistical analysis are as follows. The results relative to each of the hypotheses are described. Interpretation of results is given in the next chapter.

Hypothesis 1. The distribution of individuals in the Index of Improvement for plaque control is the same for both the control and experimental groups.
Table 5
Comparison of the Index of Improvement for Plaque Quantity in Individuals in the Experimental and Control Group

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E Group</td>
<td>102</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>C Group</td>
<td>40</td>
<td>11</td>
<td>44</td>
</tr>
</tbody>
</table>

Chi Square: 35.107 Table Value: 5.99

On the basis of the results, Hypothesis 1 is rejected.

Hypothesis 2. The distribution of individuals in the Index of Improvement for gingival health is the same for both the control and experimental groups.

Table 6
Comparison of the Index of Improvement for Gingival Health in Individuals in the Experimental and Control Group

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>E Group</td>
<td>82</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>C Group</td>
<td>43</td>
<td>14</td>
<td>38</td>
</tr>
</tbody>
</table>

Chi Square: 16.84 Table Value: 5.99

On the basis of the results, Hypothesis 2 is rejected.

Hypothesis 3. There is no difference between the results of the distribution of individuals in the Index of Improvement for the experimental group for plaque control and the distribution of individuals in the Index of Improvement for gingival health.
Table 7
Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Experimental Group

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque</td>
<td>102</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Gingival</td>
<td>82</td>
<td>26</td>
<td>20</td>
</tr>
</tbody>
</table>

Chi Square: 10.674  Table Value: 5.99
On the basis of the results Hypothesis 3 is rejected.

Hypothesis 4. There is no difference between the results of the distribution of individuals in the Index of Improvement for the control group for plaque control and the distribution of individuals in the Index of Improvement for gingival health.

Table 8
Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Control Group

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque</td>
<td>40</td>
<td>11</td>
<td>44</td>
</tr>
<tr>
<td>Gingival</td>
<td>43</td>
<td>14</td>
<td>38</td>
</tr>
</tbody>
</table>

Chi Square: 0.907  Table Value: 5.99
No reason to reject the hypothesis
CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The computed results of the Chi Square analysis were compared with the table values at the 95 percentile. The interpretation of these results and their significance follows.

Table 5 refers to Hypothesis 1 and considers that there is an equality between the control and experimental groups in regard to plaque control based on individual results on the Index of Improvement. The Chi Square results are larger than the table value and therefore this hypothesis must be rejected. Therefore, there is a significant difference between the control and experimental group in regard to plaque control based on the Index of Improvement.

The original group (raw) data as shown in Table 3 also show a difference of improvement between these two groups on pre-examinations and postexaminations in regard to the amount of plaque on the various surfaces of the teeth.

It is therefore the conclusion of this researcher that the programs utilized in the two schools were different and as a result caused a difference in the plaque quantity found on the teeth of the children from the two groups. This conclusion is supported by work of other researchers. In a review of the literature, it was found that others had observed a significant reduction in the quantity of plaque when consistent oral hygiene was followed. (40, 42, 45)

Hypothesis 2 states that the Index of Improvement occurred equally for both groups in regard to their gingival health. Table 6 refutes this statement and therefore this hypothesis is also rejected.
There is a significant difference in the gingival health of these two groups.

Again, in referring to Table 3, it is seen that in the raw data, as well as in the Index of Improvement, there is a significant difference between the E and C group in regard to gingival health. Although the Chi Square analysis does not state where the inequality lies, it is this researcher's opinion, based on the comparison of dental health between the pre-examinations and postexaminations (Table 3), that the educational approach utilized by the experimental group is superior to the approach of the control group.

Table 7 compares the teeth surfaces with the gingival surfaces in the experimental group. As a result of the Chi Square analysis of this table which is based on Hypothesis 3, the hypothesis is rejected. There is no difference in the amount of improvement of, and no dependence upon the improvement of, the plaque quantity as compared to the gingival health of the individuals in the E group.

By converting Table 7 into percentages, as shown in Table 9, it can be seen that there is no relationship between the plaque quantity and the gingival health in the individuals in the experimental group.

Table 9

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque</td>
<td>80%</td>
<td>7%</td>
<td>13%</td>
</tr>
<tr>
<td>Gingival</td>
<td>64%</td>
<td>20%</td>
<td>16%</td>
</tr>
</tbody>
</table>
The researcher concludes that the educational approach utilized by this group applied different emphasis on the different areas of the mouth of the children.

