The Ministry of Health of Turks and Caicos Islands
Result of a National Survey 2002
Pan American Health Organization
Working Report 1/14/2009 4:05:01 PM

1. Executive Summary and Recommendations

This report documents the results of what is believed to be the first oral health survey of children in the Turks and Caicos Islands. The population is about 19,000, most of it (about 17,000 persons) is concentrated on the island of Providenciales. A total of 1575 children were sampled from the areas with the largest population. In 2002, children and adolescents in the following six age groups were examined: age 5 and younger, 6-8, 9-11, 12-14, 15-17, and 18 and older. The report describes findings for these groups as well as 12 years olds who were examined separately for the purposes of international comparison.

Main findings:

1. The number of diseased missing and filled teeth (dmft) in the primary or deciduous dentition was at a mean of 1.09 in the 6-8 age group, decreasing to 0.30 in the 12 year-olds.

2. The DMFT in the permanent dentition for the 12-14 age group was a mean of 0.97. The DMFT for 12-year olds was similar at 0.92. The DMFT for 15-year olds was 1.09

3. Providenciales was the region with the smallest proportion of children affected by caries in the primary (15%) and permanent dentition (20%).

4. While the prevalence of caries is relatively low, filled teeth make up a small component of the dmft and DMFT, which raises questions about sufficient availability or access to services.

5. Enamel fluorosis was diagnosed in 66 (4.2%) of the 1575 children surveyed. Fifty one (77.52%) of those diagnosed were age 9 or over. Sixty percent (40) of those diagnosed with fluorosis were found to have moderate or mild fluorosis.

6. The greatest number of diagnoses for enamel fluorosis was made in Providenciales, a total of 38 out of 66.

Recommendations:

The survey shows that the oral health status is good, with dmft and DMFT figures which would be considered normal or low. Nonetheless when the mean number of filled teeth is compared to the decayed teeth, it is much smaller than the

number of decayed teeth which indicates that current oral health services are not meeting the needs.

Next steps:

Prevention

1. Maintain and improve oral health prevention programs. Increase overall health promotion programs to encourage children and adults to develop good oral health habits and recognize oral health as an integral part of their well being.
2. Integrate existing oral health plans into general health plans.
3. Increase programs for the prevention and control of dental caries, through fluoride and dental sealant strategies.
4. Establish a commission to study the feasibility of a nationwide fluoridation program for the country with an appropriate surveillance system.
5. A strong health education program and a strategy of early intervention with sealants for children selected as being at a higher risk for caries may further reduce the dmft and DMFT.

Health Services

6. As part of the prevention programs, increase oral health programs in schools, for teaching prevention and applying minimal intervention techniques such as atraumatic restorative treatment (ART), which can be delivered in the school setting using glass ionomers for sealants and restorations.
7. Increase access to services in rural areas of the archipelago. Current programs in urban areas should be evaluated and an approach to address deficiencies should be developed.

2. Introduction

The Turks and Caicos Islands population was estimated at 19,000 persons in 2002. Composed of eight islands and many smaller cays and islets, the British dependent territory has a land mass of 430 km^2. Most of the population lives on Providenciales, Grand Turk, and South Caicos. The capital is Cockburn Town, Grand Turk. Nonetheless, the only urban center in the archipelago is located on the island of Providenciales, where most of the population is concentrated with over 17,000 inhabitants.[1]

The oral health survey discussed in this report is the first conducted in the Turks and Caicos Islands.

3. Methodology

Four examiners and recorders surveyed a total of 1575 children. This report describes the results of the survey. Oral health data were analyzed for the 1575 children. Owing to missing data, descriptive information about the sample is provided in accordance with the numbers of children for which it was available.

Training and Examiner Reliability

Training and standardization exercises were conducted in 2002. Four examiners and recorders were selected and provided with the diagnostic criteria and coding using WHO Basic Methods and PAHO's Oral Health Survey of School Children Protocols. The examiners and recorders are: Dr. Poornachandra Revanna, Dr. Chandini Revanna, Dental Nurse Vera Moor, Dental Nurse Jacqueline Bryan.

