

A SOCIOECONOMIC CORRELATION OF ORAL DISEASE  
IN SIX TO THIRTY-SIX MONTH OLD CHILDREN

by

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of the requirements for the degree of Master of Science in Dentistry,  
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## INTRODUCTION

Of the many reports in the literature which indicate a high prevalence and incidence of gingivitis and dental caries in children, few have dealt with the age group between six months and thirty-six months, in a fluoridated area. Only one study has been reported relative to gingivitis<sup>1</sup> and another to the prevalence of caries.<sup>2</sup> Therefore, there is an obvious lack of data<sup>3</sup> for these children relative to:

1. The frequency distribution, by age, sex, race and socioeconomic status of dental caries and gingivitis prevalence.
2. A comparison of the prevalence of dental caries and gingivitis in children who were breast-fed and those who were not.

Therefore, the purpose of this investigation was to determine the prevalence of dental caries and the gingival health status in six to thirty-six month old children who have been born and reared in a community with an optimum fluoridated water supply. It was then determined whether a relationship existed between these data and the socioeconomic level of the family.

REVIEW OF THE LITERATURE

## Gingivitis

Gingivitis is a biphasic phenomenon that is progressive, chronic and marginal in the adult. It is acute, transient, and papillary in the child.<sup>4</sup> Clinic studies by Zappler,<sup>5</sup> Bruckner,<sup>6</sup> Massler,<sup>7</sup> James,<sup>8</sup> and Carter<sup>9</sup> confirm that the most frequently observed periodontal disease entity in children is gingivitis.

Massler, Schour and Chopra<sup>10</sup> reported that 64.5 percent of five to eight-year-old children examined had one or more affected papillae and almost all of 17,079 children six to sixteen years old had some degree of gingival involvement.<sup>11</sup> Cohen and Green<sup>12</sup> found gingivitis in 130 of 145 four to five-year-olds whom they examined. Parfitt,<sup>13</sup> in a study of gingivitis in children aged two to seventeen years in England, stated that the prevalence of gingivitis increased from age three and peaks at eleven years.

The prevalence of periodontal disease in the deciduous dentition was studied by Jameson<sup>14</sup> in 229 children ranging from five to fourteen years of age. He stated that almost three-fourths of the children with deciduous teeth have gingivitis which is distributed independently of the sex and educational status of the mother.

Moore<sup>15</sup> reported that in 1,123 children, ages seven to thirteen years, gingivitis was present in 93 percent of the total and concluded that fluoridated water was non-contributory to the prevalence of this disease.

Tank and Storvick<sup>1</sup> found the prevalence and incidence of gingivitis, in children aged one through six, to be less in the 1 ppm fluoridated community of Corvallis, Oregon, than in the non-fluoridated community of Albany. The PMA index was applied and the non-fluoridated community had a significantly higher incidence of gingivitis, except at the age of one. There was also a positive relationship between the prevalence of gingivitis and dental caries.

In 1970 Mieler and Reinmann<sup>16</sup> found a 73 percent prevalence of "periodontal disease" in children 3 to 18 years of age, with the acute forms in the younger groups. According to Dilley,<sup>17</sup> unpublished data from the Dental Health Task Force Project, 1970-1972, show that nearly all of the 11,228 children in the survey, ages 6 to 18 years and residing in Indiana, had some degree of gingivitis. Houwink and DeJager<sup>18</sup> stated in 1971 that fluoridated water in Holland may have actually improved the condition of the gingival tissue.

In summary, there is little mention of gingival status in 6 to 36 month old children, born and reared in a fluoridated water supply. However, in the deciduous dentition there are reports of 64.5 percent to 89.6 percent of children with gingivitis present.

#### Caries prevalence

Little information is available concerning the prevalence of dental caries in a fluoridated community in children less than three years of age. Finn<sup>19</sup> reported the findings of the classic Newburgh-Kingston studies, prior to the fluoridation of the Newburgh water supply. Results of the examination of 6,762 two-to-fourteen year olds were reported. Only 59 two-year-old children were used in each group to report .19 deft for

children in Newburgh and .46 deft for the children in Kingston. In the three-year-olds, the 70 Newburgh children had 1.54 deft and the 59 Kingston children had .56 deft. Eight and one-half percent of the Newburgh two-year-olds had caries, and 38.6 percent of the three-year-olds. Caries prevalence for the Kingston children represented 13.6 percent of the two-year-olds and 19.3 percent of the three-year-olds.

Fulton<sup>20</sup> reviewed examination findings from 3,000 children one to seventy-one months old. The 313 six-month-old children showed 0 deft; the 258 in the twenty-four-month group had .2 deft; and the 277 thirty-six-month-old children had 1.1 deft.

Hewat and others,<sup>21</sup> using three surveys, showed that two-year-old children had a caries prevalence of 30 to 51.5 percent and the three-year-olds from 67.6 to 88.7 percent.

Savara and Suher<sup>22</sup> investigated the incidence of dental caries in children one to six years of age. Of the 18 one-year-olds, 22.5 percent had dental caries experience, with an average of .67 deft. Of the 65 two-year-olds, 23.1 percent were afflicted with dental caries, averaging .83 deft. A significant jump to 61.8 percent was seen for three-year-olds with dental caries, averaging 2.72 deft.

Wisan, Lafell, and Colwell<sup>23</sup> surveyed 2,677 Philadelphia children between two and five years of age. They found 18.4 percent of 200 two-year-olds with caries and .6 deft. By three years of age 52.9 percent of the children had dental caries, with an average deft of 2.20. They<sup>23</sup> noted that caries incidence was less in higher socioeconomic groups than in lower socioeconomic groups. Their results supported earlier work by Cohen in 1936.<sup>24</sup>

Toth and Szabo<sup>25</sup> investigated dental conditions of one to six-year-olds in Szeged, Hungary. They found caries in 5 percent of the 206 one-year-olds, 25 percent of the 200 two-year-olds, and 50 percent of the 461 three-year-olds. The deft values were .15, .78, and 1.99, respectively.

Halikis,<sup>26</sup> studying western Australian children two to six years of age, found a higher prevalence of decay than in earlier studies: 63.2 percent of the 19 two-year-olds were affected and 98.2 percent of the 55 three-year-olds.

Protic's results<sup>27</sup> showed 82 one-year-olds with 13.4 percent caries and .16 deft; 71 two-year-olds with 25.4 percent caries and .53 deft; and 100 three-year-olds with 54 percent caries and 2.20 deft.

According to Hara et al.,<sup>28</sup> in a study of children receiving fluoride therapy in Japan, the two-year-old children had 26.7 percent caries prevalence and the three-year-olds had 36.7 percent.

In a prevalence study of dental caries in South African white children, aged one to five years, and living in a low fluoride environment (.02 ppm), Cleaton-Jones et al.<sup>29</sup> found caries in 37.5 percent of the 12 to 23-month-old children, 53.1 percent of the 24 to 35 month-olds, and 78.9 percent of the 36 month-olds and older.

In another study by Cleaton-Jones et al.<sup>30</sup> concerning dental caries in urban and rural black preschool children, they reported caries in 16.7 percent of the one-year-old urban children and 12 percent of the rural one-year-olds, 21 percent of the urban, and 30 percent of the rural three-year-olds.

Tank and Storvick<sup>2</sup> compared two Oregon communities for the effect of fluoridation of the water supply upon caries experience, eruption of



teeth, hypoplasia, malocclusion and gingivitis. For the nonfluoridated community of Albany, children with caries in the age group of one, two and three years made up 11 percent, 46 percent and 89 percent of their respective groups. In Corvallis, with 1 ppm fluoride added to the community water supply, 3 percent of the one-year-olds, 21 percent of the two-year-olds and 45 percent of the three-year-olds had dental caries.

Other studies<sup>31-34</sup> show deft values and percent with caries at three years, but nothing at an earlier age. However, Hennon, Stookey and Muhler<sup>35</sup> studied the prevalence and distribution of dental caries in preschool children. A total of 915 children between 18 and 39 months were examined, and 8.3 percent of the 48 children in the 18 to 23 month-old group had dental caries. Of the 159 children in the 36 to 39 month-old group, 57.2 percent had caries.

Winter et al.<sup>36,37</sup> studied the prevalence of dental caries in British children between the ages of one and four. In the 36 to 47 month-old group, 36 percent were affected by dental caries. Poulsen and Moller,<sup>38</sup> in a study of caries in three-year-old Danish children, found that 82.5 percent had caries in a fluoridated environment. Their defs and deft values were 3.3 and 4.9, respectively. However, this is not representative of data from the United States due to the diet of the Danish children and the controls of the study.

These studies all show some indication of caries prevalence in children three years old and younger. Many of these studies have used a limited sample and varying diagnostic criteria. However, only one study<sup>2</sup> is known to exist which identifies dental caries prevalence in children within artificially fluoridated areas between the ages of 6 and 36 months.

