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Dental Caries Prevalence of 5, 6, 7, 12 and 15 Year old School Children in Haiti: Report of a Survey Using W.H.O. Methods

Herbert Ludwig Paul Saint Jean

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THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI: REPORT OF A SURVEY USING W.H.O. METHODS

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DDS, State University of Haiti Dental School, 1996

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Master of Public Health Thesis

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI: REPORT OF A SURVEY USING W.H.O. METHODS

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2001
PREFACE

In regards to yellow fever and malaria, Shelden Watts has written in his Epidemiics and History: Disease, power and Imperialism;

"Content with what they had, Haitians felt there was no need of foreign trade....

Unfortunately (for those who like happy endings) not every one in Haiti supported the rejection of consumerism. Particularly crucial were the attitudes of heads of states. ... most of them fell for the lure of imported goods."

This thesis has more in common with Watt’s statement than the relationship of dental caries with development and consumerism. This thesis reports on the first ever national survey of dental caries in Haiti (the Haitian Basic Oral Health Survey). The report is important in documenting the disease status of children in that country, essentially a country without treatment opportunities for the mass of its citizens. The need for, and the prioritizing preventive interventions may be a result of this report. However, the true importance of this thesis rests on another level.

The successful conception, planning, organization, operations, and motivation of governmental agencies and individuals with regard to this study were accomplished by a handful of Haitian professionals. This national study of a disease in children, disenfranchised by age as well as economic need, demonstrates a commitment to and responsibility for community often absent in Haitian official affairs, a situation derived from the process Watts described.

This commitment is the true importance of this thesis, and this thesis bears witness, of the event. As such, it is a model for other Haitian nationals and other countries, transcending the relative importance of dental caries. Facing a classroom full
of children hesitant to participate in their first oral examination, one research team member would say, "this is for the nation." Rarely were there non-participants following the cheers that this encumbered.

Walter Psoter
ACKNOWLEDGEMENTS

This thesis is the result of more than two and a half year of active work; it symbolizes the efforts of several people who believe in what they were doing and most of all were persistent.

I would like to thank Dr. Samuel E. Prophete for all he has done for this project, but especially for bringing the subject of Public Health to my attention. I also thank Drs. JR Ernst Joseph, Chantal HC Noel, Odile Casimir, Gladys G. Lafontant and Jacques Denis who dedicated months of their overcharged time in order to actively participate in the planning and the making of the first Haitian national oral health survey.

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Heartfelt thanks to Drs. Umo Isong and Dr. Walter Psoter for their participation in the field data collection, especially and Dr. Psoter who actively participated in all the stages of the study and would not stop even when he got yellow fever; his dedication is without limits. I extend special thanks to Dr. Doug Morse and Dr. David Pendrys for their expertise as well as their time they invested in helping me produce a valuable work.

I also thank Mr. Rudolph Patrick Saint Jean, who made communication as well as transportations in Haiti so easy and for all his support. Thanks for helping in the making of history. Last but not least, I would like to thank Dr. Ralph V. Katz for all the advices and supports and confidence he invested in me. Ralph, thank you for everything.

Herbert Ludwig Saint Jean DDS.
TABLE OF CONTENTS

1- List of Tables

2- THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI: REPORT OF A SURVEY USING W.H.O. METHODS

<table>
<thead>
<tr>
<th>2 a)</th>
<th>Background</th>
<th>Page 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 b)</td>
<td>Specific Aims</td>
<td>Page 4</td>
</tr>
<tr>
<td>2 c)</td>
<td>Methods</td>
<td>Page 5</td>
</tr>
<tr>
<td>2 d)</td>
<td>Results</td>
<td>Page 10</td>
</tr>
<tr>
<td>2 e)</td>
<td>Discussions</td>
<td>Page 17</td>
</tr>
</tbody>
</table>

3- Bibliography | Page 27 |

4- Tables | Page 30 |

5- Appendices

<table>
<thead>
<tr>
<th>5 a)</th>
<th>Appendix A</th>
<th>Page 59</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 b)</td>
<td>Appendix B</td>
<td>Page 65</td>
</tr>
<tr>
<td>5 c)</td>
<td>Appendix C</td>
<td>Page 75</td>
</tr>
<tr>
<td>5 d)</td>
<td>Appendix D</td>
<td>Page 77</td>
</tr>
<tr>
<td>5 e)</td>
<td>Appendix E</td>
<td>Page 79</td>
</tr>
<tr>
<td>5 f)</td>
<td>Appendix F</td>
<td>Page 82</td>
</tr>
<tr>
<td>5 g)</td>
<td>Appendix G</td>
<td>Page 83</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1- Distribution of the study subjects by gender and age groups

Table 2- Distribution of the study subjects by gender and urban/rural status

Table 3- Distribution of the study subjects by gender and metropolitan/urban/rural status

Table 4- Distribution of the study subjects by gender and geographic Department

Table 5- Mean DMFS and standard deviation by gender and age groups

Table 6- Mean DMFS and standard deviation by gender and urban/rural status

Table 7- Mean DMFS and standard deviation by gender and metropolitan/urban/rural status (all age groups combined)

Table 8- Mean DMFS and standard deviation by gender and geographic Department, (Both genders combined)

Table 9- Mean DMFS and standard deviation by geographic Department and age group (Both genders combined)

Table 10- Mean DMFS and standard deviation by geographic Department and urban/rural status, (all age groups combined)

Table 11- Mean DMFS and standard deviation by age group and urban/rural status, (Both genders combined)
Table 12- Mean DMFS and standard deviation by age group and metropolitan/urban/rural status, (Both genders combined)

Table 13- Mean dmfs and standard deviation by gender for 5 to 7 year olds, (All age groups combined)

Table 14- Mean dmfs and standard deviation by gender and urban/rural status for 5 to 7 year olds, (All age groups combined)

Table 15- Mean dmfs and standard deviation by gender and metropolitan/urban/rural status for 5 to 7 year olds

Table 16- Mean dmfs and standard deviation by gender and geographic Department for 5 to 7 year olds

Table 17- Mean dmfs and standard deviation by geographic Department for 5 to 7 year olds

Table 18- Mean dmfs and standard deviation by geographic Department and urban/rural status

Table 19- Mean dmfs and standard deviation by urban/rural status for 5 to 7 year olds

Table 20- Mean dmfs and standard deviation by metropolitan/urban/rural status for 5 to 7 year olds

Table 21- Mean dmfs and standard deviation by rural/urban status for 5 to 7 year olds

Table 22- Mean dmfs and standard deviation metropolitan/urban/rural status for 5 to 7 year olds.
Table 23- Mean dmfs and primary decay, missing, filled surfaces by geographic Department, (All ages combined)

Table 24- Mean number of dmfs, decay, missing and filled surfaces by metropolitan/urban/rural status for the primary dentition, (All ages combined)

Table 25- Mean DMFT and standard deviation by gender and age groups

Table 26- Mean dmft and standard deviation by gender and age groups

Table 27- Mean DMFT and standard deviation by gender and metropolitan/urban/rural, (All age groups combined)

Table 28- Mean dmft and standard deviation by gender and metropolitan/urban/rural, (All age groups combined)
A. BACKGROUND

Haiti is located in the island of the Hispaniola, bounded by Puerto-Rico to the east, Cuba to the northwest, and Jamaica to the southwest. The Island is divided into two independent Republics: the Dominican Republic, which extends over the eastern two-thirds of the island and the Republic of Haiti, which occupies the western one-third of the island. Haiti has two official languages, Creole, spoken by more than 97% of the population and French, spoken by the upper class and the higher educated. Haiti is approximately 27,750 square kilometers in size, and is divided into nine geographical departments.

The population of Haiti was recently estimated to be about seven million people, with an increasing urban population, which was estimated to be about 33.7% in 1998 (1). Only 43% of the population has access to safe drinking water with that figure falling to 41% for the rural population. Childhood infection and malnutrition are the major causes of mortality and morbidity in Haiti. Diarrhea and acute respiratory infections account for approximately half of the under-5 mortality. Other prevalent childhood diseases include tuberculosis, malaria and hepatitis (2).

Education is highly valued but financially unavailable to most of the population. During the period 1986-90 only 44% of primary school age children were enrolled in school. Only 9% of those enrolled in first grade ever reach the sixth grade. According to
a recent survey published in 1998, Haiti has 1.2 million children between the ages of 5-15 years (48% females) attending school with 42% of them residing in rural areas. Of these 1.2 million schoolchildren, only one-third attend public schools with the remaining two-thirds of school children enrolled in private schools, most of which are run by voluntary church-related groups (3).

The Ministry of Health provides limited general health and dental care to the population via clinics located throughout the country. The dental care offered in these regional governmental dental clinics is largely limited to tooth extractions with occasional restorative services, largely limited to simple dental fillings. The dental services can be described as ‘reactive dental care’ in that nearly all services provided are in response to a painful dental condition that must be relieved as rapidly and inexpensively as possible, i.e., usually a tooth extraction. Even this “reactive dental care” is available to a small minority of Haitians. There is no preventive program, which addresses any of the known endemic dental diseases, i.e., no coordinated educational program much less a fluoride or dental sealant program. The total lack of available data on the oral health status and needs of the population, combined with the rare resources available for providing both medical and dental care at the central government level, severely limit the development of desperately needed preventive oral health programs.

There are no national surveys of oral health for Haiti. The only obtainable national dental data from the World Health Organization (WHO) reveals the lowest ratio of dentists per inhabitants in the Western Hemisphere, 0.12 per 10,000. Comparatively, the dentist/population ratio is 2.54 per 10,000 in the Dominican Republic (4).
An extensive search of the dental literature revealed only three published articles on oral health in Haiti. The first report, published in 1972, consists of a description of the knowledge of, and attitudes regarding, oral health of thirty-four adults in the rural villages in the Jeremie region (5). The remaining two reports were oral health surveys of children and adolescents published in 1983 and 1984. The 1983 report compared the oral hygiene, dental caries and periodontal diseases in 879 rural, 12-15 year olds in Haiti to a similar number of 12-15 year olds in Hamburg, Germany (6). The 1984 report was a descriptive epidemiologic study on dental caries, oral debris and periodontal disease in 61 adolescents from La Gonave, an island in the bay off the coast of Port-au-Prince (7).

Recently, two abstracts on oral health issues in Haiti have been presented at annual meetings of the International Association for Dental Research. In 1996, one abstract reported on a survey of dental caries in 611 adults residing in the Jérémie region of Haiti (8). The second abstract published in 1998 showed the findings from a repeated administration of the survey on “oral health knowledge and attitudes” originally administered in 1972. This time the questionnaire was administered to 240 adults, again in the Jérémie region (9). This latter study was the first published research study conducted by faculty from the University of Haiti Dental School.

A Haitian Non-Governmental Organization (NGO) called Service Oecumenique d’Entraide (SOE) prepared two unpublished reports on oral health in Haiti in 1991 and 1992. Both reports provided descriptive oral epidemiologic data for the region around Thomonde, in the central part of Haiti.

In total, the current oral health database for Haiti amounts to three published articles (one in 1972, another in 1983 and the last in 1984), two published abstracts (1996
These data provide an early, but fragmented, epidemiologic picture of oral health in Haiti. However, they lack both the representativeness and scientific cohesiveness to serve as a guide to develop and implement a national oral health program for Haiti. Not only were the populations studied unrepresentative of a national sample of Haitians, each study used different criteria for the measurement of dental caries. In order to build a national data set, an oral health survey of University of Haitian schoolchildren of 5, 6, 7, 12 and 15 year olds of Haiti was planned by the faculty of the University of Haiti Dental School, working in collaboration with faculty from the University of Connecticut School of Dental Medicine.

B- SPECIFIC AIMS.

The purpose of this research project was to implement an oral health survey on the prevalence of dental caries and fluorosis in Haitian school children, aged 5, 6, 7, 12 and 15 years. Based on clinician observations, dental decay appears to be an important problem in the permanent dentition of 12 and 15 year olds. The collected data will provide facts to refute or support that assumption, facts upon which the eventual implementation of a feasible and cost-effective national oral disease prevention program could be based. The State University of Haiti’s Dental School in collaboration with the Haitian Ministry of Education, the University of Connecticut school of Dental Medicine and the Pan-American Health Organization (PAHO) conducted the national survey.

The aims of this study were:

1. to determine the dental caries prevalence for both the primary and permanent
dentition of school-aged children in Haiti

2. to determine the fluorosis prevalence in the permanent dentition of school aged children in Haiti

The data related to the fluorosis prevalence section of the Haitian Basic Oral Health Survey 1999, and collected during the study will not be discussed in the current presentation.

The data from these two oral health diseases, when combined (Specific Aims 1 and 2), can be used to develop national and regional dental public health policies that will propose specific and targeted programs aimed at the reduction of dental caries in school-aged children via the introduction of well-established dental public health preventive services that are scientifically-proven, feasible, and cost-effective.

C- METHODS

This survey was conducted using a modified version of the W.H.O. Basic Oral Health Survey Pathfinder method, 4th edition. It targeted children aged 5, 6, 7, 12 and 15 years attending both public and private schools throughout Haiti, in both rural and urban regions. The 4th edition of W.H.O.'s Basic Oral Health Survey recommends 5, 12 and 15 year olds to be surveyed; however, it specifies that ages 6 and 7 can also be surveyed under special circumstances. In order to provide data on both eruption time and early caries history in the permanent dentition, 6 and 7 year olds were included in this survey since many children in Haiti experience late schooling and delayed eruption.
**Sample and site**

Study subjects were recruited from schools throughout Haiti. The sampling frame consisted of seven of the nine geographic Departments of Haiti (West, Northwest, North, Northeast, South, Grand-Anse as well as the urban part of Artibonite), each constituting a sampling cluster. The Central and Southeast departments were excluded. The Sampling, within each cluster, was carried out using a modified version of the Pathfinder method, i.e., a minimum target of 25 children for each of the three age groups (n = 75), with two sub-clusters in each urban area (150) and one sub-cluster in each rural area (75). Hence, two thirds of the samples in each cluster were selected from the major urban center (i.e., the Chef-lieu) in that cluster (geographic Department) and the other third from the rural area (table 2).