Calibration

The examiners were trained using the above-mentioned protocols. Dr. Poornachandra Revanna then trained the recorders. Data are not available about the calibration of examiners for this study.

Diagnostic Criteria

The survey utilized United States National Institute of Dental Research (NIDR) diagnostic criteria and disease coding for caries.

The examiners appear to have used Dean's criteria for fluorosis, scoring the presence/absence of fluorosis, as well as its severity.

Examinations

Examinations were conducted in selected public schools by a team of examiner/recorder. The examiners used natural light. Sterilized mirrors and dental explorers were used (visual-tactile examination). No x-rays were taken.

Data was entered into an access database. It was later converted to SAS and analyzed using that program.

It should be noted that the section relating to demographic data shows results for fewer than the 1575 children examined. This is because data were missing or miscoded with respect to date of birth and gender of some of the children, as well as region.

Demographic Data

Demographic data collected for the participants included age, gender, school and region. The five regions chosen were the islands with the greatest proportion of the population, Grand Turk, Providenciales, North Caicos, Middle Caicos and South Caicos.

For the purposes of analysis and reporting, the sample was broken down by age group into six principal groups. These were children aged five and younger, ages 6-8, ages 9-11, ages 12-14, ages 15-17, and 18 years and older.
In addition to describing the overall sample, the report will describe the oral health status of 12 year old children in the survey for the purposes of international comparison. WHO has chosen the age of 12 as the global monitoring age for caries for international comparisons and monitoring disease trends. [3] According to the WHO Oral Health Surveys manual this age is critical since at age 12 many children are likely to leave school and "it is the last age through which a reliable sample may be obtained easily through the school system." Of equal importance is the fact that the majority of 12-year olds "all permanent teeth, except third molars, will have erupted. "

4. Demographics

A total of 1575 children and young people, between the ages of 5 and 28 were examined. The survey was conducted in government schools (primary to high

school) on five islands, Grand Turk, Providenciales, North Caicos, Middle Caicos, and South Caicos.

Data concerning age was available for 1545 children. There were 502 children aged 9-11, making this the largest group accounting for 32.49% of the sample. The second largest group consisted of 363 children aged 12-14, or 23.50% of the sample, followed by 304 children in the 15-17 year olds or 19.68%. Next, the 257 children in the 6-8 group who made up 16.63% of the sample. The youngest and second smallest group, age 5 or younger, represented 6.28% (97) of the sample, while the smallest was the group of 22 young adults 18 years old and over representing 1.42% of the sample. Table 1 shows the distribution of children by age, including the number and proportion of each group in the sample.

Table 1: Distribution of Children by Age in the Sample (2002).

Age	Frequency	Percent	Cumulative Frequency	Cumulative Percent
5 or younger	97	6.28	97	6.28
6-8	257	16.63	354	22.91
9-11	502	32.49	856	55.40
12-14	363	23.50	1219	78.90
15-17	304	19.68	1523	98.58
18 or older	22	1.42	1545	100.00

Frequency Missing = 30

Examination of the sample by age gender and region reveals that the 1506 children for whom there was information about gender are evenly divided between males and females (See Table 2). The size of each gender group by age ranges between 44% and 55.4%.

Table 2: Distribution of Children, by Gender and Age

	Age												Total	
	5 or younger		6-8		9-11		12-14		15-17		18 or older			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Gender														
Female	44	47.8	115	45.8	245	49.2	200	55.4	147	48.7	12	54.5	763	50.0
Male	48	52.2	136	54.2	253	50.8	161	44.6	155	51.3	10	45.5	763	50.0

There are 26 (1.6%) of participants missing a value for gender.