### Socioeconomic status

Hollingshead and Redlich<sup>39</sup> first developed the Index of Social Position by examining a number of previously conducted studies of New Haven, Connecticut. The need existed for an objective, easily applicable procedure to estimate the socioeconomic status of individuals. The two sociologists independently examined each of 552 family schedules in detail and obtained agreement in 96 percent of the cases. They placed each into one of five classes. Their final criteria were the family's address, the occupation of its head, and the years of school completed. This became known as the Three Factor Index of Social Position.

However, the Two Factor Index has been used widely because of the difficulty in obtaining residential information from the family's address where adequate ecological maps do not exist.<sup>40</sup> This index utilized the occupation of the head of household and the years of school completed. Factor-weights have been changed to compensate for the two factor variation.

The Three Factor and Two Factor Indices have been validated. In a study about social stratification and schizophrenia by Hollingshead and Redlich,<sup>41</sup> the index was utilized to obtain reliable information. In a comparison study by Lawson and Boek<sup>42</sup> of seven indices of socioeconomic status, the Two Factor Index measured second to the best measured one (Three Factor Index). It was concluded that "Hollingshead's seven point occupational classification provided a practical and sufficiently reliable measure of social class for most analysis."<sup>42</sup> Also, in a study of child-rearing in families of working and non-working mothers by Yarrow et al.,<sup>43</sup> the Hollingshead index was used and found quite adequate and reliable.

## METHODS AND MATERIALS

Four hundred and forty-one Indianapolis area children were selected for the study. Some were seen at the private pediatric offices of Drs. Roth, Kahn, Young and Cheung. Others were seen at Riley Hospital Well Baby Clinic, Fountain Square Well Baby Clinic, Metro Health Center, Morgan Street Health Center, Fall Creek Health Center, People's Health Center and Indiana University School of Dentistry. A child's participation was dependent on a voluntary commitment by the accompanying parent. The subjects were examined at the time of their periodic health visits, or the parent was asked to bring them to the Dental School at a designated time. A socioeconomic, medical background questionnaire, and consent form were completed by the parent (Figures 1 and 2). Each patient's accompanying parent received a brief consultation and a pamphlet on the proper care of their child's oral health (Figure 3). When the findings of the examination indicated a need for dental care, the parents were so informed.

### Subjects

The criteria for selection of the 441 subjects were as follows:

1. Six to thirty-six months of age.
2. Normal, healthy children.
3. Children born and reared in the fluoridated water supply area of Indianapolis, Indiana.

### Examination

One dentist examined all of the subjects while an assistant did all the recording. For the examination, the child was either cradled on the

lap of the parent or examined on an examining table. A mouth mirror, explorer, and chip blower were utilized. If the child had posterior teeth with closed contacts, bitewing radiographs were made at Indiana University School of Dentistry. The data were recorded on diagnostic sheets which were developed and used at the Indiana University Oral Health Research Institute (Figures 4, 5 and 6).

#### Examination of the teeth

Starting on the right, each maxillary tooth was thoroughly examined. Then dropping to the lower left, each mandibular tooth was also examined. The criteria for diagnosis of dental caries were the ones used by Radike,<sup>44</sup> which include changes in enamel translucency, retention of the explorer point and softness at the base of the questionable area. (When bitewing radiographs were examined, any definite radiolucency indicating a break in the continuity of the enamel surface was scored as carious.)

The teeth were scored on all five surfaces: 1 - occlusal or incisal, 2 - buccal or labial, 3 - distal, 4 - lingual and 5 - mesial. All erupted tooth surfaces were recorded as: S - sound, A - incipient caries, and B - frank caries. Unless sound or carious, each tooth was either recorded as: U - unerupted, X - missing, F - restored, and N - non-applicable, hypoplastic, hypocalcified, fractured.

#### Gingival examination

The Papillary - Marginal - Gingivitis - Index (PMGI) was employed for scoring gingivitis. This is a combination of the Gingival Index by Loe and Silness<sup>46</sup> and the PMA Index by Massler and Schour.<sup>47</sup>

First, the examiner noted which teeth were missing. All gingival tissues were then carefully examined, beginning at the upper right posterior facial tissue, proceeding around the arch to the left and then back to the right from the lingual. Next, the mandibular facial tissues were examined from right to left, then continuing on the lingual gingiva from left to right. Apart from the decision as to whether gingivitis was present, the relative severity of papillary and marginal inflammation was graded as follows:

- 0 - No inflammation, normal tissue.
- 1 - Mild inflammation, slight change in color (erythema) and little change in texture.
- 2 - Moderate inflammation, moderate glazing, redness, edema and hypertrophy. Bleeding on pressure with blunt instrument (e.g., side of explorer).
- 3 - Severe inflammation, marked redness and hypertrophy; tendency to bleed spontaneously, ulceration.

The gingival examination was limited to the tissue surrounding the number of deciduous teeth present. If 20 deciduous teeth were present, there were 44 gingival papillae (including 4 "midline") and 40 gingival margins to be examined. A total of 84 gingival units which were at risk were scored and divided into the four areas of the mouth as follows:

Upper Anterior - The distal papillae of the right cuspid to the distal papillae of the left cuspid.

Upper Posterior - The gingival margin of both first primary molars to the distal papillae of both second molars.

Lower Anterior - The distal papillae of the right cuspid to the distal papillae of the left cuspid.

Lower Posterior - The gingival margin of both first primary molars to the distal papillae of both second molars.

In this method, the severity of gingivitis as rated by the PMGI is the severity score for a subject. This is the sum of all inflammation scores divided by the number of papillary and marginal units examined per subject (Figures 5 and 6). Black subjects were not used for gingivitis recordings due to their inconsistent gingival colors.

#### Socioeconomic evaluation

A Two Factor Index of social position was developed by Hollingshead<sup>39</sup> for an objective, easily applicable procedure to estimate positions that individuals occupy in the status structure of the community. The validity and reliability of these indices in dealing with more than 100 variables have been proven by Hollingshead<sup>39-41</sup> and others.<sup>42,43</sup> The Two Factor Index utilizes occupational and education scales as follows:

Rankings - Occupational Scale (Constant factor = 7, see Appendix IV).

1. Higher executives of large concerns, proprietors and major professionals.
2. Business managers, proprietors of medium-size businesses and lesser professionals.
3. Administrative personnel, owners of small businesses and minor professionals.
4. Clerical and sales workers, technicians and owners of little businesses.
5. Skilled manual employees (Plumber\*).

6. Machine operators and semi-skilled employees.
7. Unskilled employees.
8. Unemployed (category added as a modification).

Rankings - Educational Scale (Constant factor = 4)

1. Professional (M.A., M.S., M.E., M.D., Ph.D., L.L.B., D.D.S., etc.)
2. Four year college graduation (A.B., B.S., B.M.)
3. 1 - 3 year college (Plumber\*)
4. High school graduate
5. 10 - 11 years of school
6. 7 - 9 years of school
7. Under 7 years of school

The score that each family head received on each scale was multiplied by an approximate constant-factor for each scale. To illustrate: a plumber\* who went to trade school two years receives a "5" on the occupational scale ranking and a "3" on the educational scale ranking. The "5" is multiplied by the constant occupational factor of 7, resulting in a partial score of 35. The "3" is multiplied by the constant educational factor of 4, resulting in a partial score of 12. These partial scores total 47, which falls into the Class III\* range (34-51), representing an index of middle socioeconomic status. The range of total scores in each class on the Two Factor Index follows:

	Class	Range of Total Scores
High	I	11 - 18
	II	19 - 33
*Middle	III	34 - 51
	IV	52 - 66
Low	V	67 - 84



Based on the Hollingshead index distribution of occupational and educational scales of the 1970 Census of Marion County (Table I), a prediction of the distribution for the inhabitants of Marion County was completed and compared to the examined study population to insure similar representativeness (Table II).

## RESULTS

All parents' requests for an examination of their children were honored for humanitarian reasons. However, the results of only 441 were included due to the strict criteria of the survey. The more common reasons for exclusion were: subject on well water, subject living outside the fluoridated Indianapolis water supply area, subject on fluoridated water and a fluoride supplement, subject too young or too old, or subject severely compromised medically.<sup>36</sup>

Table III presents a comparison of the socioeconomic status of the actual children examined in Marion County versus the estimate based on the 1970 Marion County Census. A Chi-square analysis indicates no significant difference between the sample distribution and the distribution of all Marion County families. Therefore, we can assume that the children reported in this study are representative of all children in Marion County in terms of socioeconomic factors.