The survey as conducted exceeded W.H.O. suggested guidelines for a national Basic Oral Health Survey (BOHS) in both sample size and number of clusters. (BOHS guidelines suggest the capital city, two major towns and four rural areas) (Appendix A). It has, however, been reduced from its original planned size, which targeted children from the capital city and all nine geographic Departments, and a sub sample of children that did not attend school, as several geographic areas were unable to be surveyed.

Because of economical restraints, the planned survey included only four of the nine geographic Departments of Haiti (North, Northwest, West, and South). However, during the first week of the survey, one examiner noticed several particularly severe cases of fluorosis in one of the surveyed Departments, North. Inquiries revealed that the fluorosis cases originated from the same geographic Department, one of those that was not included in the original survey plan, the Northeast Department. Thus, this geographic
Department was included in the sampling frame as a subcluster. Upon the inclusion of Northeast in the sampling frame more cases of fluorosis were recorded in that region. The Grand-Anse Department and the urban part of Artibonite Department were also added to the study because of available time and access factors.

A total of 108 schools were randomly picked from a master list of all Haitian schools provided by the Ministry of Education, and a letter was sent to the principal of all of these schools explaining the objectives of the study and requesting their help to conduct the oral examinations (Appendix B). From this sample, 80 schools were randomly picked within the seven clusters for the survey. Due to an unanticipated strike of the public school teachers that occurred at the beginning of the field examinations, it was not possible to conduct examinations in some of the schools listed in two of the selected departments. Therefore, an alternative school was selected from among the 108 listed schools, usually the nearest working school.

A “paternalistic” consent form describing the purpose of the study was submitted to each school principal for their information and questions (See Appendix C). Due to the high rate of illiteracy in the country and other problems related to the impossibility of reaching more than a third of the parents, written consent was to be obtained from the school principal rather than the parent before any children were examined. This approach to obtaining a meaningful informed consent was approved by the Internal Review Board of the University of Connecticut Health Center. Only one school refused to be part of the survey.
Oral Examination

Four trained dentists calibrated to World Health Organization Standards by a W.H.O. trained calibrator performed all the oral examinations. Three recorders and three field supervisors, newly graduated dentists, assisted them. The examiners were calibrated to 90% agreement for Decayed, Missing and Filled surfaces and Fluorosis according to W.H.O.'s criteria during the two weeks preceding the beginning of the field examinations; they were calibrated to 90% agreement within each individual score for non-cavitated lesions. All field examinations occurred from October 6 to November 12, 1999. To ensure coherence in the way the examiners applied diagnostic criteria during the course of the examination, each examiner performed duplicate examinations on 10% of the sample of subjects examined. The field supervisor and the school principal arranged the reexamination, and the examiners were blinded as to which children would be reexamined. The inter- and intra-reliability examiner reliability reexaminations occurred the same day in intervals of approximately two hours. Non-parametric correlation tests were used to assess the level of inter- and intra-reliability; Pearson and Spearman’s correlation tests were performed using the 193 duplicates examinations. When compared, both examinations were similar in about 99% of the cases.

The oral examinations included a caries index (DMFS) (Appendix D) and a Fluorosis index (modified Dean’s Index) (Appendix E) as well as the new PAHO disease criterion of non-cavitated lesions. This is the first national oral health survey to include this latter disease category. The examiners performed the examination under normal daylight conditions using mirrors and explorers with portable headlamps supplementing normal daylight. Dental caries were scored by surface on all erupted teeth. Caries were
recorded when a lesion in a pit or fissure or a proximal surface had a tactiley detectable softness. The data collected relied solely on the visual-tactile examination performed by the W.H.O. trained examiners; no dental radiographs were taken. The fluorosis examination was performed on the maxillary arch from canine to canine.

Basic demographic information was also recorded regarding age, sex, and geographic department and whether the town involved was urban (generally a chef-lieu [capital] of department with 50,000 or more inhabitants) or rural (less than 50,000 inhabitants and no infrastructure such as electricity and tap water) using numeric codes. Children who where found to have an oral condition that required immediate attention (cases of acute pulpitis, dental abscesses, tooth fractures and any soft tissue lesion that requires a biopsy) were directed to the closest health center, and a note from one of the examiners was given to the school principal for one of the local practitioners to provide the necessary treatment. The children’s parents were notified of the dental emergency status of the child.

Data Management

The data were recorded on a record form used by the University of Connecticut Health Center (Appendix F), entered and verified manually, by one person (HLPSJ), into a computer using the data entry program of the Statistical Package for Social Sciences software (SPSS). A total of 1888 cases, representing the number of children that were examined for Dental caries and fluorosis, was entered with 170 variables for each case. Once entered, the data were verified by re-entry of all the data using the SPSS Data Entry software program. The data were then cleaned before initiating any data analysis. A total of 21 cases were dropped during the data cleaning because of incomplete dental
and/or demographic information. Additionally, new variables were defined and added to each case (Urban/rural, Geographic Department, Locale and Age Groups, etc.).

**Statistical analysis**

Summary measures were computed using the Statistical Package for Social Sciences program (SPSS). Means and their associated standard deviations were calculated. Analysis of variance (ANOVA) was used to compare means, and post hoc tests were corrected for multiple comparisons. (Tables 12 and 22). Differences were considered statistically significant when the p-value was less than or equal to 0.05.

**D-RESULTS**

The sample distribution of the first Haitian national oral health survey according to the demographic parameters of age, sex urban/rural/metropolitan status and geographic Department is shown in Tables 1 to 4. The dental caries findings in terms of tooth surfaces (i.e. DMFS, dmfs) are summarized in Tables 5 to 14 for the permanent dentition and in Tables 15 to 24 for the primary dentition; findings for teeth are presented in Tables 25 to 28.

**Demographics**

Table 1 presents the sample distribution by gender and the three chosen age groups. Although the intention was to attain a 1:1 male-to-female ratio, this table reveals a higher percentage of females than males in all three age groups; the largest difference being in the 15-year-olds age group where females constitute 59.3% of the sample. Table 2 shows the distribution of the sample by rural and urban status. The urban
component of the sample represents about two thirds of the sample as planned in the protocol and in accordance with 4th Edition of the W.H.O. Of this urban sample, 57% were females. Table 3 further dichotomizes the urban sample and reveals that approximately 18.4% of the study population come from Port-au-Prince, the Capital City and the only Metropolitan City of Haiti. Finally, Table 4 shows this difference in sample size within gender is largely due to the fact that females represent 64.7% of the West Department sample overall and although not shown 67.8% for Port-au-Prince, which is in the West Department. Moreover, females compose 57.7% of the sample for the South Department. The proportion of females is slightly higher than males for each of the other Departments except Artibonite and Grand-Anse where females represented only 48.5% and 39.7% of the sample respectively.

*Permanent Dentition*

Table 5 presents the mean DMFS scores by gender within each of the three age groups. As expected, the 15-year-olds age group showed the highest DMFS score. Although not statistically significantly different, the mean DMFS score for males was higher than that of females in the 15-year olds age group [2.72 (5.3) vs. 2.20 (4.0), P value = 0.2]. On the other hand, however, females show a higher DMFS score than males among both 12-year olds [1.12 (2.5) vs. 0.88 (1.9)] as well as 5 to 7-year-olds [0.20 (0.9) vs. 0.15 (0.8)]. Again, however neither difference was statistically significant.

Table 6 presents the mean DMFS by gender and urban and rural status. The results in Table 6 revealed a higher DMFS scores in the rural [1.65 (4.5), 1.48 (3.5)] than in the urban population [0.87 (2.3), 1.05 (2.5)]. The DMFS score by gender is lower for urban males [0.87 (2.3) vs. 1.05 (2.5)], while in the rural area; females appear to have the
lowest DMFS [1.65 (4.5) vs. 1.48 (3.5)], however, the differences in means are not significant.

In Table 7, when isolated from the other urban sites, Port-au-Prince (the only metropolitan city of Haiti) shows a significantly lower DMFS score for males [0.35 (0.9)] when compared to females [1.15 (2.8)]. However, males and females from the urban site show similar DMFS scores ([1.01 (2.6) vs. 1.01 (2.4)]. For the rural sites, males show higher DMFS scores than females, [1.65 (4.5) vs. 1.48 (3.5), respectively], however the differences in scores are not significant.

The mean DMFS scores by gender within geographic Departments are presented in Table 8. The South Department shows the highest DMFS score by geographic Department for males [2.52 (5.8)], Grand-Anse Department’s score is next [1.74 (5.3)]. The South Department’s DMFS score is at least two fold higher than that of other Departments such as North [0.60 (2.6)] and West [0.80 (2.2)]. In the permanent dentition, females from the Northeast Department have the highest score [1.53 (3.5)]; the South Department score is next highest [1.42 (3.1)].

Table 9 presents the mean DMFS by age group in the surveyed geographic Department. Two Departments, South and Grand Anse show the highest scores for both 12 and 15 year olds. The Northwest Department has the fifth highest mean score in the 12 year olds and the third highest mean score in the 15 year olds, while West Department moves from the third highest score in the 12 year olds to the fourth highest mean score in the 15 year olds.

Table 10 presents DMFS scores for each of the surveyed geographic Departments by urban/rural status. The mean DMFS scores in the rural sites are higher than the mean
scores for urban areas within most of the Departments, except in the Northeast [0.64 (2.4) vs.1.45 (3.0)] and Grand-Anse [1.02 (2.9) vs.1.84 (5.1)]. It should be noted that no rural population was surveyed in the Artibonite Department.

Table 11 presents mean DMFS scores for the three chosen age groups by urban/rural status. Statistically, only the mean scores for 15-year-olds shows a significant difference when the rural and urban sites are compared.

In Table 12, mean DMFS scores are presented for each of the three age groups within Port-au-Prince, urban and rural sites. Although all three sites present similar mean scores for the 5-7 year olds, Port-au-Prince shows the lowest mean DMFS score for 12 and 15 year olds. The rural sites have the highest mean DMFS scores for the 12 year olds as well as the 15 year olds [3.45 (6.2)]. For the 15 year olds the mean score of the Port-au-Prince sample was half that of the 15 year old rural children [1.70 (3.4)]. The mean DMFS score is significantly greater in the rural area than in Port-au-Prince among the 15-year olds. Post hoc comparison was performed for the 15 years olds, between the three sites to determine which comparisons were statistically significant. The comparison between Port-au-Prince and the rural sites as well Port-au-Prince and the rural sites were statistically significant at 0.005 and 0.003 level, respectively using Scheffe Post hoc analysis. No other comparisons were statistically significant.

Table 13 presents the mean score for decayed, missing and restored surfaces by geographic department. These tables show that decay represents the major component of DMFS scores for both genders. The mean number of decayed surfaces is slightly lower or equal to the mean DMFS score for children from both genders within the surveyed geographic Departments in both dentitions. Table 13 shows that females have higher
mean DMFS scores than males in four of the seven surveyed departments, and consistently, in those four departments, the mean number of decayed surfaces is highest in which-ever gender has the highest DMFS score. Missing surfaces represented much smaller numbers, and in four of the departments surveyed, none of the children surveyed had a restoration in their mouth. The vast majority of the caries experienced in the permanent dentitions consisted of untreated disease. In the permanent dentition, only three of the surveyed Departments had children with restorations.

In Table 14, the rural area shows the highest mean for decayed surfaces for both genders [1.21 (3.81) and 1.20 (2.80)]. Males from the rural area present also the highest mean for missing surfaces [0.42 (1.65)]; females from Port-au-Prince present the second highest mean score for missing surfaces [0.30 (1.48)]. The rural area shows also the highest mean filled surfaces.

**Primary dentition**

Table 15 presents the mean dmfs scores by gender among 5 to 7 year-olds. Males in that age group present a higher dmfs score than females of the same age group [3.22 (6.7) vs. 3.01 (6.0)]; however the difference is not statistically significant. Table 16 presents the mean dmfs by gender and urban/rural status. There is no statistical difference between the mean dmfs scores of 5 to 7 years olds males and females in urban or rural sites.

Table 17 presents the mean dmfs score for the primary dentition by gender within Port-au-Prince, the urban sites and the rural sites. Port-au-Prince shows the lowest mean dmfs score, for males and females [2.46 (5.2) and 2.60 (7.0)]. The mean scores for the urban sites although higher, are lower than those of the rural sites.
The mean dmfs scores by gender within geographic Departments are presented in Table 18. In the primary dentition, females from the South Department show the highest score [4.58 (7.7)]. The next higher score is recorded in the Northeast Department [3.78 (5.7)]. In this dentition, males from the Grand Anse Department show the highest mean dmfs score by Department [4.88 (9.3)].

Table 19 presents the mean dmfs for the 5-7 years age group; South and Grand Anse have the two highest scores [4.35 (8.0), 4.28 (7.6)], which are between two to three fold of that of the North [1.83 (5.4)] Department. The Northeast Department holds the third highest mean score [3.93 (5.7)] by geographic Department in the primary dentition.

Table 20 presents the dmfs score for 5-7 year olds by urban/rural status in each of the surveyed geographic Departments. This table shows that the rural South and urban Grand Anse hold the highest scores [6.82 (10.3) and 6.08 (9.5)] for that age group in the primary dentition.

Table 21 presents the mean dmfs score for 5-7 year olds for the urban and the rural sites; the rural sites have the highest score. The difference between the two mean scores, however, is not significant.