With respect to region, there were 1364 children in the sample for whom region could be identified. A greater proportion of the sample, 43.48% was from the main urban center on Providenciales. Almost 35% of the children sampled in Providenciales were between the ages of 15 and 17, while between 24% and 25% were in the 9-11 and 6-8 age groups. Next, 27.3% of the children sampled were on Grand Turk with 43% in the 12-14 group and 31% in the 9-11 age group. North Caicos had 20.82% of the children in the study. Tables 2 and 3, describe the population in terms of age and gender, as well as age and region.

Table 3: Distribution of Children, by Age and Region

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Age	Region					
	Grand Turk	Providenciales	North Caicos	Middle Caicos	South Caicos	Total
5 or younger		16	18	0	0	75
number of children	41	1.17	1.32	0.00	0.00	5.50
% of total (n=1364)	3.01	21.33	24.00	0.00	0.00	
% in age group	54.67	2.70	6.34	0.00	0.00	
% in region	11.08					
6-8	6	143	63	2	37	251
	0.44	10.48	4.62	0.15	2.71	18.40
	2.39	56.97	25.10	0.80	14.74	
	1.62	24.11	22.18	11.11	37.37	
9-11	115	154	88	10	48	415
	8.43	11.29	6.45	0.73	3.52	30.43
	27.71	37.11	21.20	2.41	11.57	
	31.08	25.97	30.99	55.56	48.48	
12-14	160	55	64	6	14	299
	11.73	4.03	4.69	0.44	1.03	21.92
	53.51	18.39	21.40	2.01	4.68	
	43.24	9.27	22.54	33.33	14.14	
15-17	48	205	50	0	0	303
	3.52	15.03	3.67	0.00	0.00	22.21
	15.84	67.66	16.50	0.00	0.00	
	12.97	34.57	17.61	0.00	0.00	
18 or older	0	20	1	0	0	21
	0.00	1.47	0.07	0.00	0.00	1.54
	0.00	95.24	4.76	0.00	0.00	
	0.00	3.37	0.35	0.00	0.00	
Total	370	593	284	18	99	1364
	27.13	43.48	20.82	1.32	7.26	100.00
Frequency Missing = 211						

Demographic data were available for 122 of the 158 12-year-olds examined. Table 4 below shows their distribution by region. With the exception of Providenciales with 5 females and 11 males and South Caicos with 2 females and 10 males, the regional groups were evenly divided between males and females.

Table 4: Distribution of 12-Year Olds by Region.

12 year olds only by region	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Grand Turk	68	55.74	68	55.74
Providenciales	16	13.11	84	68.85
North Caicos	24	19.67	108	88.52
Middle Caicos	2	1.64	110	90.16
South Caicos	12	9.84	122	100.00

Thirty-six 12 year olds missing REGION

A total of 127 15-year olds were examined from Grand Turk, Providenciales and North Caicos only. Demographic data was available for 126 children in this group. The survey did not include 15 –year olds in Middle and South Caicos. The distribution of males and females in this age group was close to 50%.

Table 5: Distribution of 15-Year Olds by Region.

15 year olds only by region	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Grand Turk	37	29.37	37	29.37
Providenciales	67	53.17	104	82.54
North Caicos	22	17.46	126	100.00

1 15-year old missing REGION

5. Number of Teeth (Primary and Permanent) and Molars (Permanent)

The mean number of primary teeth per child in all age groups surveyed and the 12-year-olds is detailed in Tables 5 and 6 below. Children aged 5 years or younger had a mean of 10.67 primary teeth, while those aged 6-8 had an average of 11.17. That number dropped consistently with age to 0.04 in the 15-17 year-old age group. This was consistent among 12-year-olds too with a mean of 2.18 and 15 year-olds with a mean of 0.0 5 (Tables 7 and 8). The mean of 1 in the group 18 years and older may be a result of data collection or data entry error.