In Table IV, column A shows a relatively equal distribution of children by age groups, although the 6 to 11 month-old group shows a slight under-representation. Columns B and C demonstrate a relatively equal frequency of males and females with caries. Columns D and E show that the number and percentage of children with caries increased with the age of the child. Caries were found in 68 of the 441 children (15.42 percent). Caries increased in geometric progression from 0 percent at 6 to 11 months to 36.4 percent at the 30 to 36 months age group. Columns F and G show an increase in deft and defs values with age. The deft

value increased from 0 in the 6 to 11 months age group to 1.101 in the 30 to 36 month age group, while the defs went from 0 to 1.444 in the same age groups. There were no significant differences in deft and defs values between Blacks and Caucasians (Table V).

Table VI lists the mean deft, defs, and severity of gingivitis by socioeconomic groups. The results of a Newman-Keul's sequential ranking test on these data showed no significant group differences. However, there were individual differences ( $p = 0.06$ ), with a trend toward the middle and middle low socioeconomic groups having higher caries values (deft = 0.63 and 0.69, defs = 1.01 and 1.09) than the high, middle high, and low socioeconomic groups (deft = 0.23, 0.23 and 0.27, defs = 0.26, 0.27 and 0.36). Age is an important factor in relation to caries prevalence. The mean ages of the different groups in this study varied; therefore, it was difficult to make comparisons between these groups. One statistical tool which can be employed to "adjust" the main variable, i.e. caries prevalence, for existing differences in a concomitant variable, i.e. age, is the Analysis of Covariance. The effect of this analysis is to offset the age differences and make a valid comparison of the caries prevalence possible.<sup>17</sup> Using this analysis, Table VII also shows no significant statistical group differences at the .05 level. The main impact of this analysis was to change the low socioeconomic group's status from the low to the average caries prevalence range.

Gingival scores were divided into four areas by severity and frequency and compared by age groups, sex and methods of feeding (Tables VI to XI). Black subjects were not included in gingivitis scores due to their inconsistent gingival colors. Although the data are not presented, there

were no significant differences among age groups for gingival severity in either the overall or area scores. The overall frequency of the children with gingivitis was 28.1 percent. Area 4 (mandibular posterior) had the greatest frequency (17.4 percent), with the most common site being the lingual of the lower deciduous molars (Table VIII). Area 1 (maxillary anterior) had 14.4 percent, with the most common site being the lingual of the maxillary incisors. Area 2 (maxillary posterior) had an overall frequency of 8 percent, with the buccal of the deciduous first molars being the most common site. Area 3 (mandibular anterior) had a 7 percent frequency, with the most frequent site being the lingual of the deciduous incisors. When age groups are compared, area 1 (maxillary anterior) was the most common site for gingivitis in children 6 to 17 months of age with a 12.4 percent frequency. In the 18 to 23 month group there were no apparent differences among the various areas, but the total gingivitis had increased to 33.9 percent. At 24 to 36 months, 31.5 percent of the children had more gingivitis in area 4 (mandibular posterior) with a 38.5 percent overall frequency. The frequency of gingivitis in relation to sex indicated no significant differences among areas, except that in area 4 (mandibular posterior) females had the greater frequency of gingivitis (26.8 percent versus 11.1 percent).

Caucasian children with gingivitis had significantly higher deft and defs values than those without gingivitis (Table IX). Children in the 24 to 36 month old group with gingivitis had a deft value (1.66) more than 3 times greater than the group without gingivitis (0.525); the total group had 5 times the deft value (1.15) of the group without

gingivitis (0.23). The younger groups with gingivitis also had more teeth and surfaces involved but had too few decayed teeth to be significant.

Table X shows the frequency of gingivitis by areas in relation to method of feeding. There were no significant differences between children who were breast fed and those who were bottle fed. However, area 4 (mandibular posterior) was the most frequent site of gingivitis overall, with 17.4 percent frequency.

Tables XI and XII present the observed and adjusted mean deft, defs and gingivitis scores of children by methods of feeding. As the average age of these groups varied, Table XII adjusts the data to make a valid comparison of the caries prevalence. Using the Analysis of Covariance, no statistically significant differences existed in mean gingivitis severity in the bottle or breast fed groups. There were significantly higher deft and defs values in the bottle fed group than the breast fed group. Comparisons within the bottle fed children showed significantly lower deft and defs values in children bottle-fed up to 14 months (deft = 0.36, defs = 0.46) than in children who were being bottle fed longer than 15 months (deft = 0.87, defs = 1.51).

FIGURES AND TABLES

Figure 1. Consent letter.



INDIANA UNIVERSITY SCHOOL OF DENTISTRY  
1121 WEST MICHIGAN STREET • INDIANAPOLIS, INDIANA 46202

DEPARTMENT OF PEDODONTICS

AREA CODE 317  
TELEPHONE 264-8111

Dear Parent:

During the past few years, an increase in the number of very young children with dental caries and other oral health problems has been noted. Therefore, we are asking you to allow your child to participate in a research program designed to provide information which will help dentists to better understand the dental health status of young children.

The procedures in this examination are easily accomplished, quite comfortable for your child, and at no charge to you. We will ask you to fill-out a brief questionnaire about your child in strictest confidence; then a thorough dental examination of the teeth and of the soft tissues of the child's mouth will be completed. If necessary, and the child is old enough, we will take one cavity-detecting x-ray of the back teeth on each side of the mouth. In addition, you will receive information on the proper dental home care of your youngster. Of course, we strongly urge you to continue or begin regular dental visits for your child.

During the course of these procedures, we may wish to take photographs of your child for educational or scientific publication purposes and would appreciate your consent to do so.

Your authorization for the child's participation in this project is entirely voluntary. Please feel free to ask any questions about our program and thank you for your assistance and participation in this research project!

Sincerely,

James A. Weddell, D.D.S.  
Graduate Pedodontic Resident

I grant permission for my child \_\_\_\_\_  
to participate in the Dental Health Study of Children 3 - 36 Months of  
Age. I understand that my child's name will not be used in any analysis  
of the results or in the identification of any photographs in this project.

DATE \_\_\_\_\_

\_\_\_\_\_  
Parent's Signature (Legal Guardian)

\_\_\_\_\_  
Witnessed by

Figure 2. Information questionnaire.

INFORMATION QUESTIONNAIRE

Child's Name \_\_\_\_\_ Sex \_\_\_\_\_ Age \_\_\_\_\_ - \_\_\_\_\_ Date of Birth \_\_\_\_\_  
months-days

Child's Address \_\_\_\_\_ How long? \_\_\_\_\_

Describe in detail the occupation (job) of head of your household. \_\_\_\_\_  
 \_\_\_\_\_

Indicate Industry \_\_\_\_\_

Circle highest level of education of head of household 1 2 3 4 5 6 7 8 9 10 11 12  
 College 1 2 3 4 5 6 7 8 Other \_\_\_\_\_

Is anyone else in your household employed? Yes \_\_\_\_\_ No \_\_\_\_\_  
 If yes, please describe in detail their job, relationship to you \_\_\_\_\_  
 \_\_\_\_\_

Circle Highest level of education of spouse 1 2 3 4 5 6 7 8 9 10 11 12  
 College 1 2 3 4 5 6 7 8 Other \_\_\_\_\_

How long have you bottle fed your child? \_\_\_\_\_ months

How long have you breast fed your child? \_\_\_\_\_ months

Is your child supervised by a baby sitter? \_\_\_\_\_ Hours per week \_\_\_\_\_

If yes, is the baby sitter one of the following? Circle:  
 Family Paid Baby Sitter Child Care Center

Does your baby sitter have city or well water? \_\_\_\_\_

In your home do you have city or well water? \_\_\_\_\_

Has your child ever resided outside of Indianapolis? \_\_\_\_\_  
 If yes, where? \_\_\_\_\_ How long? \_\_\_\_\_

Do you routinely give your child vitamins? \_\_\_\_\_ What brand? \_\_\_\_\_

Do you routinely give your child a fluoride supplement? \_\_\_\_\_ Brand? \_\_\_\_\_

Has your child ever been hospitalized or had a serious illness? \_\_\_\_\_  
 If yes, explain: \_\_\_\_\_

Has your child had any history of the following? (If yes, please check)

- |  |                                       |  |
|--|---------------------------------------|--|
| <input type="checkbox"/> Heart trouble | <input type="checkbox"/> Allergies    | <input type="checkbox"/> Kidney or Liver Disease |
| <input type="checkbox"/> Asthma        | <input type="checkbox"/> Epilepsy     | <input type="checkbox"/> Diabetes                |
| <input type="checkbox"/> Anemia        | <input type="checkbox"/> Nervousness  | <input type="checkbox"/> Rheumatic Fever         |
| <input type="checkbox"/> Hepatitis     | <input type="checkbox"/> Tuberculosis | <input type="checkbox"/> Bleeding Disorders      |

Figure 3. Oral Health pamphlet.

HELP YOUR BABY  
TO A HAPPY SMILE



The best time to learn how to take care of your baby's teeth is before they grow into the mouth. With your dentist's help, your baby's new teeth will help him to talk, chew and smile pretty . . . AS A PARENT, IT'S UP TO YOU!