Finally, Hypothesis 4 is reflected in Table 8. This hypothesis deals with a comparison of the Index of Improvement in regard to plaque control and gingival health for the control group. In this case, the statistical analysis proves that the hypothesis should be accepted, as there is no significant difference between the Indexes of Improvement for plaque quantity and gingival health.

This is further illustrated in Table 10 where the indexes are converted to the percentages of individuals in the different categories.

Table 10
Comparison of the Index of Improvement for Plaque Control and Gingival Health in Individuals in the Control Group Based on Percentages

<table>
<thead>
<tr>
<th></th>
<th>POSITIVE</th>
<th>NO CHANGE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaque</td>
<td>42%</td>
<td>12%</td>
<td>46%</td>
</tr>
<tr>
<td>Gingival</td>
<td>45%</td>
<td>15%</td>
<td>40%</td>
</tr>
</tbody>
</table>

The contrast between the results of Hypothesis 4 and Hypothesis 3 indicates to this researcher that the type of education given to the children in the control group results in an equal effect throughout the entire mouth. Education in the experimental group differed in emphasis thus causing independent results for the areas tested in the children's mouths.

Another point of emphasis that Hypotheses 3 and 4 show is a much higher improvement in positive results for the E group. It
appears that the educational approach utilized by the E group has
greater advantages than that utilized by the C group. This is shown
by Table 10, in which an equal percentage of individuals are stated
to have positive and negative results. This equality indicates to
this researcher that the routine educational approach utilized until
this time within this school district was ineffective in bringing about
positive results by means of dental health education.

On the other hand, the children involved in the E group showed
a definite improvement (see Table 9) in both plaque quantity and gingi-
gival health at a higher percentage level than the C group. Although
the percentages were not as high for gingival health as it was for
plaque quantity, the total percentage in the positive column was
definitely higher. The contrast between the two groups is further high-
lighted when reference is made to the original study that led to this
program.

In that original study, described in Chapter 1 of this paper,
the E group had 98% of its population in need of further dental follow-
up, while the C group had 85% of its population needing followup. With
an improved educational system for dental health adopted by this school
district, future surveys should show a reduction in the percent of
children needing corrective dental care for caries and cleaning of
teeth. This conclusion is substantiated by other studies done amongst
school-age children in various cities around the world. (45, 49)

The reduction of need should in turn greatly reduce the burden
that dentists now experience as they attempt to cope with both cor-
rective and preventive requirements.

"A hypothetical school dentist finds in his children's target
group for each year two thousand new carious cavities. He spends all the working time in filling up these cavities. If he decides to spend 50% of his working time for prevention he should be able to prevent 50% of the expected cavities. If he prevents only 25% of them, the remaining 25% (500 cavities) will be left untreated, because the dentist has no more time left for either prevention or treatment."

Without improved educational techniques of the sort described in this paper, it can be expected that little change in the severity of the problem will occur.

"Within currently available resources of finance and manpower, and with existing programmes of dental education, there seems little prospect that there will be significant improvements in the prevention and treatment of the major dental diseases which will permit the regular care of a large number of individuals. It seems probable that radical changes will have to be made in dental education, manpower availability and the methods of delivering dental care to the population if this dual standard of care is to be eradicated."

It is the belief of this researcher that the program developed and described in this project can be effectively utilized to improve the current status of dental health.

LIMITATIONS OF STUDY

A follow-up of the experimental group used in this particular study would have been ideal had sufficient funding been available. Regrettably, in regard to the children, the school district, and this researcher, financial support for the district was cut back and further evaluation processes on the study could not be completed. The methods employed at the conclusion of the study should have included: (1) screening examinations similar to the ones held before and after the program should have been conducted to see whether the boys and girls had continued with what they had learned; (2) evaluation techniques and tools to determine the use of brushing and flossing techniques in the home should have been conducted; and (3) studies to see whether
or not constant reinforcement is necessary for the behavior to continue should have been developed and implemented.

The original objectives set up for this program included the improvement of the dental condition of the children, and hopefully, other members of the family. Only the children were evaluated as to whether improvement of the dental health conditions took place. There were no techniques developed to study the family members.

The objective for evaluation processes for overt behavior, unfortunately, was not followed through, and this is an area of investigation that another researcher should explore in future tests of this sort. Home studies could also have been developed to follow up whether or not overt behavior changes took place.