Table 22 presents the mean dmfs score for the 5-7 year olds living in Port-au-Prince, urban and rural areas. The rural sites have a higher score than both the urban and Port-au-Prince [3.45 (5.8) vs. 2.54 (6.3) and 3.11 (6.7)]. The difference between mean dmfs scores is significantly greater between Port-au-Prince and Rural than any other mean comparison using the Sheffe analysis (P value level of 0.05).

Table 23 presents the mean score for decayed, missing and restored surfaces (dmfs) for all ages combined. This table shows that decayed surfaces represent the major
component of dmfs scores for both genders as well. In Table 23, decayed surfaces for the primary dentition were the primary component of the mean primary dmfs. Decay, in most cases, is the only component of the mean dmfs, while there were no filled or missing surfaces. The mean number of missing surfaces in the primary dentition is even smaller than the mean number for the permanent dentition. More than 90% of the decayed surfaces remain untreated. Only one Department (Grand Anse) had children with restored surfaces for the primary dentition.

In Table 24, children in both Port-au-Prince as well as the rural sites have no filled surfaces in the deciduous dentition. The decayed component represented 100% of the dmfs score for Port-au-Prince males and exceeded 94% of the total dmfs for each other gender/region category.

Table 25 presents the mean DMFT scores by gender within each of the selected age groups. In the Haitian national survey, dental caries was scored by surface as shown in Tables 5 to 24. However, to allow comparison with preexisting data from W.H.O. (underdeveloped, developing as well as developed countries), DMFT was calculated by age groups and gender in both dentitions.

In the 15-year-olds, the mean DMFT score was higher for males than females [1.51 (2.69) vs. 1.32 (2.04)] (P Value = 0.3). In the 12-year-olds, the mean DMFT score was higher in females [0.54 (1.04) vs. 0.74 (1.44)] (p-value = 0.4). Children from 5-7 years old show very low scores; however, the mean DMFT for females is 17 times higher than for males [0.008 (0.33) vs. 0.14 (0.84)]. There was no statistical difference between the DMFT scores of males and females in any of the age groups.
The mean dmft score by gender and age group for the primary dentition is presented in Table 26. This table shows that male 5 to 7 year-olds present a lower dmft score than females of the same age group [1.72 (2.84) vs. 1.83 (2.92)], however the result is not statistically significant. For the 12 year-olds, males present a higher score than females [0.17 (0.81) vs. 0.10 (0.41)]; however, the difference was not statistically significant at the 0.05 level (P value = 0.1).

In Table 27, mean DMFT scores are presented by gender within Port-au-Prince, the combined urban sites and the combined rural sites. Females from the rural sites show the highest mean DMFT score [0.95 (1.9)] while males from Port-au-Prince present the lowest DMFT [0.51 (1.1)]. Rural males have the second highest DMFT score [0.88 (2.3)]. As presented in Table 27, none of the differences are statistically significant.

Finally, Table 28 presents the mean dmft by gender for the primary dentition for the three locales. Males in the rural areas show the highest mean dmft score [0.85 (1.9)]. Males from the capital had a lower mean score [0.57 (1.7)] than females [0.63 (2.0)], however, the mean difference was not statistically significant.

E- DISCUSSION

As this is the first Haitian national oral health survey, it constitutes the baseline. There are no pre-existing data at the national level that could be used to compare these results in order to assess the evolution of dental caries in Haitian school children. However, it is obvious from the results of the survey that dental caries constitutes an oral health problem among 5-7, 12 and 15 year-olds Haitian school children.
Although the primary intention was to target an even number of male and female children within each of the selected age groups, in each geographic Department as well as urban and rural setting, females constituted 55.1% of the overall sample. This imbalance in the gender distribution can be attributed to chance. The schools visited were randomly chosen, first from the master list of all Haitian schools submitted by the Haitian Minister of Education and then randomly picked from the selected list. As an example, five of the schools picked in the West Department, were exclusively girls’ schools, while only one was an exclusively boys’ school, the remaining nine were schools attended by students of both genders. In the Grand-Anse Department, only three of the 15 visited schools where exclusively girl’s schools, 11 were schools attended by both males and females, and only one exclusively boys school was visited.

The rural sites generally showed higher mean DMFS scores than the urban and Port-au-Prince sites for both the primary and permanent dentitions. This may be attributable to the fact that means of dental caries prevention such as fluoridated toothpaste are scarce (more often absent) in the rural areas. This scarcity is due to factors such as limited access and availability and mostly very low purchasing power of the population in the rural area, where a toothpaste tube can cost as much as one meal. In addition, even the relatively low consumption of sugar-based foods by the rural population has the potency to increase the risk of dental decay, according to Szpunar et al. (10). Inversely, in the urban area, fluoridated toothpaste is believed to be relatively more available for several reasons. Most of the urban sites are both chef-lieu (capital) of a geographic Department and/or of a coastal town. These towns trade with each other; some even trade with other countries as well. Thus, an urban population receives, and
certainly uses, more refined products than the rural population. The hypothesis of the combined effect of fluoridated toothpaste and supposedly better oral hygiene should be studied as a possible reason of the lower decay prevalence of the urban population when compared to the rural population.

Port-au-Prince shows lower DMFS scores for 12 year old males and 15 year olds especially where the mean score for Port-au-Prince sample is half that of the rural sample (Table 12), while the 5 to 7 group age scores are similar to that of the urban areas as well as the rural areas. These scores would be in keeping with the hypothesis that fluoridated toothpaste and supposedly better oral hygiene are more effective in urban communities, although the good hygiene habits are picked up at a late age. The perceived beneficial effects of the use of fluoridated toothpaste can be appreciated in the mean DMFS and DMFT scores for both the primary and the permanent dentitions in Port-au-Prince. The mean DMFS and DMFT scores for Port-au-Prince are lower than the combined urban sites or the rural sites; however, the differences were not statistically significant (P =0.8 and 0.2 respectively).

Haiti is showing a pattern of development similar to that of other underdeveloped or developing counties, i.e., a big city (Port-au-Prince) more or less modernized with features similar to modern western cities and the rest of the country, which has some big towns, but is mostly rural. According to the pattern that has been observed worldwide, Port-au-Prince, because of its westernized lifestyles, would be expected to show higher mean DMFS scores than the rest of the country because of a greater exposure of its population to major risk factors of dental caries. This, however, does not appear to have occurred in Haiti.
The problem of dental caries, although prevalent all over the country, is more apparent in some regions. Among the seven surveyed geographic Departments, South and Grand-Anse showed the highest mean scores for the permanent dentition; in both departments males hold the higher scores. In the primary dentition Grand-Anse and South department, once more, show the highest mean dmfs score; males in Grand-Anse still have the highest score while females hold the highest score in the South Department. These two Departments are neighboring and constitute the far end of the southern peninsula of Haiti, Grand-Anse being the most isolated from the rest of the country both geographically and administratively. Surveys on sugar consumption and dental health behavior as well as knowledge should be conducted in order to clarify the relatively high mean DMFS scores experienced by children from both South and Grand-Anse Departments. These surveys could then indicate the dental preventive program that would be more appropriate in order to significantly reduce not only the prevalence of dental caries in those Departments but also its incidence.

Among the seven surveyed geographic Departments, Grand-Anse and Northeast are the only departments that showed higher mean DMFS scores for the urban area than the rural area in both dentitions. These two Departments could be considered as the most isolated of Haiti both geographically and structurally. The simple dirt roads that lead to these Departments are generally flooded during the rainy seasons, making these sites very difficult to reach. Barmes et al (11) as well as Miura et al (12) twenty years apart found evidence suggesting that the prevalence of dental caries in developing countries increase with the degree of urbanization. Urban migration is afflicting Haiti as well as most of the Latin American countries; Jérémie, the chef-lieu of the Grand-Anse Department, is a
transit from the rural area to Port-au-Prince. If the migrating population is usually very fast to adopt a westernized diet, it is however slow to adopt its health behaviors, particularly dental health behaviors (9). Fort Liberte, the chef-lieu of the Northeast Department, because of urban migration is going through the same changes. The higher mean DMFS score in the urban survey of both Departments could signify that these towns are slowly moving toward urbanization according to the two studies mentioned earlier.

According to a recent study (13) sugar consumption has not increased in Haiti as it has in other developing Caribbean, African and Southeast Asian nations. However, sweets and sugar-based foods are part of the diet of many Haitians just like other Caribbean countries (14). In neighboring countries the use of fluoride in toothpaste, fluoridated water and salt have helped control the incidence, and even reduce the prevalence of dental decay. It is possible that the lower mean DMFS score for both dentitions recorded in Port-au-Prince may be the result of fairly good oral hygiene practices and the use of fluoridated toothpaste. However, Haiti has not yet begun the use of fluoride at the population level and, as explained previously, fluoridated toothpaste is not available nationwide and where available, is not affordable to a sizeable segment of the Haitian population.

An extensive search of the dental literature of the Caribbean from 1961 to 1996 shows that similar national oral health surveys have been conducted in several Caribbean and Central American countries. However, there is some difference in methodology acknowledged by the Pan-American Health Organization (PAHO), which makes it difficult to compare the results of the Haitian survey to some of their findings. The more
recent survey, however, used standard methods developed by PAHO. According to the results of these surveys (12, 20), only two Caribbean countries showed mean DMFT scores as low as those of 12-year-old children in the Haitian survey [0.64 (1.24)]. These scores classify the dental status of these countries [Bermuda in 1989 (DMFT= 0.2) and Antigua and Barbuda in 1988 (DMFT= 0.7)] in the very low decay category.

According to an article published in 1999 in the International Dental Journal on DMFT studies dated from the 1990's, the mean DMFT for 12-year-old Haitian children [0.54 (1.04)] for males and [0.74 (1.44)] for females would place Haiti's DMFT score as the lowest on the American continent. The closest mean DMFT scores are held by countries such as Jamaica (1.1), the United States of America (1.4), Guyana (1.33) Cayman Island (1.7) and Canada (1.8). All of these countries, except Guyana and Puerto Rico, have an active fluoridation program. The mean DMFT of Haiti can be categorized as being very low and fits the profile of undeveloped and developing countries in the early 1980's (14, 20).

The results of this survey show that caries experience in both the permanent and primary dentitions is not very predominant in Haitian school children; however, the burden of untreated decay represents a significant challenge. It is clear that strategies to provide treatment to those with untreated decay need to be rapidly implemented. The survey revealed a need for restorative treatment in both the primary and permanent dentitions. The mean decay is equal or slightly inferior to the mean total DMFS score for each of the surveyed departments, while the mean score for restorations (fillings) is very small.
However, despite the need for restorative treatment to reduce the level of untreated decay, a program solely based on restoration, for several reasons, does not seem to be the most efficient means to reduce the prevalence of dental decay of the 5 to 15 year old Haitian school children. One of the reasons is the fact that, if such a project were to be implemented, maintaining an active restorative program running at the national level would be difficult because of the shortage in Haiti of the needed dental personnel. The Haitian dentist/population ratio is only 0.12 per 10,000, one of the lowest of the Caribbean. Only 20 students (on average) graduate from the only Haitian dental School each year and are sent to perform one year of mandatory social service in government hospitals and health centers throughout the country. This number is insufficient to assess and fulfill the Haitian population’s need for dental care. About 99% of the dental care providers in Haiti are dentists; there is very few dental assistants and hygienists. There are no institutions that offer training for dental assistants and hygienists in Haiti. It is doubtful that a restorative program using the limited number of dentists available in Haiti would be successful, but if implemented, a training component should be part of the program.

Furthermore, the basic equipment needed to run a restorative program is neither available in public and private hospitals, health centers of the chef-lieu and towns of Haiti nor the rural areas. Investing in this equipment would have to be part of the plan. Finally, such a program would be very expensive to maintain, and would not be cost-effective. Thus, although needed, restorative dental care would not be the best solution to control the dental decay of the Haitian school children given the current resource limitations.
These factors emphasize the need for dental public health service aiming, instead, at preventing dental caries among school children. Based on the results of the current survey, such a program should target the most affected geographic Departments; South and Grand-Anse.

The use of fluoride as a means to prevent dental decay is very well documented (15, 16). As a public health tool for preventing dental caries there is no other product that can reach a much greater subset of the population or is as cost effective. Moreover, when used in the water, milk or salt it does not require any cooperation from the individual that benefits from it (16, 21). The use of sealants would not be as cost effective as fluoride, however, studies (18, 19) have shown that when placed adequately, sealant is not only long-lasting (over 4 years), but also very effective in preventing pit and fissure caries in patients with risk factors for occlusal caries.

An alternative treatment approach that could be used along with prevention is a technique known as atraumatic restoration treatment (ART). This technique combines minimal tooth preparation with hand instruments and cavity restoration with glass ionomere placement. When properly performed, this technique exhibits very high survival rates when compared to amalgam restoration over a three-year period (21, 22). This technique presents the same limitations as the conventional restorative treatment, i.e. the lack of trained personnel. Therefore, a training component should be part of this program if ever implemented in Haiti.

The current study is the survey of the dental status of school children of 5-7, 12, and 15 year olds from seven of the nine geographic Departments of Haiti. The results of this survey, however can be generalized to the Haitian children population from 5 to 15
years of age. Although children attendance at school is low in Haiti (about 44% between 1986 and 1990), it should be noted that not the same pool of children goes to school every year. There is a revolving-door system. Because Haitian parents value education, every child will have the opportunity to go to school at least one year. Children going in and out of school every year or other year make the sample very representative. Moreover, the current survey occurred early enough in the scholastic year, and therefore it was possible to examine a representative sample of the Haitian child population.

Additional oral health studies, as well as programs, should be implemented in Haiti in order to:

1) Complete the current study by surveying the two remaining geographic Departments Southeast and Center as well as rural Artibonite for dental caries and fluorosis.

2) Evaluate the dental health status of the other age groups in the population in order to have a complete dental decay and fluorosis picture of the Haitian population.