Table 6: Mean Number of Primary Teeth per Child, by Age (n=1575)

Age	N	Mean	Std. Dev.
5 or younger	97	10.67	6.08
6-8	257	11.17	4.69
9-11	502	5.35	4.22
12-14	363	1.62	2.85
15-17	304	0.04	0.41
18 or older	22	1.00	3.73

The average number of permanent teeth per age group increased steadily from 9 at age 5 or younger to 24.38 per child in the15-17 age group (Table 7). The examiners found a mean of 19.7 teeth per child among 12 year olds and 24.29 among the 15-year olds (Tables 8 and 9). This was slightly different for the 18 or older group, probably related to reasons mentioned above.

Table 7: Mean Number of Permanent Teeth per Child by Age (n=1575)

Age	N	Mean	Std. Dev.
5 or younger	97	9	8.6
6-8	257	8.76	6.07
9-11	502	14.88	5.68
12-14	363	20.75	5.15
15-17	304	24.38	2.55
18 or older	22	23.41	5.65

Table 8: Mean Number of Permanent Teeth Per 12-year Old Child (n=158)

Age	N	Mean	Std. Dev.
12	158	19.7	5.43

Table 9: Mean Number of Permanent Teeth Per 15-year Old Child (n=127)

Age	N	Mean	Std. Dev.
15	127	24.29	2.53

The mean number of molars per child was 3.88 among the 1,575 children.

6. Prevalence and Severity of Dental Caries

A. Primary Dentition

Proportion of Dental Caries in the Primary Dentition by Age Group and by Region

Table 10 shows the proportion of dental caries in each age group.
The children with the largest amount of decay were in the 6-8 age group with 44%. This number decreased consistently with age. Analysis of the regional groupings revealed that region with the smallest proportion of dental decay was in Providenciales with 15% percent. (See Table 11)

To analyze the proportion of children with dental caries in the primary dentition in each of the age groups and in the regions statistical testing was used. SAS General Linear Models (GLM) procedure was used to compute probabilities for all pair wise differences while adjusting for the differences in the sizes of the age groups. The results of the series of paired t-tests showed that the proportions of children with caries in the groups of children under the age of 9 were statistically different from groups of children over the age of 12. The proportion of children with caries in the children in the 9-11 age group was statistically significant for differences with the two of the three groups of children over 12, the exception being the 18 or older group (Table 10).

Table 10. Proportion of children with dental caries in the primary dentition in each age group (%)

Number	Age Group	N	Proportion (%)
1	12-14	363	0.12396694
2	15-17	304	0.00328947
3	18 or older	22	0.04545455
4	5 or younger	97	0.43298969
5	6-8	257	0.44357977
6	9-11	502	0.34063745

Statistical testing of the regional groupings (Table 11) showed Grand Turk, Providenciales and Middle Caicos were each statistically different from North and South Caicos. The SAS GLM procedure also adjusted for differences in the sizes between the groups. The regions with children with the greatest proportions of caries in the primary dentition were South (51%), Middle (44%), and North Caicos (37%). Children surveyed in Grand Turk (22%) and Providenciales (15%) had a smaller proportion of caries in the primary dentition. The results must be read carefully with respect to Middle Caicos as that group is considerably smaller than the others.

Table 11. Proportion of children with dental caries in the primary dentition in each region (%)

Number	Region	N	Proportion (%)*
1	Grand Turk	372	0.22043011
2	Middle Caicos	18	0.44444444
3	North Caicos	287	0.37282230
4	Providenciales	597	0.15075377
5	South Caicos	99	0.51515152

Table 12 shows that the prevalence of caries in the primary dentition peaked at a dmf (diseased, missing and filled) of 1.09 in the 6-8 age group. This number decreased consistently as children grew older and shed their primary dentition. Figure 1 illustrates the trend. The 12 year olds followed the pattern with a mean dmft 0.30 (Table 13). Miscoding may be the reason for the results showing a mean dmf of 0.22 in the group of children 18 and older.