The development of evaluation techniques for dental health and other aspects of health education, another objective, was not accomplished. Further experimentation by means of a double-blind study should have been done. A double-blind study could have been utilized that would have prevented the dentists involved in the pretests and post-tests from knowing which were the experimental and control schools.

Consistent observations of the teachers' individual instructional methods and evaluation tools should have been developed. Techniques for evaluation of the teachers' relative effectiveness in the program should have been devised.

RECOMMENDATIONS

At the conclusion of this study, the educational program and its results were presented to the school superintendent, school principals, PTA, and the school board. After careful consideration of techniques used and the results of the raw data, it was decided to
continue with the program on a regular basis. A further decision of
the School Board and the educators was to expand the program through-
out the entire school district. Further meetings were held with the
Dental Society to solicit additional suggestions and training in re-
gard to continuation of this program.

The expansion that evolved from these joint meetings, of edu-
cators and dentists, was a program that would be continued throughout
the school year and would include boys and girls up to and including
the fifth grade. Some of these fifth grade children were in the exper-
imental program when it was first established. Workshops for the
teachers throughout the district were to be developed. Additional
techniques to be developed involved a more active participation at the
community level.

Recommendations made by the teachers for future use of this
program were:

1. It should run for the full school year, with the program be-
ing used two to three times a week.

2. The program should be retained for the grade levels used
   in the study, even though the teachers who had experience
   with the program felt that it would not be beneficial from
   the fourth grade up.

3. It was agreed that even though the younger children were
   not as adept in their dexterity, that they will benefit
   the most and will follow through with the program.

This particular type of a program can easily be implemented in
a school district with the understanding and cooperation of the school
board, parents, teachers, and students. The techniques involved are
simple and easy to use. The enthusiasm of the educator is the most important aspect of the program, for it is upon this person that the success in the classroom depends.

Various dentists have found that in their private practice they are able, on a one-to-one basis, to educate their patients in proper brushing techniques. The weakness they have found in their program is that they see a limited number of patients. Too, only a few patients are seen once a week. Therefore, the dentists involved in the experimental study recommended continuation of this program in the schools, so that the children would have their dental health behavior constantly reinforced.

This program can be utilized simply, easily, inexpensively by any school district. It is this researcher's recommendation that this program be supported and supplemented by the local dental societies.

One of the most neglected aspects of health in the United States is dental health care. The children of today are the adults of tomorrow. The choice is up to the children as to whether or not they will have good dental health and a minimum of dental problems. This choice is dependent upon the guidance they received in their early years of development in regard to good dental hygiene.
BIBLIOGRAPHY


<table>
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<table>
<thead>
<tr>
<th>GRADE</th>
<th>TEACHER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ratings:

**Plaque** - Place number in tooth surface box
0 - No Plaque  1 - Slight  2 - Moderate  3 - Heavy

**Gingival Health** - Place letter in box adjacent to tooth
A - Good  B - Fair  C - Poor

**Other** - Place large X through tooth surface box if tooth is missing
Leave tooth surface box blank if the tooth is deciduous.
Dear Parent,

Our school is embarking on a Dental Screening Program.

On March 22nd, two dental teams will come to the school to see how much plaque, the cause of cavities, is on the teeth of your child. The child will be asked to chew a tablet made of red food coloring to aid in the screening. A post screening will be done on May 24th. Please return the tear-off giving us permission to have your child screened for this very important program.

We are trying to evaluate the dental hygiene habits of children in order to plan a more effective health program.

Thank you for your cooperation.

Sincerely,

Superintendent of Schools

Principal,

District School Nurse

----------------------------------------
I give my permission for ____________________________ to partake in the

Child's Name

Dental Screening held at school.

Parent's or Guardian's Signature
**WORK SHEET**

**Plaque Quantity**

<table>
<thead>
<tr>
<th></th>
<th>E Group</th>
<th>C Group</th>
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<tbody>
<tr>
<td>+</td>
<td>( f_1 )</td>
<td>( f_4 )</td>
</tr>
<tr>
<td>0</td>
<td>( f_2 )</td>
<td>( f_5 )</td>
</tr>
<tr>
<td>-</td>
<td>( f_3 )</td>
<td>( f_6 )</td>
</tr>
</tbody>
</table>

**Gingival Health**

<table>
<thead>
<tr>
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<th>C Group</th>
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