3) Survey sugar consumption as well as dental health behavior in the Haitian children population as well as adults.

4) Reduce the incidence of dental decay as well as its prevalence, by using the cost effective fluoride and sealant program. A program targeting children from 6 to 12 year olds for topical application of fluoride as a mean of preventing dental decay (Appendix G) was implemented in the area of Jérémie (Haiti) in 1998 by the Haitian Health Foundation, a not-for profit health organization, and could be used as a model. The model was very successful and received a warm welcome from the indigenous population. This program required very few materials as well as little time and expense.
This model could be part of the practice of the social service dentist and could fit easily into their schedule.

5) Survey other oral conditions such as root decay, gingivitis and periodontal disease, oral mucosa lesions, malocclusion and temporo-mandibular joint disorders, etc.
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Table 1. Distribution of the study subjects by gender and age groups

<table>
<thead>
<tr>
<th>Age Strata (years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>5 to 7</td>
<td>305 (46.9)</td>
<td>344 (53.0)</td>
<td>649 (100)</td>
</tr>
<tr>
<td>%</td>
<td>36.40%</td>
<td>33.50%</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>287 (46.9)</td>
<td>324 (53.1)</td>
<td>611 (100)</td>
</tr>
<tr>
<td>%</td>
<td>34.20%</td>
<td>31.50%</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>247 (40.7)</td>
<td>360 (59.3)</td>
<td>607 (100)</td>
</tr>
<tr>
<td>%</td>
<td>29.40%</td>
<td>35.00%</td>
<td></td>
</tr>
<tr>
<td>All ages</td>
<td>839</td>
<td>1028</td>
<td>1867</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999.
Table 2. Distribution of the study subjects by gender and urban/rural status

<table>
<thead>
<tr>
<th>Urban/rural Status</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
</tr>
<tr>
<td>Urban</td>
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<td>42.8</td>
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<td>71.10%</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>34.80%</td>
<td></td>
<td>28.90%</td>
</tr>
<tr>
<td>Total</td>
<td>839</td>
<td>44.9</td>
<td>1028</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.
Table 3. Distribution of the study subjects by gender and met/ur/ru status

<table>
<thead>
<tr>
<th>Met/ur/ru</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n</td>
</tr>
<tr>
<td>Port-au-Prince</td>
<td>111 (32.2)</td>
<td>233 (67.8)</td>
<td>344 (18.4)</td>
</tr>
<tr>
<td>Urban</td>
<td>436 (46.6)</td>
<td>498 (53.4)</td>
<td>934 (50.0)</td>
</tr>
<tr>
<td>Rural</td>
<td>292 (49.5)</td>
<td>297 (50.5)</td>
<td>589 (31.5)</td>
</tr>
<tr>
<td>Total</td>
<td>839 (44.9)</td>
<td>1028 (55.1)</td>
<td>1867</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL-CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.
### Table 4. Distribution of study subjects by gender and geographic Department

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Artibonite</th>
<th>GrandAnse</th>
<th>All geo Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of male/N</td>
<td>10.20%</td>
<td>6.20%</td>
<td>6.20%</td>
<td>6.20%</td>
<td>4.00%</td>
<td>3.60%</td>
<td>8.60%</td>
<td>44.90%</td>
</tr>
<tr>
<td></td>
<td>190 (35.3)</td>
<td>115 (45.8)</td>
<td>115 (46.0)</td>
<td>115 (42.3)</td>
<td>75 (47.8)</td>
<td>68 (51.5)*</td>
<td>161 (60.3)</td>
<td>839 (100%)</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td>348 (64.7)</td>
<td>136 (54.2)</td>
<td>135 (54)</td>
<td>157 (57.7)</td>
<td>82 (52.2)</td>
<td>64 (48.5)*</td>
<td>106 (39.7)</td>
<td>1028 (100%)</td>
</tr>
<tr>
<td>% of female/N</td>
<td>18.60%</td>
<td>7.30%</td>
<td>7.20%</td>
<td>8.40%</td>
<td>4.40%</td>
<td>3.40%</td>
<td>5.70%</td>
<td>55.10%</td>
</tr>
<tr>
<td></td>
<td>1028 (100)</td>
<td>251 (100)</td>
<td>250 (100)</td>
<td>272 (100)</td>
<td>157 (100)</td>
<td>132 (100)*</td>
<td>267 (100)</td>
<td>1867 (100%)</td>
</tr>
<tr>
<td><strong>Both</strong></td>
<td>538 (100)</td>
<td>251 (100)</td>
<td>250 (100)</td>
<td>272 (100)</td>
<td>157 (100)</td>
<td>132 (100)*</td>
<td>267 (100)</td>
<td>1867 (100%)</td>
</tr>
<tr>
<td>% of both sex</td>
<td>28.80%</td>
<td>13.50%</td>
<td>13.40%</td>
<td>14.60%</td>
<td>8.40%</td>
<td>7.00%</td>
<td>14.30%</td>
<td></td>
</tr>
</tbody>
</table>

* Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.
Table 5. Mean DMFS and standard deviation by gender and age group

<table>
<thead>
<tr>
<th>Age Strata (years)</th>
<th>n</th>
<th>Male Mean (SD)</th>
<th>Female Mean (SD)</th>
<th>P Value *</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>649</td>
<td>0.15 (0.8)</td>
<td>0.20 (0.9)</td>
<td>0.4</td>
</tr>
<tr>
<td>12</td>
<td>611</td>
<td>0.88 (1.9)</td>
<td>1.12 (2.5)</td>
<td>0.2</td>
</tr>
<tr>
<td>15</td>
<td>607</td>
<td>2.72 (5.3)</td>
<td>2.20 (4.0)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.

* By ANOVA
### Table 6. Mean DMFS and standard deviation by gender and urban/rural status.

(all ages combined)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>0.87 (2.3)</td>
<td>1.05 (2.5)</td>
<td>0.2</td>
</tr>
<tr>
<td>Rural</td>
<td>1.65 (4.5)</td>
<td>1.48 (3.5)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

The dental caries prevalence of 5, 6, 7, 12 and 15 year old school children in Haiti. WHO/PAHO, HBOHS 1999.

*by ANOVA
Table 7. Mean DMFS and standard deviation by gender and metropolitan/urban/rural status (all age groups combined)

<table>
<thead>
<tr>
<th>Met/ur/ru</th>
<th>Male Mean (SD)</th>
<th>Female Mean (SD)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port-au-Prince n =344</td>
<td>0.35 (0.9)</td>
<td>1.15 (2.8)</td>
<td>0.04*</td>
</tr>
<tr>
<td>Urban n =934</td>
<td>1.01 (2.6)</td>
<td>1.01 (2.4)</td>
<td>0.9</td>
</tr>
<tr>
<td>Rural n =589</td>
<td>1.65 (4.5)</td>
<td>1.48 (3.5)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.

*by ANOVA
Table 8. Mean DMFS and standard deviation by gender and geographic Department. (both genders combined)

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West Mean (SD)</th>
<th>North Mean (SD)</th>
<th>Northwest Mean (SD)</th>
<th>South Mean (SD)</th>
<th>Northeast Mean (SD)</th>
<th>Artibonite Mean (SD)</th>
<th>GrandAnse Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.8 (2.2)</td>
<td>0.6 (2.6)</td>
<td>1.18 (2.8)</td>
<td>2.52 (5.8)</td>
<td>0.54 (1.5)</td>
<td>0.55 (1.8)*</td>
<td>1.74 (5.3)</td>
</tr>
<tr>
<td>Female</td>
<td>1.30 (3.2)</td>
<td>1.05 (2.4)</td>
<td>0.91 (2.7)</td>
<td>1.42 (3.1)</td>
<td>1.53 (3.5)</td>
<td>0.79 (1.7)*</td>
<td>1.25 (2.7)</td>
</tr>
</tbody>
</table>

*Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI

WHO/PAHO, HBOHS 1999.

n= 1867
Table 9  Mean DMFS and standard deviation by geographic department and age group (both genders combined)

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Artibonite</th>
<th>GrandAnse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age strata (years)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>5 to 7</td>
<td>0.17 (0.5)</td>
<td>0.006 (0.2)</td>
<td>0.13 (1.0)</td>
<td>0.18 (0.8)</td>
<td>0.70 (1.9)</td>
<td>0.009 (0.3)</td>
<td>0.15 (0.7)</td>
</tr>
<tr>
<td>12</td>
<td>1.15 (2.6)</td>
<td>0.72 (1.7)</td>
<td>0.86 (1.2)</td>
<td>1.34 (2.5)</td>
<td>0.88 (2.5)</td>
<td>0.40 (1.2)</td>
<td>1.27 (2.1)</td>
</tr>
<tr>
<td>15</td>
<td>2.18 (4.15)</td>
<td>1.88 (3.9)</td>
<td>2.43 (4.3)</td>
<td>3.69 (6.4)</td>
<td>1.60 (3.5)</td>
<td>1.55 (2.6)</td>
<td>3.43 (7.0)</td>
</tr>
</tbody>
</table>

* Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.

n = 1867
<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Artibonite</th>
<th>GrandAnse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Rural</td>
<td>1.59 (3.6)</td>
<td>1.51 (3.4)</td>
<td>1.47 (3.8)</td>
<td>3.73 (7.6)</td>
<td>0.64 (2.4)</td>
<td>*</td>
<td>1.02 (2.9)</td>
</tr>
<tr>
<td>Urban</td>
<td>0.89 (2.4)</td>
<td>0.54 (1.9)</td>
<td>0.80 (1.9)</td>
<td>1.36 (2.9)</td>
<td>1.45 (3.0)</td>
<td>0.67 (1.8)</td>
<td>1.34 (3.1)</td>
</tr>
</tbody>
</table>

* Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI

n = 1867
Table 11. Mean DMFS and standard deviation by age group and urban/rural status (both genders combined)

<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Urban</th>
<th>Rural</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>0.18  (0.8)</td>
<td>0.19  (0.9)</td>
<td>0.8</td>
</tr>
<tr>
<td>12</td>
<td>0.91  (2.1)</td>
<td>1.19  (2.4)</td>
<td>0.1</td>
</tr>
<tr>
<td>15</td>
<td>3.45  (6.2)</td>
<td>1.93  (3.5)</td>
<td>0.01*</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAAHO, HBOHS 1999. * by ANOVA n =1867
Table 12. Mean DMFS and standard deviation by age group and metropolitan/urban/rural status. (both genders combined)

<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Port-au-Prince Mean (SD)</th>
<th>Urban Mean (SD)</th>
<th>Rural Mean (SD)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>0.20 (0.6)</td>
<td>0.16 (0.9)</td>
<td>0.19 (0.9)</td>
<td>0.9</td>
</tr>
<tr>
<td>12</td>
<td>0.85 (2.3)</td>
<td>0.93 (2.1)</td>
<td>1.19 (2.4)</td>
<td>0.3</td>
</tr>
<tr>
<td>15</td>
<td>1.70 (3.4)(^a)</td>
<td>2.24 (4.6)(^b)</td>
<td>3.45 (6.2)(^a)</td>
<td>0.01*</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999.
Means with the same letter superimposed are statistically significant at \( p < 0.05 \)
* by ANOVA

n = 1867
<table>
<thead>
<tr>
<th></th>
<th>Geo/Dpt</th>
<th>North</th>
<th>NorthWest</th>
<th>South</th>
<th>Northeast</th>
<th>Anhui</th>
<th>Grand Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>DMFS</td>
<td>0.80(2.2)</td>
<td>1.00(2.8)</td>
<td>0.60(2.6)</td>
<td>1.08(2.4)</td>
<td>1.18(2.8)</td>
<td>0.91(2.7)</td>
<td>2.52(5.8)</td>
</tr>
<tr>
<td>Decay</td>
<td>0.58(1.6)</td>
<td>0.92(2.3)</td>
<td>0.60(2.6)</td>
<td>0.86(1.9)</td>
<td>0.87(2.1)</td>
<td>0.83(2.6)</td>
<td>2.10(5.1)</td>
</tr>
<tr>
<td>Missing</td>
<td>0.21(1.1)</td>
<td>0.39(1.7)</td>
<td>0.00(0.0)</td>
<td>0.18(1.2)</td>
<td>0.30(1.4)</td>
<td>0.07(0.6)</td>
<td>0.41(1.5)</td>
</tr>
<tr>
<td>Filled</td>
<td>0.09(0.2)</td>
<td>0.22(0.3)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.02(0.3)</td>
</tr>
</tbody>
</table>

THE DENTAL CAVITY PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN CHINA. WHO/DAPIQ/HGBS 1999.
Table 14. Mean DMFS and permanent decayed, missing and filled surfaces by Metropolitan/urban and rural status (all age groups combined)

<table>
<thead>
<tr>
<th>Met/ur/ru</th>
<th>Port-au-Prince</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>DMFS</td>
<td>0.35 (0.90)</td>
<td>1.15 (2.80)</td>
<td>1.13 (3.52)</td>
</tr>
<tr>
<td>Decay</td>
<td>0.34 (0.90)</td>
<td>0.80 (1.938)</td>
<td>0.81 (2.07)</td>
</tr>
<tr>
<td>Missing</td>
<td>0.09 (0.94)</td>
<td>0.30 (1.48)</td>
<td>0.19 (1.23)</td>
</tr>
<tr>
<td>Filled</td>
<td>0.00 (0.00)</td>
<td>0.003 (0.35)</td>
<td>0.000 (0.00)</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.
Table 15. Mean dmfs and standard deviation by gender for 5 to 7 year olds.