FACTS ABOUT YOUR BABY'S TEETH

When your baby is born his first set of teeth are completely formed inside his gums. At this time, his permanent teeth are just beginning to form.

You should keep your baby's teeth clean as soon as they come in.

Your baby's first set of teeth are important for the following reasons:

- \*Helping your baby learn to talk
- \*Chewing of food to help develop bones and body muscles
- \*Saving space for the permanent teeth to grow in straight
- \*Giving your baby a nice appearance and smile.

DENTAL HEALTH FOR YOUR BABY'S FIRST YEAR

Breast Feeding

While you are nursing, your diet will play a role in determining how good your baby's teeth will be. Since your baby will be getting his food through you, he will get a well-balanced diet only if you are on a balanced diet. A nursing mother should have the following each day:

- \*Four servings of milk or cheese
- \*Four servings of fruits and vegetables, including at least one dark green vegetable and one fruit high in Vitamin C
- \*Two servings of meat
- \*Four servings of bread and cereal products.

Bottle Feeding

After your baby's first teeth come in, avoid letting him sleep with a bottle in his mouth. Acid forms from the milk or juice in the bottle and causes cavities.

Pacifiers

Some pacifiers can affect the way your baby's teeth grow by causing a change in the shape of his mouth. A pacifier is not necessary for every child. However, if you feel he needs one, ask your dentist or physician about the correct style. Avoid putting sweets like honey on

a pacifier, nipple or teething ring because they can cause cavities.

Fluoride Supplements

Fluoride helps to make teeth strong and to prevent cavities. It is important that your child receive fluoride from birth so that his or her teeth will receive optimum protection. The amount of fluoride in the water varies in each community and will also vary depending on what feeding method is used (breast or bottle). It is recommended that you check with your family physician or dentist so that he may advise you as to the need for supplementation.

Toothbrushing

The teeth can be wiped with a small piece of gauze or a washcloth. When your child is about one year of age and has adjusted to having someone clean his teeth, you can start using a small soft toothbrush. Toothpaste is not necessary and is not used when the parent cleans their child's teeth.

A child does not develop the hand movement necessary to handle the toothbrush and dental floss until he is nine or ten years old. As a result, he cannot be depended on to thoroughly clean his teeth.

## DENTAL HEALTH FOR YOUR BABY'S FIRST YEAR, continued

It is the parents' responsibility to clean their child's teeth until the child is about nine years of age. Getting teeth cleaned should become a part of the daily routine early in life.

### Birth to 6 Months

Use a proper bottle nipple. Beware of a free-flowing nipple. No sucrose containing additives in the formula. Use sucrose-free teething cookies, etc. Baby should not go to sleep with milk or food in the mouth (if possible). If bottle is needed, use water.

### 6 to 12 Months

Make sure baby does not habitually sleep on fist or other firm objects under face.

If traumatic injury, take child to the dentist.

Teeth should be cleaned by wiping with gauze or soft wash cloth wrapped around your finger.

Make sure the child is receiving the proper amount of fluoride in the water supply or by supplements.

### The First Tooth

The front teeth will usually be the first ones to come in, between 6 months and 1 year. At this time, bacteria (germs) start to form on the

teeth. Bacteria may combine with sugar to form acid which can cause cavities. Therefore, foods containing sugar should be limited and the teeth cleaned daily.

### 12 Months

FIRST VISIT TO THE DENTIST SHORTLY AFTER THE FIRST TOOTH ERUPTS.

Your dentist will examine the child's mouth, teach you proper tooth cleaning procedures for your baby, make certain that dental plaque is under control, and suggest a list of substitute snack foods for the common sucrose (sugar) containing foods.

Fluoride supplementation should be continued possibly with the dentist applying fluoride topically to the baby's teeth.

REGULAR DENTAL CARE SHOULD BEGIN BY THE AGE OF ONE YEAR.

Your dentist will determine how often your baby should be seen after the twelve-month examination.

## MOTHER'S GUIDE TO PREPARING SOFT FOODS FOR CHILDREN

The sooner your baby can be taken off the bottle, the better. Change from liquid to solid foods as soon as possible. Many of the canned baby foods have sugar added which can cause cavities. However, there are snack items available which will not cause cavities. Try to choose one of the following snack items for your child: unsweetened juices, fruits, vegetables, crackers, sugarless candy and gum.

Home preparation of baby foods is not only economical but the taste of home prepared foods is more like the taste of table foods children will be eating.

Since every child is an individual, there may be some foods he may not personally tolerate well (may give him "gas" or runny stools), but try to offer your child a variety of tastes. Teaching children to like new foods usually requires more than one trial and some patience!

Preparation of soft table food can be accomplished with any of the following: electric mixer, grinder, blender, and mashing with a table fork.

MOTHER'S GUIDE TO PREPARING SOFT FOODS FOR CHILDREN, continued

Moderate quantities of food may be prepared ahead of time and frozen in ice cube trays -- you may easily remove one cube at a time to use as needed.

Cereals: Baby cereals and any home cooked cereals (oatmeal, farina, cream of rice, etc.) are especially nutritious and easy to prepare. Cereals may be thinned with milk and strained if necessary.

Fruits: Remove the skins, core, and cut into small pieces. Blend, grind or mash with 1 tablespoon of water. Many fruits may also be cooked into a sauce.

Bananas may be mashed with small amounts of orange juice or lemon juice to prevent them from turning brown. Other fruits: pears, peaches, apples, apricots, plums, prunes, strawberries, melon.

Vegetables: Cook thoroughly in small amount of water. Many vegetables may be easily mashed after cooking. After mashing, remove any fibrous or stringy parts. Small amounts of milk or water may be added. Vegetable suggestions are: carrots, peas, beets, asparagus, broccoli, green and wax beans, squashes, white and sweet potatoes.

Soups: Thick creamed soups can be made with pureed vegetables and adding a medium white sauce (1 table- spoon flour, 3 tablespoons butter, 2 1/2 cups milk). Suggestions: carrots, broccoli, asparagus, spinach, beets, etc.

Meats should be well-cooked before being ground or pureed. Most any meats the family uses (including weiners) may be adapted for use for the young child. To make the meat mixture smoother, add milk, water, vegetables, fruits, or fruit juices.

Mixed food dishes: Macaroni or any noodles may be mashed or blenderized with any combination of vegetables and meats. Canned soups or cream sauce may be used as a binding agent.

Desserts: Homemade pudding made with whatever formula or milk the child drinks. Fruits or fruit juice mixed with plain gelatin. Applesauce or pureed fruit sauce mixed with plain gelatin. Custard.

Figure 4. Caries record sheet.



NAME: \_\_\_\_\_

LOCATION: \_\_\_\_\_

Card 2	Exam.	4	Subj. No.	8	Study	Group	14	Examiner	Previous Product
1									
19	Date Exam.	25	Date X-ray	32	Age	Sex	Race	DMFS	

Upper Right

	7	6	5	4	3	2	1
	2nd M.	1st M.	2nd Bi.	1st Bi.	Cusp.	Lat.	Cent.
T	39						
1	46						
2	53						
3	60						
4	67						
5	74						

Upper Left

	2	1	2	3	4	5	6	7
	Cent.	Lat.	Cusp.	1st Bi.	2nd Bi.	1st M.	2nd M.	
T	39							
1	46							
2	53							
3	60							
4	67							
5	74							

Lower Right

	3	7	6	5	4	3	2	1
	2nd M.	1st M.	2nd Bi.	1st Bi.	Cusp.	Lat.	Cent.	
T	39							
1	46							
2	53							
3	60							
4	67							
5	74							

Lower Left

	4	1	2	3	4	5	6	7
	Cent.	Lat.	Cusp.	1st Bi.	2nd Bi.	1st M.	2nd M.	
T	39							
1	46							
2	53							
3	60							
4	67							
5	74							

PLEASE RECORD IN BLACK BALL POINT INK

Figure 5. Gingival record sheet.

NAME \_\_\_\_\_

PLEASE RECORD IN BLACK BALL POINT INK

2	6					12					18															
CARD	STUDY					EXAMINER					PRODUCT CODE					GRP.	EXAM.	SUBJECT NO.					AGE		SEX	RACE
1																										
22	EXAM. DATE					PMGI SEV.																				