<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Male</th>
<th>Female</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>3.22 (6.7)</td>
<td>3.01 (6.0)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999. n =649
*by ANOVA
Table 16. Mean dmfs and standard deviation by gender and urban/rural status for 5 to 7 year olds

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>3.10 (7.0)</td>
<td>2.83 (6.2)</td>
<td>0.6</td>
</tr>
<tr>
<td>Rural</td>
<td>3.46 (5.9)</td>
<td>3.44 (5.7)</td>
<td>0.9</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999.

n = 649

*by ANOVA
Table 17. Mean dmfs, standard deviation by gender and metropolitan/urban/rural status for 5 to 7 year olds

<table>
<thead>
<tr>
<th>Local</th>
<th>Male</th>
<th>Female</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td></td>
</tr>
<tr>
<td>Port-au-Prince</td>
<td>2.46 (5.2)</td>
<td>2.60 (7.0)</td>
<td>0.9</td>
</tr>
<tr>
<td>Urban</td>
<td>3.32 (7.5)</td>
<td>2.93 (5.8)</td>
<td>0.6</td>
</tr>
<tr>
<td>Rural</td>
<td>3.46 (5.9)</td>
<td>3.44 (5.6)</td>
<td>0.9</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999.

n = 649

* by ANOVA
Table 18. Mean dmfs and standard deviation by gender and geographic Department for 5 to 7 year olds.

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Artibonite</th>
<th>GrandAnse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
</tr>
<tr>
<td>Male</td>
<td>2.48 (5.0)</td>
<td>1.80 (4.4)</td>
<td>2.75 (5.6)</td>
<td>3.96 (8.5)</td>
<td>4.08 (5.8)</td>
<td>3.22 (6.0)</td>
<td>4.88 (9.3)</td>
</tr>
<tr>
<td>Female</td>
<td>3.14 (6.7)</td>
<td>1.89 (6.7)</td>
<td>1.71 (3.5)</td>
<td>4.58 (7.7)</td>
<td>3.78 (5.7)</td>
<td>1.72 (3.2)</td>
<td>3.39 (3.9)</td>
</tr>
</tbody>
</table>

*Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999. n = 649
Table 19. Mean dmfs and standard deviation by geographic department for 5 to 7 year olds.

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Artibonite</th>
<th>GrandAnse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age strata (years)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
<td>Mean (sd)</td>
</tr>
<tr>
<td>5 to 7</td>
<td>2.90 (6.1)</td>
<td>1.83 (5.4)</td>
<td>2.18 (4.6)</td>
<td>4.35 (8.0)</td>
<td>3.93 (5.7)</td>
<td>2.47 (4.8)</td>
<td>4.28 (7.6)</td>
</tr>
</tbody>
</table>

* Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHOPAHO, HBOHS 1999.  

n = 649
Table 20. Mean dmfs and standard deviation by geographic Department and urban/rural status for the 5 to 7 year olds

<table>
<thead>
<tr>
<th>Geo Dept (GD)</th>
<th>Location</th>
<th>West Mean (sd)</th>
<th>North Mean (sd)</th>
<th>Northwest Mean (sd)</th>
<th>South Mean (sd)</th>
<th>Northeast Mean (sd)</th>
<th>Artibonite* Mean (sd)</th>
<th>GrandAnse Mean (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
<td>3.59 (5.6)</td>
<td>3.37 (5.6)</td>
<td>3.58 (6.6)</td>
<td>6.82 (10.3)</td>
<td>3.93 (5.7)</td>
<td>*</td>
<td>2.02 (3.0)</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>2.54 (6.3)</td>
<td>1.21 (5.2)</td>
<td>1.45 (3.0)</td>
<td>3.75 (7.3)</td>
<td>4.34 (6.7)</td>
<td>2.47 (4.8)</td>
<td>6.08 (9.5)</td>
</tr>
<tr>
<td></td>
<td>5 to 7</td>
<td>2.90 (6.1)</td>
<td>1.83 (5.4)</td>
<td>2.18 (4.6)</td>
<td>4.35 (8.0)</td>
<td>3.93 (5.7)</td>
<td>2.47 (4.8)</td>
<td>4.28 (7.6)</td>
</tr>
</tbody>
</table>

* Artibonite (urban sample only)

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999. n =649
Table 21. Mean dmfs and standard deviation by urban/rural status for 5 to 7 year olds.

<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Urban Mean (sd)</th>
<th>Rural Mean (sd)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>2.96 (6.5)</td>
<td>3.45 (5.8)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.

by ANOVA
<table>
<thead>
<tr>
<th>Age strata (years)</th>
<th>Port-au-Prince Mean (sd)</th>
<th>Urban Mean (sd)</th>
<th>Rural Mean (sd)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7</td>
<td>2.54 (6.3)a</td>
<td>3.11 (6.7)</td>
<td>3.45 (5.81)a</td>
<td>0.4*</td>
</tr>
</tbody>
</table>

Mean dmfs and standard deviation by metropolitan/urban/rural status for 5 to 7 year olds.

Means with the same letter superimposed are statistically significant at p < 0.05 by ANOVA.

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI
WHO/PAHO, HBOHS 1999.
n =649
Table 23. Mean dmfs and primary decayed, missing and filled surfaces by geographic Department (all ages combined)

<table>
<thead>
<tr>
<th>Geo Dept</th>
<th>West</th>
<th>North</th>
<th>Northwest</th>
<th>South</th>
<th>Northeast</th>
<th>Antanan</th>
<th>Grand Ave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>DMFS</td>
<td>0.95(3.2)</td>
<td>1.09(4.1)</td>
<td>0.86(3.1)</td>
<td>0.53(3.6)</td>
<td>1.20(3.7)</td>
<td>0.76(2.4)</td>
<td>1.14(4.8)</td>
</tr>
<tr>
<td>Decay</td>
<td>0.95(3.2)</td>
<td>1.04(3.9)</td>
<td>0.86(3.1)</td>
<td>0.53(3.6)</td>
<td>1.17(3.7)</td>
<td>0.76(2.4)</td>
<td>1.14(4.8)</td>
</tr>
<tr>
<td>Missing</td>
<td>0.00(0.0)</td>
<td>0.05(1.8)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.04(0.4)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
</tr>
<tr>
<td>Filled</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
<td>0.00(0.0)</td>
</tr>
</tbody>
</table>

THE DENTAL CARES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HATTI
Table 24. Mean number of dmfs and decayed, missing, and filled surfaces for metropolitan/urban/rural in the primary dentition (all ages combined)

<table>
<thead>
<tr>
<th>Met/ur/ru</th>
<th>Port-au-Prince</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male Mean (sd)</td>
<td>Female Mean (sd)</td>
<td>Male Mean (sd)</td>
</tr>
<tr>
<td>dmfs</td>
<td>0.93 (3.21)</td>
<td>1.09 (4.10)</td>
<td>1.25 (4.73)</td>
</tr>
<tr>
<td>Decayed</td>
<td>0.93 (3.21)</td>
<td>1.04 (3.96)</td>
<td>1.20 (4.47)</td>
</tr>
<tr>
<td>Missing</td>
<td>0.000 (0.00)</td>
<td>0.054 (1.01)</td>
<td>0.057 (0.86)</td>
</tr>
<tr>
<td>Filled</td>
<td>0.000 (0.00)</td>
<td>0.000 (0.00)</td>
<td>0.000 (0.00)</td>
</tr>
</tbody>
</table>

* All ages

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999.
Table 25. Mean DMFT and standard deviation by gender and age groups (all regions combined)

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male Mean (SD)</th>
<th>Female Mean (SD)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7 yo</td>
<td>0.008 (0.33)</td>
<td>0.14 (0.84)</td>
<td>0.1</td>
</tr>
<tr>
<td>12 yo</td>
<td>0.54 (1.04)</td>
<td>0.74 (1.44)</td>
<td>0.4</td>
</tr>
<tr>
<td>15 yo</td>
<td>1.51 (2.69)</td>
<td>1.32 (2.04)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999. n = 1867

*by ANOVA
Table 26. Mean dmft and standard deviation by gender and age group
(all regions combined)

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Male Mean (sd)</th>
<th>Female Mean (sd)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 to 7 yo</td>
<td>1.72 (2.84)</td>
<td>1.83 (2.92)</td>
<td>0.6</td>
</tr>
<tr>
<td>12 yo</td>
<td>0.17 (0.81)</td>
<td>0.10 (0.41)</td>
<td>0.1</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAI
WHO/PAHO, HBOS 1999. n = 1260

*by ANOVA
Table 27. Mean DMFT and standard deviation by gender and metropolitan/urban/rural (all age groups combined)

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port-au-Prince</td>
<td>0.51 (1.1)</td>
<td>0.73 (1.5)</td>
<td>0.1</td>
</tr>
<tr>
<td>Urban</td>
<td>0.61 (1.5)</td>
<td>0.68 (1.4)</td>
<td>0.4</td>
</tr>
<tr>
<td>Rural</td>
<td>0.88 (2.3)</td>
<td>0.95 (1.9)</td>
<td>0.5</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HA WHO/PAHO, HBOHS 1999.

n =1867

*by ANOVA
Table 28. Mean dmft and standard deviation by gender and metropolitan/urban/rural (all age groups combined)

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port-au-Prince</td>
<td>0.57 (1.7)</td>
<td>0.63 (2.0)</td>
<td>0.2</td>
</tr>
<tr>
<td>Urban</td>
<td>0.65 (2.0)</td>
<td>0.65 (1.8)</td>
<td>0.9</td>
</tr>
<tr>
<td>Rural</td>
<td>0.85 (1.9)</td>
<td>0.65 (1.9)</td>
<td>0.7</td>
</tr>
</tbody>
</table>

THE DENTAL CARIES PREVALENCE OF 5, 6, 7, 12 AND 15 YEAR OLD SCHOOL CHILDREN IN HAITI WHO/PAHO, HBOHS 1999. n = 1867

by ANOVA
WHO GUIDELINES FOR A BASIC ORAL HEALTH SURVEY


"Pathfinder" surveys

Pathfinder surveys can be either pilot or national, depending on the number and type of sampling sites and the age groups included.

A pilot survey is one that includes only the most important subgroups in the population and only one or two index ages, usually 12 and one other age group. Such a survey provides the minimum amount of data needed to commence planning. Additional data should then be collected in order to provide a reliable baseline for the implementation and monitoring of services.

A national pathfinder survey incorporates sufficient examination sites to cover all important subgroups of the population that may have differing disease levels or treatment needs, and at least three of the age groups or index ages (see page 7). This type of survey design is suitable for collection of data for planning and monitoring of services in all countries whatever the level of disease, availability of resources, or complexity of services. In a large country with many geographic and population subdivisions and a complex service structure, a larger number of sampling sites is needed. The basic principle of using index ages and standard samples in each site within a stratified approach, however, remains valid.

The following method is recommended as a general guideline for basic oral health surveys for the planning, monitoring and evaluation of oral care services.
Subgroups: The number and distribution of sampling sites depend upon the specific objectives of the study. Sampling sites are usually chosen so as to provide information on population groups likely to have different levels of oral disease. The sampling is usually based on the administrative divisions of a country - the capital city, main urban centers, and small towns or rural areas. In countries where there are different geophysical areas, it is usual to include at least one sample site in each area type.

If there are several distinct ethnic groups in the population with known, or suspected, differences in levels of oral disease, it may be necessary to include separate samples of each of these groups in the main subdivisions for the survey. However, maximum use should be made of available knowledge about variations between the different groups in order to limit the number of additional subsamples needed. Once the different groups are decided upon, application of random sampling of subjects within the groups is desirable.

The assistance of local health administrators can be very useful when the final decision is made as to which population subgroups are significant for the study and should be represented in the final sample. For a national pathfinder survey, between 10 and 15 sampling sites are usually sufficient. If, however, there are large urban centers in the country, it may be necessary to locate several additional sampling sites in at least two cities.

Index ages and age groups. The following ages and age groups are recommended: 5 years for primary teeth and 12, 15, 35-44 and 65-74 years for permanent teeth.
a) 5 years: Where it is practical and feasible, children should e examined between their 5th and 6th birthdays. This age is of interest in relation to levels of caries in the primary dentition, which may exhibit changes over a shorter time span than the permanent dentition at other index ages. In some countries 5 years is also the age at which children begin primary school.

Note: In countries where school entry is later, e.g. at 6 or 7 years, these ages can be used, though the mean age should be reported with the results. In these older age groups, missing primary incisor teeth should not be scored as missing because of the difficulty in differentiating between primary incisors lost due to exfoliation and those lost because of caries or trauma.

b) 12 years: This age is especially important, as it is generally the age at which children leave primary school, and therefore in many countries, is the last age at which a reliable sample may be obtained easily through the school system. Also, it is likely at this age that all permanent teeth, except third molars, will have erupted. For these reasons, 12 years has been chosen as the global monitoring age for caries for international comparisons and monitoring of disease trends.

In some countries, however, many school-age children do not attend school. In these circumstances, an attempt should be made to survey two or three groups of non-attenders, from different areas, in order to compare their oral health status with that of children attending school.

c) 15 years: At this age the permanent teeth have been exposed to the oral environment for 3-9 years. The assessment of caries prevalence is therefore often more meaningful than at 12 years of age. This age is also important for the
assessment of periodontal disease indicators in adolescents. In countries where it is
difficult to obtain reliable samples of this age group, it is usual to examine 15-year-
olds in two or three areas only, i.e. in the capital city or other large town and in one
rural area.

d) 35-44 years (mean = 40 years). This age group is the standard monitoring
group for health conditions of adults. The full effect of dental caries, the level of
severe periodontal involvement, and general effects of care provided can be
monitored using data for this age group. Sampling adult subjects is often difficult.
Samples can, however, be drawn from organized groups, such as office or factory
workers. Use may also be made of readily accessible groups, e.g. at a market, to
obtain a reasonably representative sample in situations where truly representative
sampling is not feasible. Care must be taken to avoid obvious bias, such as sampling
patients at medical care facilities.

e) 65-74 years (mean = 70 years). This age group has become more important
with the changes in age distribution and increases in life-span that are now occurring
in all countries. Data for this group are needed both for planning appropriate care for
the elderly and for monitoring the overall effects of oral care services in a population.
Examination of representative members of this age group is often not as difficult as
for the previous age group, as elderly people are more likely to be found in or near
their homes, or in day centers or institutions and can therefore be examined during the
day. Nevertheless, care should be taken to sample adequately both house-bound and
active members of this age group.
Number of subjects. The number of subjects in each index age group to be examined ranges from minimum 25 to 50 for each cluster or sampling site, depending on the expected prevalence and severity of oral disease.

A sample of a sample design for a national pathfinder survey for each index age or age group is as follows:

**Urban**
- 4 sites in the Capital City or metropolitan area
  - \((4 \times 25 = 100)\)
- 2 sites in each of 2 large towns
  - \((2 \times 2 \times 25 = 100)\)

**Rural**
- 1 site in each of 4 villages in different regions
  - \((4 \times 25 = 100)\)

**Total**
- 12 sites x 25 subjects \(= 300\)

If this cluster distribution is applied to four index ages in the population under study, the total sample is \(4 \times 300 = 1200\).

Such a sample design permits the identification of significant differences between urban and rural groups and, in certain situations, between different socioeconomic groups in the Capital City or large towns. Areas where the disease prevalence is either much higher or much lower than the national average may also be identified from the results of such a survey.
However, a total 25 subjects, with approximately equal numbers of females and males, is sufficient only in populations where caries and periodontal disease levels are estimated to be low or very low. In populations where these disease levels are known to be moderate or high - e.g. the percentage of caries-free 12-year-olds is 5-10% or lower - the standard size for each sample should be 40-50 subjects.

If the level of dental caries in the population is unknown, it will be necessary to estimate the level of disease before starting a survey. A rapid and effective way of estimating the prevalence of caries in a population is by classifying a group of subjects as caries-free or not. For example, it should be possible to examine two or three classes of 12-year-olds of different socioeconomic levels, in two or three local, easily accessible schools, where the widest possible differences in disease may be expected. If more than 20% of the children in the class are caries-free, the caries prevalence is low; if 5-20% are caries-free, the prevalence is moderate; and if fewer than 5% are caries-free, the prevalence is high. This estimate of prevalence may then be used as a guide when deciding on standard sample size and when completing the protocol.
APPENDIX B

LIST OF RANDOMLY DRAWN SCHOOLS

A- WEST REGION: Port-au-Prince, Kenskoff, Croix-des-Bouquets

1- Ecole Nationale République du Liberia
    12, 1ère Impasse Lavaud

2- Collège Joyeux Départ
    Ruelle Alerte

3- Institution Primaire de Carrefour Feuille
    49 A, Impasse Eddy

4- Institution du Sacré Cœur de Turgeau
    44, Avenue Jean Paul II

5- Ecole Nationale du Canada
    3, Rue du Foyer, Delmas 3

6- Collège de Côte Plage
    Rue Tovar et Côte Plage, Carrefour

7- Ecole des Filles de la Sagesse
    Route de Frères et Rue Sœur, Pétion Ville

8- Ecole Nationale Marie Louise de Jésus
    Kenskoff

9- Lycée Marie Jeanne
    12, Impasse Lavaud

10 - Collège Cacique Henry
    18, Avenue Magloire Ambroise
11-Ecole Cœur Immaculée de Marie
   2ème Avenue du Travail

12- Nouveau Collège Moderne
   86, Rue Lafleur Duchène

13- Grand Collège l’Humanisme (Annexe)
   2, Delmas 60

14- Ecole Mixte le Bon Berger
   193, Corridor Djo, Croix des Missions

15- Institution Roseraie
   Rue Grande Plaine, Croix des Bouquets

---

B- NORTH REGION: Cap-Haïtien, Milot

16- Ecole Nationale Notre Dame d’Altagrâce
   444 bis, Bel Air, Cap Haïtien

17- Ecole Nationale Charles Lebosse
   Rue 20 H, Cap Haïtien

19- Collège Mixte Mont Bel Air
   56, Rue Anténor Firmin, Cap Haïtien

20- Collège Le Phare
   Rue Jean Marie Vincent, Cap Haïtien

21- Ecole Henriette Saint Marc
   Avenue Baden P. Sainte Philomène, Cap Haïtien

22- Ecole Presbytériale Saint Denis
33, Rue 24, Cap Haïtien

23- Ecole Amour Fraternel
   Église du Christ, Petite Anse

24- Ecole Nationale de Fort Bourgeois
   Fort Bourgeois, Bande du Nord

25- Centre Saint Vincent de Paul
   Haut du Cap

26- Collège Mixte de Parrois
   Quartier Morin

27- Ecole Nationale de Campêche
   Campêche, Limonade

28- Ecole Immaculée Conception de Limonade
   29, Rue Républicaine, Limonade

29- Ecole Nationale Sacré Cœur
   Rue 2K-L La Fossette, Cap Haïtien

30- Lycée Jean baptiste Boukman
   Rue 17 L-O, Cap Haïtien

31- Lycée Henry Christophe
   Rue Républicaine, Milot

32- Ecole Cœur Immaculée de Marie
   Rue du Calvaire, Milot

33- Ecole Presbytère Saint Joseph de Milot
   Rue Geffrard, Milot
C- NORTH-WEST REGION: Port-de-Paix, Jean-Rabel, La Tortue Island

34- Ecole Nationale Richard Brisson
   Rue Parisse, Port-de-Paix

35- Ecole Nationale Amélia Jean Baptiste
   168, Rue du Quai, Port-de-Paix

36- Ecole Nationale Notre Dame de Fatima
   Rue Bénito Sylvain, Port-de-Paix

37- Ecole Évangélique de Jérusalem
   135 bis, Rue Bénito Sylvain, Port-de-Paix

38- Institution Mixte Arche de l'Alliance
   Rue Champ d'Aviation, Port-de-Paix

39- Ecole Amour en Action
   Rue Telfort

40- Collège Chrétien de Dolciné
   Dolciné, La Pointe

41- Ecole Communautaire de La Pointe
   La Pointe

42- Lycée Tertulien Guibaud
   Rue Charlemagne Péralté

43- Collège Immaculée de Marie
   Rue 12, Rue Bénito Sylvain

44- Ecole Classique du Nord-Ouest
   29, Rue Monfort, Port-de-Paix
APPENDIX B

45- Collège La Sainte Famille.
    Lavaud, La Pointe

46- Ecole Nationale Dominique Savio
    Rue Sténio Vincent, Jean Rabel

47- Ecole Adventiste de Jean Rabel
    Grand Rue, Jean Rabel

48- Institut Moderne Frères Perrier
    Rue Sténio Vincent

49- l’Ecole Saint Joseph
    Rue du Quai, Jean Rabel

50- College secondaire Des Freres
    Palmiste, La Tortue

51-Ecole primaire des Palmistes
    Palmiste, La Tortue

D- SOUTH REGION: Cayes, Aquin/Cavaillon

52- Ecole Nationale Dumarsais Estimé
    2. Avenue Cartagéna, Cayes

53- Ecole La Foi Chrétienne
    Rue Prospère Faure, Cayes

54- Ecole Nationale Marie Immaculée
    Rue Général Marion

55- Ecole Nationale Sainte Famille
Rue Monseigneur Maurice, Cayes

56- Ecole Lysius Félicité Salomon Jeune

2, Rue du Peuple, Cayes

57- Ecole Évangélique du Nazaréen

Rue Trois Frères Rigaud, Cayes

58- Ecole Nationale de Laborde

Laborde

59- Ecole Nationale Saint Michel de Charpentier

Charpentier, Laurent

60- Ecole Bon Berger de Lagandray

Lagandray, Laurent

61- Ecole Évangélique Béthanie

Charpentier, Laurent

62- Lycée Philippe Guerrier

Rues Maurice et Anderson, Cayes

63- Collège Les Professeurs Réunis

142, Rue Nicolas Geffrard, Cayes

64- Ecole Nationale Mixte d’Aquin

Rue Égalité

65- Ecole Primaire Charlemagne Peralte

Avenue François Vaval

66- Ecole Notre-Dame de la Mère d’Aquin

Rue David Saint Preux
APPENDIX B

67- Ecole Bon Samaritain D'Aquin
    Route Nationale # 2

E- NORTH-EAST REGION: Fort-Liberte, Trou du Nord

68- Ecole Notre Dame du Perpetuel Secour
    Sicar, Fort-Liberte

69- Echo du Calvaire
    Rue Stenio Vincent

70- Pratique du Nord-Est
    126 rue du Quai

71- College Mixte St Joseph
    Rue La Paix

72- Ecole Secondaire de Terrier Rouge
    Terrier Rouge route nationale

73-Nlle Mixte P.M. Trou du Nord
    Calvaire, Trou du Nord

74-Congreganiste Nationale Dominique Savio
    Rue Samson, Trou du Nord

75- College le Falmbeau
    Rue Alexandre, Trou du Nord

F- ARTIBONITE REGION: St Marc, Gonaïves

76- Ecole Nationale Armand Thoby
APPENDIX B

122, Rue Louverture, Saint Marc

77- Ecole Les Amants du Savoir

68, Rue Pivert, St Marc

78- Ecole Antoinette Dessalines

Rue Louverture/Normil Charles

79- Ecole Le Bon Semeur

68, Rue Désir Fleurenceau, Saint Marc

80- Ecole Primaire Mixte de Jérusalem

90, Cité Larose, Pivert, Saint Marc

81- Lycée Sténio Vincent

402, Avenue Gabart, Saint Marc

82- Ecole Nationale St Val Roy

12, Rue Vernet, Gonaïves

83- Ecole Nationale St Pierre Claver

129, Rue Louverture, Gonaïves

84- Collège Moderne des Gonaïves

58, Rue Christophe, Gonaïves

85- Ecole Maranatha

13, Cité Résidentielle, Gonaïves

86- Collège Philippe Guerrier

Gatereau 99, Route Nationale, Gonaïves

87- La Nouvelle Semence de Gonaïves

41, Rue Julce, Gonaïves
88- Lycée Fabre Geffrard des Gonaïves
   15, Rue Paul Eugène Magloire, Gonaïves

89- Collège Emile Roumer
   13, Ruelle Saint Jean, Gonaïves

90-Ecole Roi Henry Christophe
   1ère Ruelle Roland, Gonaïves

G- GRANDE-ANSE REGION: Jeremie, Bonbon, Au-Bac/Gebeau,

Miragoane

91- Ecole Nationale Hortensius Merlet
   Rue Edmond Laforest, Jérémie

92 -Ecole Nationale Père Fouquet
   Source d’Hommage, Jérémie

93- Ecole Nationale Saint Martin de Porrès
   Jérémie

94- Ecole Nationale Frère Paulin
   2,Rue Guerrier Moussignac, Jérémie

95- Ecole Martin Luther King
   145, Rue Sténio Vincent, Jérémie

96- Collège les Enfants de Lumière
   Jérémie

97- Collège Péniel
   Rues Alexandre Pétion et Eugène, Jérémie
APPENDIX B

98- Collège Béthanie
    19, Avenue Emile Roumer, Jérémie

99- Ecole Bon Samaritain
    42, Rue Dr. Hyppolite, Jérémie

100- College Sacré-Coeur
    La Source d’Hommage, Jeremie

101- Ecole Saint Pierre
    Marfranc

102- Collège Saint Louis
    Rue Kersy Philidor, Bonbon

103- Ecole Presbyterale
    Bonbon

104- l’Ecole Nationale Notre Dame de Lourdes
    Miragoâne

105- Ecole Sainte Thérèse de Miragoâne
    Miragoâne

106- Collège Union Baptiste
    Miragoâne

107- Ecole Notre Dame de Lourdes
    Rue Bel Air, Miragoâne

108- Lycée Jacques Prévert
    Route Colonia, Miragoâne
From: Research Committee of the Dental School of the Haitian State University
To the: Principal of the school

Sir, Ms.,

The Research Committee of the Dental School of the Haitian State University presents you their compliments and takes this opportunity to inform you that your school has been chosen to participate in the first national survey on the “Prevalence of Dental Decay and Fluorosis in Haitian school children”. The chosen age groups range from 5 to 15 years.

Your school will be soon visited by a group of dentist from the Haitian State University’s Dental School, the School of Dental Medicine of the University of Connecticut and the University of Meharry Medical School. These dentists will perform oral examination on children of the designated age groups in order to create the first national database on dental diseases in Haiti. Please, note that no invasive examination nor any dental treatment will be undertaken.

This investigation is conducted by the Research Committee of the Dental School of the Haitian State University with the approval of the Ministries of Health and Education, and is funded by the World Health Organization.

Knowing that he can already count on your collaboration for the success of this project so important for the evolution of Oral Health in Haiti, the Research Committee of the Dental School of the Haitian State University would ask you to return the form duly filled and signed to the carrier of this message.

For more information, you can call one of these numbers: 246-1218, 257-6521

We thank you for and ask you to accept our more respectful greetings.

Principal Investigator
I, the undersigned __________________________ Principal of the __________________________ school, certifies by this signature that I have read and understood the included conditions of the investigation on “the Prevalence of dental decay and Fluorosis in Haitian School children” and accept to cooperate with the Research Committee of the Dental School of the Haitian State University and its partners for the success of this investigation.