UPPER FACIAL

31	35					40					45					50					55								
7	6	5	4	3	2	1	M	1	2	3	4	5	6	7															
	35					40					45					50					55								

CARD REPEAT  
2 COLUMNS 3-30

UPPER LINGUAL

RIGHT

LEFT

CARD REPEAT  
3 COLUMNS 3-30

LOWER FACIAL

31	35					40					45					50					55								
7	6	5	4	3	2	1	M	1	2	3	4	5	6	7															
	35					40					45					50					55								

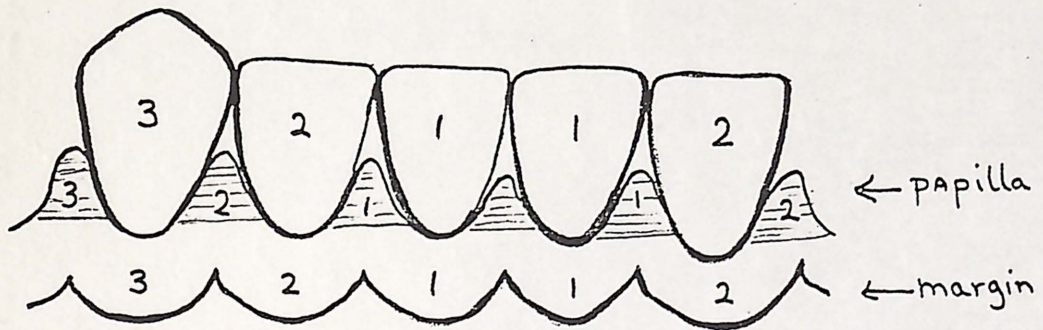
CARD REPEAT  
4 COLUMNS 3-30

LOWER LINGUAL

Figure 6. Method of scoring Papillary Marginal Gingivitis Index (PMGI).

## PAPILLARY MARGINAL GINGIVITIS INDEX (PMGI)

<u>Severity Scale</u>	
0	- None
1	- Mild
2	- Moderate
3	- Severe
9	- Missing or Ungradable tooth



Each papilla and margin or each erupted deciduous tooth will be graded. To provide uniformity in this assessment, each papilla is considered the gingival structure distal to a tooth. An exception is the papilla between the central incisors. Since it is not distal to a tooth, it is labeled the "midline papilla."

PAPILLARY MARGINAL GINGIVITIS INDEX (PMGI)

TABLE I

Occupation	Numbers	Percentage
1. Higher Executives and Major Professionals	74,554	15
2. Business Managers	50,062	10
3. Administrative Personnel and Minor Professionals	18,004	4
4. Clerical and Sales Workers	145,726	29
5. Skilled Manual Employees	46,920	9
6. Semi-Skilled Employees	71,942	14
7. Unskilled Employees	77,026	15
8. Unemployed	13,882	4

Education/Years of School Completed	Numbers	Percentage
1. Professional School	21,584	6
2. College Graduate	29,749	7
3. 1 - 3 College	46,788	10
4. High School Graduate	145,435	32
5. 10 - 11	91,951	20
6. 7 - 9	69,596	15
7. Under 7	44,777	10

\*The number and percentage of the population of Marion County which can be identified in terms of the Occupational and Educational Scales of Hollingshead Two Factors of Social Position.

TABLE II

## HOLLINGSHEAD RANKINGS - MARION COUNTY

Percentages based on 1970 Census - Marion County\*

		Index Scores	Percentage of Population
Low	Class V	84 - 67	11.7
	Class IV	66 - 52	34.2
Middle	Class III	51 - 34	28.5
	Class II	33 - 19	15.0
High	Class I	18 - 11	10.6

\*An effort was made to select a sample population for this study which reflected similar percentages of the above Hollingshead rankings.

TABLE III

## HOLLINGSHEAD RANKINGS - MARION COUNTY AND SAMPLE POPULATION

Percentages based on 1970 Census of  
Marion County and Sample Population

		Census Percentage Population	Percentage of Sample	No. of Sample
Low	Class V	11.7	12.70	56
	Class IV	34.2	26.98	119
Middle	Class III	28.5	23.13	102
	Class II	15.0	19.0	84
High	Class I	10.6	18.14	80

---

\*Chi-square analysis showed no significant difference at the 0.05 level of percentages between the 1970 Census of Marion County and the sample population.



TABLE IV

## FREQUENCY SUMMARY AND CARIES PREVALENCE OF CHILDREN BY AGE GROUPS AND SEX

Age Range in Months	(A)	(B)		(C)		(D)	(E)	(F)	(G)
	N	N	Female Caries	N	Male Caries	Total Caries	Percentage Caries	Deft	Def's
6 - 11	64	22	0	42	0	0	0	0.0	0.0
12 - 17	94	34	2	60	2	4	4.2	0.128	0.457
18 - 23	88	36	4	52	5	9	10.23	0.238	0.454
24 - 29	96	45	8	51	11	19	19.79	0.604	0.739
30 - 36	99	46	16	53	20	36	36.4	1.101	1.444
Total	441	183	30	258	38	68	15.42	0.453	0.673

TABLE V

## MEAN DEFT AND DEFS VALUES BY RACE

	N*	Deft**	DeFs**
Blacks	113	0.46 $\pm$ 0.12	0.63 $\pm$ 0.21
Caucasian	328	0.45 $\pm$ 0.09	0.69 $\pm$ 0.15
Total	441	0.45 $\pm$ 0.07	0.67 $\pm$ 0.12

\*N = Number

\*\*Deft and defs are shown as mean and standard error of mean.

The differences using a standard t-test were not statistically significant at the .05 level.

TABLE VI

COMPARISON OF ORAL DISEASE OF CHILDREN\* SIX  
TO THIRTY-SIX MONTHS BY SOCIOECONOMIC GROUPS

Group (Score) Index	N	Average Age	Deft**	Defs**	Gingivitis**
1 - (11-18) High	80	21.79	0.23 ± 0.08	0.26 ± 0.10	0.02 ± .0044
2 - (19-33) Middle High	84	22.27	0.23 ± 0.09	0.27 ± 0.13	0.05 ± .0183
3 - (34-51) Middle	102	22.97	0.63 ± 0.18	1.01 ± 0.36	0.03 ± .0092
4 - (52-66) Middle Low	119	20.94	0.69 ± 0.17	1.09 ± 0.32	0.04 ± .0086
5 - (67-84) Low	56	18.20	0.27 ± 0.11	0.36 ± 0.15	0.05 ± .0203
Total	441		0.45 ± 0.07	0.67 ± .12	0.04 ± .0054

\*Blacks not included in gingivitis scores, number of missing observations = 113.

\*\*Deft, defs, and gingivitis included as mean and standard error of mean.

The Newman Keul's multiple t-test showed no significant differences at the .05 level. The deft and defs values between the high and middle low groups showed a statistical difference at the .06 level.

TABLE VII

MEAN DEFT AND DEFS BY SOCIOECONOMIC GROUPS -  
COVARIANCE ADJUSTED DATA

Group (Score) Index	N	Deft*	Defs*
1 - (11-18) High	80	0.21 $\pm$ 0.08	0.25 $\pm$ 0.10
2 - (19-33) Middle High	84	0.19 $\pm$ 0.09	0.24 $\pm$ 0.13
3 - (34-51) Middle	102	0.56 $\pm$ 0.18	0.94 $\pm$ 0.36
4 - (52-66) Middle Low	119	0.71 $\pm$ 0.16	1.12 $\pm$ 0.31
5 - (67-84) Low	56	0.40 $\pm$ 0.11	0.50 $\pm$ 0.15

\*Deft and defs included as mean and standard error of mean.

Newman Keul's multiple t-test showed no significant statistical differences at the .05 level.

TABLE VIII

## GINGIVAL CONDITION OF CHILDREN\* BY SEX AND AGE GROUPS

Areas	% Gingivitis		6-17 months % Gingivitis	18-23 months % Gingivitis	24-36 months % Gingivitis	All Age Groups %
	Male	Female				
Maxillary Anterior	13.33	15.96	12.4	21.4	13.1	14.4
Maxillary Posterior	8.33	7.56	0	10.7	13.8	8.0
Mandibular Anterior	5.55	9.24	1.8	19.6	6.1	7.0
Mandibular Posterior	11.11**	26.84**	0.9	17.8	31.5	17.4
Total Areas	22.22	36.97	13.2	33.9	38.5	28.1

\*Blacks not included, number of missing observations = 113.  
Sign. = Significance

\*\*Significant at the 0.05 level using a standard t-test.

TABLE IX

CARIES 'PREVALENCE OF CAUCASIAN CHILDREN\*  
WITH AND WITHOUT GINGIVITIS BY AGE

	Total			24-36 Months		
	N	Deft	Defts	N	Deft	Defts
Healthy Gingivae	215	0.232	0.326	80	0.525	0.737
Gingivitis	84	1.154	1.833	50	1.667	2.141
Level of Significance using t-test		.001	.01		.05	.05

\*Blacks not included, number of missing observations = 113.

TABLE X

## GINGIVAL CONDITION OF CHILDREN BREAST-FED AND BOTTLE-FED\*

Areas	Breast-Fed** % Gingivitis	Bottle-Fed*** % Gingivitis	Total % Gingivitis	Sign.****
Maxillary Anterior	9.2	15.8	14.4	.2552
Maxillary Posterior	9.2	7.7	8.0	.8841
Mandibular Anterior	6.1	7.3	7.0	.9741
Mandibular Posterior	10.7	19.2	17.4	.1594
Total Areas	20.0	30.3	28.1	.1375

\*Blacks not included, number of missing observations = 113.

\*\*Breast-fed children in study = 65.

\*\*\*Bottle-fed children in study = 234.

\*\*\*\*Level of significance as determined by a Chi-square test.

TABLE XI

OBSERVED DATA  
 MEAN DEFT, DEFS, AND GINGIVITIS BY METHODS OF FEEDING

Method	N	Age (months)	Deft	Def's	Gingivitis*
Breast-fed	79	20.47 ± 0.97	[ 0.228 ± 0.077	0.241 ± 0.077 ]	0.024 ± 0.0082
Bottle-fed 6-36 months	341	21.81 ± 0.84			
- - - - -					
6-14 months	245	20.63 ± 0.58	[ 0.355 ± 0.072	0.46 ± 0.107 ]	0.031 ± 0.0075
15-24 months	87	24.23 ± 0.76			
25-36 months	9	30.75 ± 1.41	1.444 ± 0.988	3.33 ± 2.734	0.028 ± 0.0220
-----					
Total	422**	21.45 ± 0.07	0.462 ± 0.070	0.700 ± 0.130	0.035 ± 0.0054

\*Blacks not included, number of missing observations = 113.

\*\*Subjects not included due to use of both methods of feeding = 19.

Deft, defs, and gingivitis included as mean and standard error of mean.

Note: Means within brackets are significantly different at P = 0.05, using the Newman Keul multiple t-test.



TABLE XII

COVARIANCE ADJUSTED DATA  
 MEAN DEFT, DEFS, AND GINGIVITIS ADJUSTED FOR AGE BY METHOD OF FEEDING

Method	N	Deft	Defs	Gingivitis*
Breast-fed**	79	0.27 ± 0.08	0.27 ± 0.08	0.02 ± 0.01
Bottle-fed** 6-36 months	341	0.50 ± 0.08	0.79 ± 0.16	0.04 ± 0.01
-----				
6-14 months	245	0.39 ± 0.07	0.49 ± 0.11	0.03 ± 0.01
15-24 months	87	0.78 ± 0.24	1.43 ± 0.48	0.06 ± 0.01
25-36 months	9	1.10 ± 2.89	3.05 ± 8.09	0.02 ± 0.07

\*Blacks not included, number of missing observations = 113.

\*\*Subjects not included to use of both methods of feeding = 19.

Deft, defs, and gingivitis included as mean and standard error of mean.

Note: Means within brackets are significantly different at P = 0.05, using the Newman Keul multiple t-test.

## DISCUSSION

The findings of this study in one-year-old children show caries experience and deft scores comparable to those of previous caries prevalence studies from non-fluoridated communities (Appendix I). This survey's deft value of 0.13 is similar to those of Hennon et al.,<sup>35</sup> Toth et al.,<sup>31</sup> and Tank and Storvick.<sup>2</sup> The deft value of 0.34 in this survey is higher than Hennon et al.<sup>35</sup> and Tank and Storvick,<sup>2</sup> probably due to the increased number of one-year-old children in the present study. This would indicate that we observed an increased number of carious surfaces per carious tooth as compared to previous surveys. The 4.8 percent of children with caries are in the lower overall range.

As shown in Appendix II, the most recent prevalence surveys of dental caries of two-year-old children in the United States are those by Hennon et al. in 1969 and Tank and Storvick in 1965. In the present study, which is included in Appendix II, caries prevalence values in a fluoridated area show a decrease from Hennon's values in a non-fluoridated area and an increase over those reported by Tank and Storvick.

Appendix III compares dental caries among three-year-olds. The low values in the present study reflect the fact that the sample size was non-representative due to the dissimilar number and age of subjects (31 children at 36 months only), while other surveys included hundreds of children from 36 to 48 months of age. As Hennon et al.<sup>35</sup> indicated, most of the earlier values reported by other investigators are deft values only.

This study indicates that sex and race are not important factors in caries and it is apparent that caries experience increase with age. The small number (less than 10) of one, two and three year-old children who have actually visited dental offices is indicative of the limited interest in dental needs of these children. It was also noted that no children presented for examination with previously restored teeth, despite an observed caries range from 4.8 percent in one year olds to 31 percent in thirty-six month olds. This is in agreement with the findings of Savara and Suher<sup>22</sup> in 1954, Wisan et al.<sup>23</sup> in 1957, and Tank and Storvick<sup>2</sup> in 1965.

Although no statistically significant group differences were apparent, individual groups showed a trend for the high and middle-high groups to have lower deft and defs values than the middle and middle-low socioeconomic groups ( $p = 0.06$ ). These findings are similar to those of Wisan et al.<sup>23</sup> and Winter et al.<sup>36</sup> with one exception: Moderate caries values were found in the low socioeconomic group of this study.

These data could be influenced by such factors as age, fluoridated water supply,<sup>2</sup> urban environment, dental I.Q. of the parent and child,<sup>37</sup> diet, sample size, and variability of diagnosis due to different methods and examiners.<sup>36</sup>

### Gingivitis

The data indicated that there was no difference in mean gingival severity scores in relation to age groups, sex, methods of feeding, and socioeconomic groups. Even though eruption gingivitis was excluded, there seems to be a correlation with gingivitis present and the most recently erupted teeth. These findings could possibly be due to the

acute, transitory nature of gingivitis in young children and agrees with the findings of Poulsen.<sup>38</sup> Table VIII illustrates that females had a higher frequency of gingivitis in the mandibular posterior area, which is not significant considering the dissimilar size and age of the groups.

Other investigators<sup>1,10,11,13</sup> have demonstrated an increase in the prevalence and incidence of gingivitis with increasing age. This study shows an increase in the prevalence of gingivitis with increasing age and with varying age groups (Table VIII). The 12.4 percent prevalence of gingivitis in the 6 to 17 month-old group in the maxillary anterior area correlates with location of teeth present, lack of hygiene, and perhaps pooling of liquids in that area. The next two age groups (18 to 36 months) show a sharp rise in frequency to 38 percent, with a shift in the location frequency to the mandibular posterior and the maxillary anterior areas. This is slightly higher than Poulsen's value of approximately 25 percent.

In contrast to the study by Tank and Storvick,<sup>1</sup> the present study of 6 to 36 month-old children demonstrates that marginal gingival units were affected, although the findings are in agreement in that the papillary gingival units were the most commonly affected.

#### Methods and duration of feeding

In comparing methods of feeding, significant differences existed between the bottle-fed and the breast-fed group. There was a trend in the breast-fed group to have lower defs and deft values which is in agreement with Tank and Storvick.<sup>50</sup> However, since the breast group

was possibly unrepresentative due to sample size and overall low caries rates, an adequate comparison could not be made. This survey indicates a need for a more controlled study of breast and bottle-fed groups.

One study<sup>36</sup> has been done which compared the duration of bottle feeding. The present study shows significant differences in defs and deft between children who were bottle-fed up to 14 months and those fed from 15 to 24 months. The defs increased more than three-fold, and the deft increased two and one-half times. There appeared to be a great difference in deft and defs in children bottle-fed from 25 to 36 months, but due to limited sample size no definite conclusions can be drawn.

This study also shows that children who were breast fed and bottle fed did not differ significantly in the frequency of gingivitis. Gingivitis in these groups was as common in the mandibular posterior as in the maxillary anterior area.

SUMMARY AND CONCLUSIONS

A study of 441 children between the ages of 6 and 36 months, born and reared in a fluoridated water supply, revealed the presence of dental caries in 0 percent of group 1 (6 to 11 months old), 4.2 percent of group 2 (12 to 17 months old), 10.23 percent of group 3 (18 to 23 months old), 19.79 percent of group 4 (24 to 29 months old), and 36.4 percent of group 5 (30 to 36 months old). Regarding caries data in children 6 months to 36 months of age in this study, the following conclusions can be made:

- (1) Caries prevalence is independent of sex, race, and socioeconomic status, although middle and middle-low socioeconomic groups have trends toward higher caries frequencies.
- (2) Caries prevalence increases with age, and the number of decayed surfaces is higher than the number of decayed teeth.
- (3) Caries prevalence may be affected by methods of feeding. Breast feeding had a lower overall caries rate but a more controlled study is indicated to resolve this question.
- (4) Caries prevalence is increased with prolonged bottle feeding.
- (5) Parents, dentists, and other health professionals involved with the care of young children need to be more aware of their dental needs and the necessity for much earlier treatment for the prevention of dental disease.

An examination of gingival condition of the 299 children in the study (Blacks not included) showed that 13.2 percent of groups 1 and 2 (6 to 17 month olds), 33.9 percent of group 2 (18 to 23 month olds), and



38.5 percent of groups 4 and 5 (24 to 36 month olds) had gingivitis.