City: 

Date: 

Address: 

Telephone: 

__________________________
Signature
CODING FOR DENTAL CARIES


<table>
<thead>
<tr>
<th>CODE</th>
<th>DIAGNOSTIC CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOUND</strong></td>
<td>Surface without any signs of cavitation due to decay, restorations or a sealant.</td>
</tr>
<tr>
<td><strong>NON CAVITATED LESIONS</strong></td>
<td>This code is reserved only for surfaces with pit and fissures with more than 25% of the pit showing coloration (brown to black) without clinical signs of decay.</td>
</tr>
<tr>
<td><strong>DECAYED</strong></td>
<td>Three types of lesions can be coded as decayed:</td>
</tr>
<tr>
<td></td>
<td>Pit and fissures lesions</td>
</tr>
<tr>
<td></td>
<td>Free surface lesion</td>
</tr>
<tr>
<td></td>
<td>Secondary caries</td>
</tr>
<tr>
<td></td>
<td>It is defined as the presence of a cavitation or decalcification or undermining of the surrounding enamel. Diagnosis is reached if you can detect the presence of soft dentine with the explorer.</td>
</tr>
</tbody>
</table>
FILLED
It included any surface restored partially or completely with a restorative material as a direct consequence of decay.

MISSING DUE TO CARIES
Applies to any surface from any tooth that has been extracted as a direct consequence of caries

SEALANT
Is called if total or partial sealant is present only in the occlusal surface of a permanent or primary tooth.

UNERUPTED
Applicable to spaces in the arch with absence of primary teeth due to normal shedding and before any clinical signs of the erupted permanent can be distinguished.

EXCLUDED
Applicable to all surfaces in very specific situations, including anterior crown due to cosmetic reasons, teeth that cannot be assessed completely because of orthodontics band or brackets.
CODING FOR DENTAL FLUOROSIS (Dean’s Index)


Fluorotic lesions are usually bilaterally symmetrical and tend to show a horizontal striated pattern across the tooth. The premolars and second molars are most frequently affected, followed by the upper incisors. The mandibular incisors are least affected.

The examiner should note the distribution pattern of any defects and decide if they are typical of fluorosis. The defects in the "questionable" to "mild" categories (the most likely they occur) may consist of fine white lines or patches, usually near the incisal edges or cusp tips. They are paper-white or frosted in appearance like a snow-capped mountain and tend to fade into the surrounding enamel.

It is recommended that Dean’s index criteria (3) be used. The recording is made on the basis of the two teeth that are most affected. If the two teeth are not equally affected, the score for the less affected of the two should be recorded. When teeth are scored, the examiner should start at the higher end of the index, i.e. "severe", and eliminate each score until he or she arrives at the condition present. If there is any doubt, the lower score should be given.
## CODE and CRITERIA

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal:</td>
<td>The enamel surface is smooth, glossy and usually a pale creamy-white color.</td>
</tr>
<tr>
<td>1</td>
<td>Questionable:</td>
<td>The enamel shows slight aberrations from the translucency of normal enamel, which may range from a few white flecks to occasional spots.</td>
</tr>
<tr>
<td>2</td>
<td>Very mild:</td>
<td>Small, opaque, paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface.</td>
</tr>
<tr>
<td>3</td>
<td>Mild</td>
<td>The white opacity of the enamel of the teeth is more extensive than for code 2, but covers less than 50% of the tooth surface.</td>
</tr>
<tr>
<td>4</td>
<td>Moderate:</td>
<td>The enamel surfaces of the teeth show marked wear and brown stain is frequently a disfiguring feature.</td>
</tr>
<tr>
<td>5</td>
<td>Severe:</td>
<td>The enamel surfaces are badly affected and hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance.</td>
</tr>
<tr>
<td>8</td>
<td>Excluded:</td>
<td>(e.g. a crowned tooth)</td>
</tr>
</tbody>
</table>
9 Not recorded:

CODING FOR DENTAL FLUOROSIS as used in the first HAITIAN BASIC ORAL HEALTH SURVEY (Modified Dean’s Index)

(Tooth-based coding for upper teeth - cuspid to cuspid)

<table>
<thead>
<tr>
<th>Code</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Fluorosis.</td>
</tr>
<tr>
<td>0,5 or 5</td>
<td>Questionable, the enamel shows slight aberrations.</td>
</tr>
<tr>
<td>1</td>
<td>Opaque, paper-white areas involving less than 25% of the surface.</td>
</tr>
<tr>
<td>2</td>
<td>Mild, the white opacities of the enamel extend to more than 25% and less than 50% of the surface.</td>
</tr>
<tr>
<td>3</td>
<td>Moderate, the amount of enamel affected extends to more than 50% of the surface.</td>
</tr>
<tr>
<td>4</td>
<td>Severe, any of the previous classification AND the presence of distinctive unique or confluent pits.</td>
</tr>
<tr>
<td>5</td>
<td>Any partially erupted permanent tooth.</td>
</tr>
<tr>
<td>6</td>
<td>When more than one third of the tooth is visible AND there is any evidence of Fluorosis.</td>
</tr>
<tr>
<td>8</td>
<td>Non fluorotic white lesion that is very well delineated.</td>
</tr>
<tr>
<td>9</td>
<td>Excluded, applicable to any primary tooth.</td>
</tr>
</tbody>
</table>
THE ORAL HEALTH EDUCATION AND TOPICAL FLUORIDE APPLICATION PROGRAM at the HHF: Final Evaluation

June 28 1999

This is the final evaluation of the oral health education and topical fluoride application program, which will highlight the result of the last visit, made to the Haitian Health Foundation, at Jeremie. The objectives of this visit were to assess the effects of a two-part preventive dental health program:

1) An oral education program which was implemented in October of 1998 in Jeremie, Haiti

2) And a topical fluoride application that started last February completing the education program.

From May 21 to May 27 1999, a visit was made to the Haitian Health Foundation (HHF) in Jeremie to evaluate the effects of both the oral education and the topical fluoride application programs. The primary responsibilities of the evaluator during this visit were to:

a) Observe and work with the staff as well as conduct interviews.

b) Conduct interviews with program participants (especially mothers), to find out what questions they have and to gather information on needed changes to refine the program.

c) Go on sites with the staff and observe if the oral education and the topical fluoride application are performed as designed.

In addition, the evaluator had to ascertain that previous problems were resolved. The lack of communication, between staff member, had been a very serious problem that had threatened the survival of the program.

BACKGROUND

The Haitian Health Foundation (HHF) is a non-profit organization based in Norwich, Connecticut and which has a community health clinic in Jeremie, which is the capital of The Grand Anse Department, one of the nine geographic departments of Haiti.
Jeremie is a small town located on the southwestern peninsula of Haiti. The HHF clinic’s goal is to provide sound health care to the population of this area.

The HHF medical staff there consists of two Haitian physicians, Dr. Roynel Bourdeau who is the medical director and Dr. Milo Richard recent graduate of Haitian Medical school; the head nurse, a Franciscan nun, Sister Mary Immaculate, who is in charge of medical supplies and equipment. Other medical personnel include a public health nurse trained and anthropologist, Dr Bette Gebrian, who is in charge of the fieldwork, some Haitian and foreign nurses and the community health agents.

The administrative staff consists of the director Sister Maryann Berard, who is also a Franciscan nun; the Budget manager named Marco. Periodically, a few international volunteers will join the clinic to offer their services for a few weeks or days of work.

One of the most recent additions to the staff is a graduate of the Haitian dental school, Dr. Brice Butler who is the first HHF staff dentist. Prior to Dr. Brice’s recruitment, a few foreign dentists who supplied a limited number of days each year within the two HHF dental clinic operatories providing dental care. Under these conditions, dental care was episodic, and the population regularly expressed complaints about this gap in the health care provided by the HHF, i.e. the lack of regularly available dental services.

Suffice to say the presence of regular dental care is new to the HHF system. Further, the preventive approach to dentistry is even more of a “harder sell” for both the staff and the population being served, than the well recognized practices of clinical dentistry. Consequently, advocating clinical or preventive dental care, is not an easy job for the newly appointed dentist. However, the population has welcomed the presence of the dental program of the HHF as a useful component of the health care being provided.

It should also be mentioned that the Grand-Anse department only has 7 dentists for a population of about 300,000 people. Four of the dentists live and work in the capital of the department, Jeremie. One works in Dame-Marie, a town which is about 70 Kms south west of Jeremie; another is employed by a voluntary organization called Service Oecumenique d’Entraide (SOE) in Chambellan situated on the road to Dame-Marie,
about 30 Kms of Jeremie. The last one is the recent graduate from the Haitian State University Dental School who is assigned each year to Jeremie hospital for a mandatory year of social service. However there is no available structure for him to work in the remote areas where the care is needed the most. Thus, it is obvious that the population of the Grand-Anse Department has a great need for a dental preventive program for.

THE PROGRAM

This dental preventive program has been planned and designed by Dr. H. Ludwig Saint Jean as his practicum as a Master in Public Health student at the University of Connecticut Health Center, with the help and guidance of Dr. Ralph Katz. This dental preventive program is designed to provide oral education and administrate topical fluoride, a substance that is well demonstrated to prevent dental decay. This preventive program is targeting children from the age of 6 to 12 years old.

The goal of the oral education component of the program was to inform and to teach the mothers of these targeted children about the most common causes of dental decay which them and their children are exposed to on a daily basis. The program also taught them the basic oral hygiene practices that could be used to prevent the occurrence of dental decay. It finally emphasized on the use of topical fluoride and its effectiveness in the prevention of dental decay.

The objective of the second component, the fluoride application, was to apply topical fluoride twice a year over the teeth of children registered in the Haitian Health Foundation Health program. Dr. Brice Butler, the newly appointed dentist runs both programs. Dr. Brice benefits the help of an assistant, also newly hired, that he is currently training in assisting him beside the dental chair and on sites in the mountains.

The oral education program started on October 2, 1998 two months prior the topical fluoride application component. As stated earlier, the goal of the education component of the program is to inform and educate the mothers of the targeted children about the causes of dental decay. To facilitate this education Dr Brice uses visual aids, three posters that illustrate the information.
1- The first poster shows the general types of decay, such as white spots, dentine and pulpal decay.

2- The second poster shows how dental decay occurs, and describes the proximate factors that cause the decay occurrence.

3- The third poster illustrates how the application of topical fluoride can regenerate enamel growth in tooth with white spots and stop the decay process.

The oral education component of the program was momentarily stopped in mid-December for the holidays. From October to mid-December, Dr. Brice educated 15 villages and reached a total of 1,107 people of which about one fifth (212) were children from the targeted age group.

The oral health education component resumed with the beginning of the topical fluoride application program in early February. When a site is reached, prior to the application, while the aid is putting the needed set in place, Dr. Brice begins with the education of the mothers and the children that are present. From February 1999 to May 1999, a total number of 8 villages were visited and 1,113 people attended the educational sessions. From the start of the program to the last evaluation by Dr. Saint Jean, not more than 23 villages were visited for the education program, and in those villages 2,220 people attended the oral education program and among them 430 were women aged from 15 to 45. Dr. Brice Butler gave all the presentations in all the villages visited (Appendix A).

As stated earlier, the topical fluoride application program only started at the beginning of February. When the topical fluoride application started however, the oral education sessions had already, more or less, prepared the population of the villages that had been visited for the topical fluoride program. The health agents had pre-informed the people in the villages that had not yet been visited. All the mothers, served by the HHF, were very interested in having their children participate in the program. Moreover, the mothers welcomed the topical fluoride application program very warmly, but they did express the need of a program for adults.
Every medicine presents along with its curative effect some detrimental effects when given at certain dose, as is the case for fluoride. Therefore, the designer and the manager of this prevention program being well aware of the danger that high dose of fluoride represents, had to establish some safety measures. These measures were especially necessary since the targeted patients were young children. Several safety measures discussed by Dr. Katz and Dr. Saint Jean have been applied since the beginning of the topical fluoride application. The reasons to support the application of these measures are to prevent any toxic accident that could happen and would consequently be fatal for both the patient and the program. Some of these measures are:

a- A verbal agreement from the mother or the person in charge is mandatory to treat a child with the topical fluoride gel.

b- A topical fluoride application card is to be given to the mother at the first visit; this card helps to monitor those who have been treated.

c- A logbook has been created, it helps to monitor the usage of the medicine, fluoride, and it should also prevent from unexplained material and medicine losses.

From the beginning of the Fluoride application program in early February to the evaluator visit in May 21, Dr. Brice and his assistant visited 15 villages. In some of these villages, the dental team spent 2 to 3 days to complete the treatment to all eligible children.

From February 1999 to the end of May of 1999, along with administrating the oral education session, Dr Brice treated 1,859 children between the ages of 6 to 12 years old with the topical fluoride (Appendix B).

ASSESSMENT

During the period spent in Jeremie from May 21 to 27, the evaluator had several talks with HHF members and also with mothers of the beneficiaries of the program. The aim of these talks were to evaluate:
1- If the goal of the oral health education program to communicate basic dental prevention knowledge, which would stimulate patient’s awareness, was reached.

2- If the topical fluoride application program was running as planned and if the safety measures were working as predicted.

Additionally, people were asked to provide their opinions regarding:

a) The need for such a program in the Jeremie area, and what were the perceived benefits, if any.

b) How the program was being facilitated.

c) What were the needed improvements.

A- Interview with HHF Administrative Staff

The first conversation of the evaluator was with Dr. Roynel Bourdeau who is, as mentioned before, the medical director of the Haitian Health Foundation, and who overlooks the clinical work of the medical as well as the dental staff. Throughout the conversation, Dr. Bourdeau confirmed that he is very supportive of the dental program at HHF. He was very concerned by the fact that Dr. Brice was performing very little clinical dentistry. Very recently, however, Dr. Brice and Dr. Bourdeau came to a schedule arrangement that satisfies both of them. Along with administering the oral education and the topical fluoride application programs, every week Dr. Brice spends one to 2 days at the HHF clinic performing clinical dentistry.