Regarding gingivitis in this study, the following conclusions can be made:

- (1) There is no significant difference in the severity of gingivitis relative to age group, sex, socioeconomic status, and methods of feeding.
- (2) The prevalence of gingivitis increases with the age of the child. The prevalence is not affected by sex, socioeconomic status, and method of feeding.
- (3) There is an increased prevalence of gingivitis in young children with dental caries.

APPENDICES

APPENDIX I

RESULTS OF DENTAL CARIES PREVALENCE SURVEYS  
OF ONE-YEAR-OLD CHILDREN

Investigator	Year	N	Deft	Def5	% Caries	Fluoride
Fulton (USA)	1952	313	0.02	--	--	-
Savara et al. (USA)	1954	18	0.67	--	22.2	-
Toth et al. (Hungary)	1959	206	0.15	--	5.0	-
Protic (NoviSad)	1964	82	0.16	--	13.4	-
Tank et al. (USA)	1965	96	0.08	0.09	3.0	+
Hennon et al. (USA)	1969	48	0.13	0.15	8.3	-
Weddell (USA)	1980	246	<u>0.13</u>	<u>0.34</u>	<u>4.8</u>	+

## APPENDIX II

RESULTS OF DENTAL CARIES PREVALENCE SURVEYS  
OF TWO-YEAR-OLD CHILDREN

Investigator	Year	N	Deft	Defs	% with Caries Fluoride	
Finn (MSA)	1947	59	0.19	--	8.9	-
Fulton (USA)	1952	258	0.22	--	--	-
Hewat et al. (N. Zealand)	1952	132	2.99	--	51.5	-
Hewat et al. (N. Zealand)	1952	431	2.22	--	45.9	-
Hewat et al. (N. Zealand)	1952	69	1.19	--	30.4	-
Savara et al. (USA)	1954	65	.83	--	23.1	-
Wisan et al. (USA)	1957	201	.60	--	18.4	-
Toth et al. (Hungary)	1959	200	.78	--	25.0	-
Halikis (Australia)	1963	19	3.79	4.42	63.2	-
Protic (NoviSad)	1964	71	0.53	--	25.4	-
Toth et al. (Hungary)	1965	319	0.68	--	--	-
Tank et al. (USA)	1965	73	0.59	0.56	21.0	+
Hennon et al. (USA)	1969	708	1.36	1.81	35.3	-
Weddell (USA)	1980	164	0.85	1.146	25.6	+

APPENDIX III

RESULTS OF DENTAL CARIES PREVALENCE SURVEYS  
OF THREE-YEAR-OLD CHILDREN

Investigator	Year	N	Deft	Def5	% with Caries Fluoride	
Finn (USA)	1947	70	1.54	--	38.6	-
Fulton (USA)	1952	277	1.06	--	--	-
Hewat et al. (N. Zealand)	1952	256	8.32	--	86.3	-
		565	4.38	--	67.6	-
		53	6.23	--	88.7	-
Savara, et al. (USA)	1954	123	2.72	--	61.8	-
Wisan, et al. (USA)	1957	380	2.20	--	52.9	-
Toth, et al. (Hungary)	1959	461	1.99	--	50.0	-
Halikis (Australia)	1963	55	8.87	15.62	98.2	-
Protic (NoviSad)	1964	100	2.20	--	54.0	-
Toth, et al. (Hungary)	1965	418	1.49	--	--	-
Nord (Sweden)	1965	79	--	--	51.1	-
Tank (USA)	1965	66	1.30	1.45	45.0	+
Gray, et al. (Canada)	1967	359	1.69	--	28.9	-
Hennon, et al. (USA)	1969	159	2.66	.53	57.2	-
Weddell (USA)	1980	31	<u>.81</u>	<u>.84</u>	<u>31.0</u>	+

## APPENDIX IV

The Occupational Scale

1. Higher executives, proprietors of large concerns, and major professionals.
  - a. Higher executives  
 Bank presidents; vice-presidents  
 Judges (superior courts)  
 Large business, e.g., directors, presidents, vice-presidents, assistant vice-presidents, executive secretary, treasurer  
 Military, commissioned officers, major and above, officials of the executive branch of government, federal, state, local, e.g., major, city manager, city plan director, Internal Revenue directors  
 Research directors, large firms
  - b. Large proprietors (value over \$100,000).<sup>1</sup>  
 Brokers  
 Contractors  
 Dairy owners  
 Lumber dealers
  - c. Major professionals

Accountants (C.P.A.)	Economists
Actuaries	Engineers (college graduate)
Agronomists	Foresters
Architects	Geologists
Artists, Portrait	Lawyers
Astronomers	Metallurgists
Auditors	Physicians
Bacteriologists	Physicists, research
Chemical engineers	Psychologists, practicing
Chemists	Symphony conductor
Clergyman (professionally trained)	Teachers, university, college
Dentists	Veterinarians (veterinary
Social worker (six years education)	surgeons)
2. Business managers, proprietors of medium sized businesses, and lesser professionals.
  - a. Business managers in large concerns  
 Advertising directors  
 Branch managers  
 Brokerage salesmen  
 District managers  
 Executive assistants  
 Executive managers, government officials, minor, e.g., Internal Revenue agents

## APPENDIX IV, CONTINUED

2. Business managers, proprietors of medium-sized businesses, and lesser professionals.
- a. Business managers in large concerns (continued)  
 Farm managers  
 Office managers  
 Personnel managers  
 Police chief; sheriff  
 Postmaster  
 Production managers  
 Sales engineers  
 Sales manager, national concerns  
 Sales managers (over \$100,000)
- b. Proprietors of medium-sized business (value \$35,000 - \$100,000)  
 Advertising owners (-\$100,000)      Manufacturer's representative  
 Clothing store owners (-\$100,000)      Poultry business (-\$100,000)  
 Contractors (-\$100,000)      Purchasing managers  
 Express company owners (-\$100,000)      Real estate brokers (-\$100,000)  
 Fruits, wholesale (-\$100,000)      Rug business (-\$100,000)  
 Jewelers (-\$100,000)      Store owners (-\$100,000)  
 Labor relations consultants      Theater owners (-\$100,000)  
 Furniture business (-\$100,000)
- c. Lesser professionals  
 Accountants (not C.P.A.)      Musicians (symphony orchestra)  
 Chiropodists      Nurses, R.N.  
 Chiropractors      Opticians  
 Correction officers      Pharmacists  
 Director of community house      Public health officers (M.P.H.)  
 Engineers (not college graduate)      Research assistants, university  
 Finance writers      (full-time)  
 Health educators      Social workers  
 Librarians      Teachers (elementary and high)  
 Military, commissioned officers,  
 Lts., Captains
3. Administrative personnel, small independent businesses, and minor professionals.
- a. Administrative personnel  
 Adjusters, insurance      Mail supervision, director of  
 Advertising agents      department  
 Chief clerks      Section heads, federal, state and  
 Credit managers      local government offices  
 Insurance agents      Section heads, large businesses  
 Managers, department stores      and industries  
 Passenger agents - R.R.      Service managers  
 Private secretaries      Shop managers  
 Purchasing agents      Store managers (chain)  
 Sales representatives      Traffic managers

## APPENDIX IV, CONTINUED

- b. Small business owners (\$6,000-\$35,000)
- |                               |                                |
|-------------------------------|--------------------------------|
| Art gallery                   | Cigarette machines             |
| Auto accessories              | Cleaning shops                 |
| Awnings                       | Clothing                       |
| Bakery                        | Coal businesses                |
| Builder                       | Convalescent homes             |
| Beauty shop                   | Decorating                     |
| Boatyard                      | Dog supplies                   |
| Brokerage, insurance          | Dry goods                      |
| Cabinet shop owner            | Electrical contractors         |
| Car dealers                   | Engraving business             |
| Cattle dealers                | Feed                           |
| Finance company, local        | Fire extinguishers             |
| 5 & 10                        | Florist                        |
| Food equipment                | Food products                  |
| Foundry                       | Funeral directors              |
| Furniture                     | Garage                         |
| Gas station                   | Glassware                      |
| Grocery-general               | Hotel proprietors              |
| Institute of music            | Jewelry                        |
| Machinery brokers             | Manufacturing                  |
| Monuments                     | Package store (liquor)         |
| Painting contracting          | Plumbing                       |
| Poultry producers             | Publicity and public relations |
| Real estate                   | Records and radios             |
| Restaurants                   | Roofing contractor             |
| Shoe                          | Shoe repairs                   |
| Signs                         | Tavern                         |
| Taxi company                  | Tire shop                      |
| Trucks and tractors           | Trucking                       |
| Upholstery                    | Wholesale outlets              |
| Window shades                 | Paralegal                      |
| Police officers (city police) |                                |
- c. Semi-professionals
- |  |                              |
|--|------------------------------|
| Actors and showmen                     | LPN                          |
| Army M/Sgt; Navy C.P.O.                | Morticians                   |
| Artists, commercial                    | Oral hygienists              |
| Appraisers (estimators)                | Photographers                |
| Clergymen (not professionally trained) | Programmer analyst           |
| Concern managers                       | Physio-therapists            |
| Deputy sheriffs                        | Piano teachers               |
| Dispatchers, R.R. Train                | Radio, television announcers |
| I.B.M. Programmers                     | Reporters, court             |
| Interior decorators                    | Reporters, newspaper         |
| Interpreters, court                    | Surveyors                    |
| Laboratory assistants                  | Title searchers              |
| Landscape planners (tree surgeon)      | Tool designers               |
|  | Travel agents                |
|  | Yard masters, R.R.           |