The evaluator also had a conversation with Dr. Bette Gebrian, the public health nurse. She also has been very supportive of the preventive dental program from the beginning, both because of her public health training and also because she sees that the education program is needed to promote good oral health habits which could lead to better oral health. “The topical fluoride application program is very important in the prevention of a disease that affects the whole population served by the HHF and at a very high rate”, she commented. She is very satisfied with the way the program is being run and the work accomplished this far by Dr. Brice, who has made a real effort to resolve previous problems with some of the HHF members and improve performance.
Both Dr Gebrian and Dr. Bourdeau suggested writing a song with the main ideas of the dental-fluoride education program to help the mothers to better understand the concept. This is a method that has proven to be very helpful and successful recently with introducing two new concepts such as oral rehydration and immunization programs to the served people. The knowledge base is used for the lyric of the song. Dr. Brice had suggested to Dr. Saint Jean to use for this song one of the recent popular tunes.

B- Interview with Dr. Brice

A set of questions prepared for the previous evaluation was used in the last evaluation for Dr. Brice Butler, who runs both the oral education and the topical fluoride program, about issues related to both programs. The objective of these questions was to collect information that could help improve both programs (see appendix C).

B-1) Here is a summary of these questions with the corresponding answers:

I- the most asked questions from the patient population were:
   a) Will there be also a program for adults?
   b) What would be the price of this fluoride?

ii- People asked sometimes if fluoride can cure gum disease medicine or can make teeth wither.

iii- Dr. Brice usually asked the mothers to explain the main ideas of the oral education program to be sure that they understood what was taught after each presentation.

iv- When asked “have you noticed any changes in the oral habits of the population that can be related to the oral education program”, Dr. Brice Butler answered that from the beginning of the project to the evaluation, not enough time had passed. However, he said that he had noticed some other changes, the population is participating and is asking more precise questions.

v- As well as the population, Dr. Brice also thinks that there is a lack of details in the visual aids. Dr. Brice also emphasized on the importance of a song based on the main ideas of the education program, this will help the mothers and the children better understand the material.
vi- When asked about his relations with the HHF staff Dr. Brice reported it as being excellent.

vii- Dr. Brice thinks that both the oral education and the fluoride application program are running well and no need for major changes, he, however, suggested some minor details to add to the program. These details are:

a) The addition of information about oral hygiene and brushing, which he had already add to the oral education presentation.

b) He also suggested adding more details in the visual aids.

viii- Dr. Brice mentioned that the only problem he had regarding the topical fluoride application was related to a lack of organization on the field. During the topical fluoride application, the mothers would surround the clinical setting and thus will make it an uneasy setting to work in.

ix- In the previous evaluation, Dr. Brice had complained about his living arrangements that he felt was the result of several factors, the salary being one of these factors. Since this is a pending situation, no questions had been asked to him about the salary situation in this current evaluation.

Dr. Brice said that he is willing to run both program for next year, however that will depend on:

a) The resolution of the salary issue.

b) The maintenance of good communication with his co-workers and superiors.

B2- Dr. Brice was once again asked to explain how the topical fluoride application is performed. The following is in details the techniques he uses for the topical fluoride application, step by step:

a) The aid fills the mothers fluoride cards.

b) The aid brings the children by groups of 7 and seats them on a bench.

c) Dr. Brice dries the first child’s mouth of the while an aide filled the trays.

d) When the mouth is dry, Dr. Brice introduces a filled tray in the child mouth, ask him/her to bite on it. To be sure he/she will not swallow the fluoride gel, the child is
asked to keep his head down, then Dr. Brice moves to the next child, while the aid is keeping track of the time.
e) After 4 minutes, (usually when he finishes to put the gel in the seventh child mouth) the first child is asked to spit.
f) After the child has spited all the gel, Dr. Brice asks the mother to keep the child away from any food for at least half an hour.

A verbal agreement from the mother or the person in charge is mandatory to treat a child with the topical fluoride gel. If the child is alone, he will not receive the treatment. The primary reason is the safety of the children.

D- Interview with mothers of children treated

The 13-item questionnaire used in the previous evaluation was once again used to assess what the mothers understood from the oral education presentation that they had attended (Appendix D). The interviewees were picked randomly from those who were present at the time and the interview took place in an isolate room. Each interview was conducted separately and the interviewee was isolated from the group after the interview.

All the mothers interviewed had attended, at least, one oral health education session. They were very interested in having their children participate in the program and welcomed the topical fluoride application program very warmly. They also mentioned that having both the oral health education and the topical fluoride application the same day was very important and thoughtful for the following reasons:

1- Taking one day out of normal obligation to come to the presentation and to bring the children for the application is easier than taking two different days out

2- When the children are present, they can listen to what is said about oral health and therefore will participate actively in the dental decay prevention.

Some of the mothers had, however, complaints related to the visual aids, which they said are not very explanatory.

Although the women asked could not give precise details on dental decay evolvement, they did understand that sugar and sweets were playing a great role in this
development. Two third of the women emphasized the use of “brushing” as a measure to prevent dental decay?” (Question 3 and 4). They knew how the topical fluoride worked, but not really why they can only bring children 6 year old and over (Questions 1, 2, 6 ans7)

The women who were present had brought at least one child to the topical fluoride application. Just like in the previous assessment, none of those interviewed knew of anyone with children, of the right age group for the topical fluoride application, who had not brought his/her for the treatment. (Questions 9, 10, 11and 12)

Most of the mothers interviewed understood the presentation (Questions 5 and 8). Some, even, suggested some changes that could be brought to improve both programs:

a) Regarding the education program:

Most of the mothers interviewed asked for the use of a clearer language with more details in the visual aids. The most heard complaint was that some of the pictures of the poster were not clear enough, because “the tooth pictured is not attached to the gum like it really is” and also that “the topical fluoride is shown as a drop while it is like a paste and used in a tray”.

b) Regarding the topical fluoride application program:

The women had two complaints. One was related to the fact that the HHF had not tough of a preventive program for adults. The other complaint was based on the fact that some mothers found the selected age group too restrictive (6 to 12 years olds). (Question 13). This problem could be addressed in a possible extension of the program.

E- Interview with a Health Agent

Some of the health agents were also interviewed. Since they are special members of the population being served, several questions were also prepared for them. Nevertheless, their interview did not really inform the evaluator about what they knew or what changes could be brought to improve the education or the topical fluoride program.

As stated earlier, the health agents are very close to the population of which they belong to, and they are often facing the same health problems. Thus, they are a very important piece of this health care system as they are able to provide very insightful
information. One should expect them to be the informed voice of the villages that they are monitoring. Unfortunately this is not always the case. However they are setting the right example by bringing their children to the topical fluoride application. This should make a great impact on those of the population who would be reluctant to participate in the program.

Some of the health agents, who had attended a presentation of the education program, were able to explain some of the problems that the population was facing and also make some suggestions:

1- Some advanced that too much material was taught in one presentation, making it somewhat uneasy for the population to fully understand.

2- They also suggested that more than one presentation was needed in order to make a real impact on people oral practices and behavior. (Appendix E)

CONCLUSION/SUGGESTION

The importance of a preventive dental program is far greater than a clinical program that would only take care of already diseased children and would ask for a bigger dental staff. This program will help prevent the pain and suffering of tens of dental decays that could have occurs in the future. It should be explained to the HHF staff, particularly the health agents.

On the previous evaluation one of the most important suggestions of the evaluator was the inclusion within the oral education program of a twice a year education session for the Community Health Agents. Thus, the health agents will be able to answer more accurately to the mothers’ questions, since they are also members of the community.

The oral education component of the program is very important, because:

1- It informs the population about the proximate causes of dental decay.

2- It teaches the population the basic oral hygiene practices that could be used to prevent the occurrence of dental decay.

3- It also emphasized on the use of topical fluoride and its effectiveness in the prevention of dental decay.
4- It finally helps to show the impact of the program on the population in comparison to a time when no such program existed.

An important consideration in the continuance of the oral education component of the program is to insure that mothers will not become so secure in the fact that fluoride alone will eradicate the problem of dental caries.

Dr Brice’s relation with the Haitian Health Foundation staff has improved since the evaluation in March, and is now very good. Every body is praising him for his commitment to the program and his dedication.

From the previous evaluation, the evaluator concluded there was a gap in the "chain of command" related specifically to the components of the dental program (oral education and topical application). This gap in the "chain of command had also impaired the lines of communication and was one of the causes of previous problems between Dr Brice and some members of the staff. As stated in the previous report, a sound proposal would be that Dr. Brice’s role should be defined with the extent and limits of his duties and responsibilities as well as who he should report to. Regarding that almost everyone is expecting some information from him about the oral education and the topical fluoride program, each one for specific reasons, Dr. Bourdeau being HHF’s medical director, Dr Gebrian, the public health person of the HHF and Sister Mary Ann is the director of the HHF. It would be important that he knows who is the authority he has to report to. That proposal will probably help in the resolution of many problems.

While on site in a village, Dr. Brice sometimes spends 2 to 3 days for the topical fluoride application, and sometimes after his work is done, he has to wait for the truck that will pick him up. All this waiting time is usually wasted when, sometimes, it could have been used, efficiently, for data entry. The collection of data is very important for both the oral education and the topical fluoride application program. If provided with a laptop computer with the appropriate software (EPI INFO, SPSS), Dr. Brice will be able to bring it with him and enter data on a more rational basis. The other reason is that he would otherwise have to use for the data entry precious hours that could be used for clinical dentistry. Additionally, the computers at the HHF are generally in use during the
day when he could have entered the data, he would only have the opportunity to do the
data entry after work time when the computers would be free.

Finally, Dr. Gebrian and Dr. Bourdeau’s suggestion about writing a song with the
main ideas of the dental-fluoride education program should be followed. One reason
being the success of that method with basic health programs such as the oral rehydratation
and immunization programs, the second reason being that it will certainly help the
mothers in a better understanding of the program. It will, therefore insure that one of our
goals is reached.

Throughout talks with Dr. Brice and Dr. Gebrian and interview with the mothers,
and the health agents it appears that the visual aids are not helping, as well as predicted,
the mothers in a better understanding of the program. Many people have been
complaining about the lack of details in some of the posters. They are targeting
specifically the poster on the evolution of dental decay, and the one about the topical
fluoride action. New draft of the changes needed should be available very soon in order
to rapidly bring the needed changes to the visual aids.

Although the targeted population is responding very well to the program by
participating actively, it is important to keep in mind that the goals has not been reached
yet and that there still is a lot of work to do. The topical fluoride application program just
turned its first six-month period and is just starting the second one. This, however, does
not prevent against a massive drop out of the population. More than ever, the emphasized
should be put on the oral education to reinforce good oral hygiene practices that could
help, in addition to the topical fluoride, in the prevention of dental decay occurrence.
**APPENDIX A**

**FLUORIDE EDUCATION PROGRAM**

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### APPENDIX B

**TOPICAL FLUORIDE APPLICATION**

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<td>04/13/99</td>
<td>Lassise</td>
<td>51</td>
</tr>
<tr>
<td>04/14/99</td>
<td>Fouach (Nan Coton)</td>
<td>44</td>
</tr>
<tr>
<td>04/15/99</td>
<td>Fouach</td>
<td>33</td>
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<td>05/10/99</td>
<td>Bigarade</td>
<td>231</td>
</tr>
<tr>
<td>05/14/99</td>
<td>Duranton</td>
<td>98</td>
</tr>
</tbody>
</table>

Total number of children treated 1859
APPENDIX C

QUESTIONS FOR Dr. BRICE BUTLER

1- what questions are most frequently asked during the education program?
   What else?
   What else?
   What else?

2- What are your responses to these questions?

3- What do they seem to misunderstand the most in the education program?
   What else?
   What else?
   What else?

4- Have you observed any changes in the oral habit of the population that can be related
to the program?

5- How do you know that?

6-- What problems are you facing during the education program?
   a) Regarding supply and equipment
   b) Regarding knowledge base
   c) Regarding relations with the:
   • HHF staff
7- Do you have any suggestion that may improve the education program?

Regarding the quality of the program

Regarding the efficiency of the program

8- Could you explain to me step-by-step how you do the fluoride application?

9- What are the problems you face during the fluoride application?

a) Regarding supply and equipment

b) Regarding knowledge base

c) Regarding relations with the:

• HHF head staff

• Bette

• Health agents

10- What are the immediate solutions you bring to these problems?

11- Do you have any suggestion regarding the fluoride application program?

a) Regarding the quality of the program

b) Regarding the efficiency of the program

12- Are you satisfied with your current salary?

13- How many years do you think you are going to spend running this program?
QUESTION FOR THE MOTHERS (who attended the education program)

1- How many times have you attend to the education program?

2- How do you find the presentation?

3- Can you explain how dental decay evolves?

4- How can you prevent dental decay?

5- Is there something that you don’t understand specifically in the presentation?
   a) 
   b) 
   c) 

6- Do you understand how fluoride works?

7- In the development of dental decay, do you know when you can use fluoride?

8- Which part you don’t understand specifically?
   a) 
   b) 
   c) 

9- Do you bring your kids to the fluoride application program?

10- If no. Why not?

11- Do you know of anyone who do not bring his or her children to the fluoride program?

12- If yes. Why do you think they do not have their child participating in the program?

13- Do you have any suggestions, complaints or ideas related to the program?
APPENDIX E

QUESTIONS FOR THE HEALTH AGENT (who attended the education program)

1- Have you had a direct presentation of the educational material or you just viewed it when it was presented to the mothers?

2- Do you think that you need a direct presentation?

3- Why are the reasons?
   a) Better serve your village
   b) Better respond to the asked questions
   c) Give better advice.

3- How could a mother prevent dental decay to develop in their children teeth?

4- What have you heard about fluoride?

5- Do you know how fluoride can stop dental decay?

6- Do you have any suggestions about the education program?
   a) Regarding the language used.
      a) That could increase the efficiency of the program

7- Do you have any suggestions about the fluoride application program?
   a) That could increase the efficiency of the program
   b) To improve the sites setting.