## APPENDIX IV, CONTINUED

- d. Farmers  
Farm owners (\$25,000-\$35,000)
4. Clerical and sales workers, technicians, and owners of little businesses (value under \$6,000).
- a. Clerical and sales workers
- |                                     |                           |
|-------------------------------------|---------------------------|
| Bank clerks and tellers             | Factory storekeeper       |
| Bill collectors                     | Factory supervisor        |
| Bookkeepers                         | Post office clerks        |
| Business machine operators, offices | Route managers (salesmen) |
| Claims examiners                    | Assistant managers        |
| Clerical/stenographic               | Sales clerks              |
| Conductors, R.R.                    | Assistant manager - sales |
| Employment interviewers             | Shipping clerks           |
| Computer technicians                | Toll station supervisors  |
| Receptionist                        |                           |
- b. Technicians
- |   |                              |
|---|------------------------------|
| Camp counselors   | Locomotive engineers         |
| Dental technicians                                      | Operators, P.B.X.            |
| Draftsmen   | Proofreaders                 |
| Driving teachers  | Safety supervisors           |
| Expeditor, factory                                      | Supervisors of maintenance   |
| Experimental tester                                     | Technical assistants         |
| Instructors, telephone company, factory                 | Telephone company supervisor |
| Inspectors, weights, sanitary inspectors, R.R., factory | Timekeepers                  |
| Investigators   | Tower operators, R.R.        |
| Laboratory technicians                                  | Truck dispatchers            |
|   | Window trimmers (store)      |
- c. Owners of little businesses
- Flower shop (\$3,000-\$6,000)
  - Newsstand (\$3,000-\$6,000)
  - Tailor shop (\$3,000-\$6,000)
- d. Farmers  
Owners (\$10,000-\$20,000)
5. Skilled manual employees
- |                       |                  |
|-----------------------|------------------|
| Adjusters, typewriter | Glassblowers     |
| Auto body repairers   | Glaziers         |
| Bakers                | Gunsmiths        |
| Barbers               | Gauge makers     |
| Blacksmiths           | Hair stylists    |
| Bookbinders           | Heat treaters    |
| Boilermakers          | Horticulturists  |
| Brakemen, R.R.        | Linemen, utility |

## APPENDIX IV, CONTINUED

Brewers	Linoleum layers (trained)
Bulldozer operators	Linotype operators
Butchers	Lithographers
Cabinet makers	Locksmiths
Carpenters	Loom fixers
Casters (founders)	Lumberjacks
Cement finishers	Machinists (trained)
Cheese makers	Maintenance foreman
Chefs	Installers, electrical appliances
Compositors	Masons
Diemakers	Masseurs
Diesel engine repair and maintenance (trained)	Mechanics (trained)
Diesel shovel operators	Millwrights
Electricians	Moulders (trained)
Electrotypists	Painters
Engravers	Paperhangers
Exterminators	Patrolmen, R.R.
Fitters, gas, steam	Pattern and model makers
Firemen, city	Piano builders
Firemen, R.R.	Piano tuners
Foremen, construction, dairy	Plumbers
Gardeners, landscape (trained)	Policemen, city
Printer (typesetter)	Postmen
Radio, television, maintenance	Tailors (trained)
Repairmen, home appliances	Teletype operators
Riggers	Toolmakers
Rope splicers	Track supervisors, R.R.
Sheetmetal workers (trained)	Tractor-trailer trans.
Shipsmiths	Typographers
Shoe repairmen (trained)	Upholsterers (trained)
Stationary engineers (licensed)	Watchmakers
Stewards, club	Weavers
Switchmen, R.R.	Welders
Telephonemen	Yard supervisors, R.R.
<u>Small farmers</u>	
Owners (under \$10,000)	
Tenants who own farm equipment	

6. Machine operators and semi-skilled employees

Aides, hospital	Transport Department
Apprentices, electricians, printers, steamfitters, toolmakers	Photostat machine operators
Assembly line workers	Practical nurses
Bartenders	Pressers, clothing
Bingo tenders	Pump operators
Building superintendents (custodial)	Receivers and checkers
	Roofers
	Set-up men, factories
	Shapers

## APPENDIX IV, CONTINUED

Bus drivers	Oiler, R.R.
Checkers	Paper rolling machine operators
Clay cutters	Signalmen, R.R.
Coin machine fillers	Solderers, factory
Cooks, short order	Sprayers, pain
Delivery men	Steelworkers (not skilled)
Dressmakers, machine	Stranders, wire machines
Drill press operators	Strippers, rubber factory
Duplicator machine operators	Taxi drivers
Elevator operators	Testers
Enlisted men, military services	Timers
Filers, benders, buffers	Tire moulders
Foundry workers, fork lift driver	Trainmen, R.R.
Garage and gas station assistants	Truck drivers, general
Greenhouse workers	Waiters-Waitresses ("Better places")
Guards, doorkeepers, watchmen	Weighers
Hairdressers	Welders, spot
Housekeepers	Winders, machine
Meat cutters, and packers	Wiredrawers, machine
Meter readers	Wine bottlers
Operators, factory machine	Wood workers, machine
Schoolhelper	Wrappers, stores, and factories

Farmers

Smaller tenants who own little equipment

7. Unskilled employees

Amusement park workers (bowling alleys, pool rooms)	Laborers, construction
Ash removers	Laborers, unspecified day work
Attendants, parking lots	Laundry workers
Cafeteria workers	Messengers
Car cleaners, R.R.	Platform men, R.R.
Carriers, coal	Peddlers
Car helpers, R.R.	Porters
Counter men	Roofer's helpers
Dairy workers	Shirt folders
Deck hands	Shoe shiners
Dock workers	Sorters, rag and salvage
Domestics	Stagehands
Farm helpers	Stevedores
Fishermen (clam diggers)	Stock handlers
Freight handlers	Street cleaners
Garbage collectors	Unskilled factory workers
Grave diggers	Truckmen, R.R.
Hod carriers	Waitresses - "Hash Houses"
Hog killers	Washers, cars
Hospital workers, unspecified	Window cleaners
Hostlers, R.R.	Woodchoppers
Mower	Relief, public, private
Janitors, sweepers	

## APPENDIX IV, CONTINUED

Unemployed (no occupation)

Farmers  
Share croppers

This scale is premised upon the assumption that occupations have different values attached to them by the members of our society. The hierarchy ranges from the low evaluation of unskilled physical labor toward the more prestigious use of skill, through the creative talents of ideas, and the manipulation of men. The ranking of occupational functions implies that some men exercise control over the occupational pursuits of other men. Normally, a person who possesses highly trained skills has control over several other people. This is exemplified in a highly developed form by an executive in a large business enterprise who may be responsible for decisions affecting thousands of employees.

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CURRICULUM VITAE

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Professional Societies and Offices

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American Academy of Pedodontics  
American Dental Association  
American Society of Dentistry for Children  
Indiana Dental Association  
Indiana Society of Dentistry for Children  
Indiana Society of Pedodontics

ABSTRACT

A SOCIOECONOMIC CORRELATION OF ORAL DISEASE  
IN SIX TO THIRTY-SIX MONTH OLD CHILDREN

by

James A. Weddell

A survey of 441 children between the ages of 6 and 36 months, born and reared with a fluoridated water supply, revealed dental caries in 2.5 percent of those 6 to 17 months of age, 9.1 percent of those 18 to 23 months of age, and in 38.7 percent of the children 24 to 26 months of age. No significant differences were found in defs and deft relative to sex, race, or socioeconomic status. Caries prevalence is affected by method of feeding; children who had prolonged bottle-feeding (more than 15 months) had significantly increased caries. In 299 Caucasian children, gingivitis was present in 13.2 percent of those 6 to 17 months of age, 33.9 percent of those 18 to 23 months of age, and in 38.5 percent 24 to 36 months of age. There was little difference in the severity of the gingivitis, although significant difference in the frequency of gingivitis was demonstrated. The prevalence of gingivitis increased with age. Young children with dental caries also showed an increased prevalence of gingivitis. The presence of gingivitis, the presence of dental caries, and the absence of professional dental care in these young children all illustrate the necessity for prevention and treatment of oral disease in children under 36 months of age.