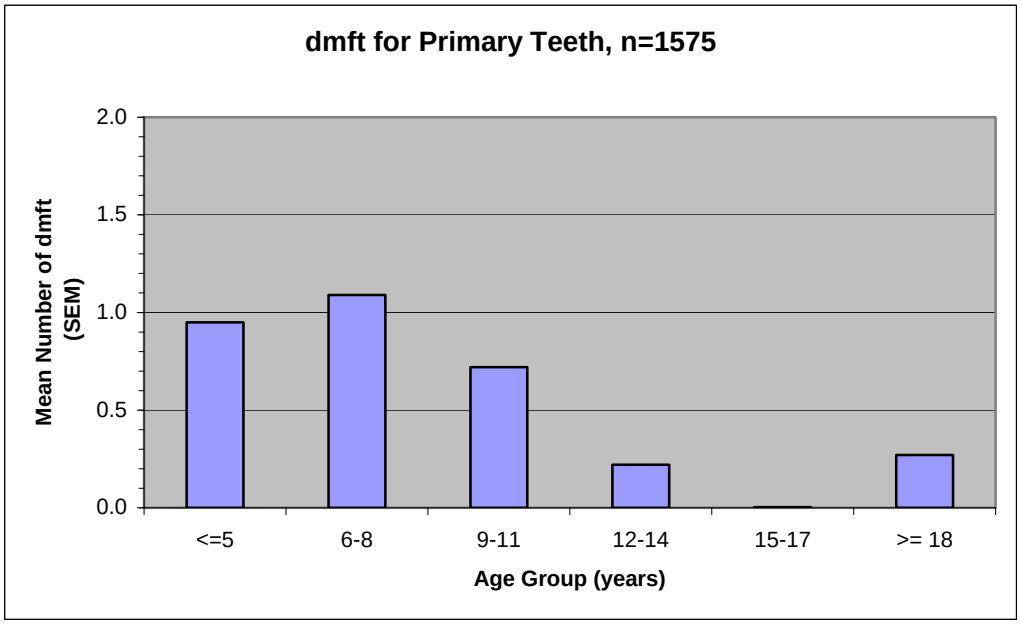
Table 12: Mean dmft, Decayed, Missing and Filled Teeth in the Primary Dentition by Age Group (n=1575)

Age	N	Mean Dmft	Std. Dev.	Decayed	Std. Dev.	Filled	Std. Dev.
5 or younger	97	0.95	1.47	0.95	1.47	0	0
6-8	257	1.09	1.58	1.09	1.58	0.01	0.12
9-11	502	0.72	1.23	0.71	1.21	0.01	0.13
12-14	363	0.22	0.71	0.22	0.71	0	0
15-17	304	0	0.6	0	0.06	0	0
18 or older	22	0.27	1.28	0.27	1.28	0	0

Table 13: Mean dmft, Decayed, Missing and Filled Teeth in the Primary Dentition among 12-Year-Olds (n=158)

Age	N	Mean dmft	Std. Dev.	Decayed	Std. Dev.	Filled	Std. Dev.
12	158	0.30	0.78	0.30	0.78	0	0

Figure 1. Turks and Caicos, dmft for primary teeth



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Descriptive Tables

Tables 14-18 describe the proportion of dental caries greater than zero in the primary dentition in each age group within each of the five regions sampled, as well as detailing the proportion of decayed and filled teeth. Because the number of children examined in each of the age groups in the regions varies and some are very small, it is difficult to make comparisons between regional age groups. Nonetheless, there several conclusions are evident: a greater proportion of the dmf is due to decay and there are comparatively few fillings in the primary dentition. This is particularly the case in the rural areas.

Table 14. Grand Turk: Prevalence of Dental Caries in the Primary Dentition (dmft >0), Untreated Decayed and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Filled (%)
5 or younger	41	63.41	63.41	0
6-8	6	33.33	33.33	0
9-11	115	32.19	31.30	1.74
12-14	160	10.62	10.62	0
15-17	48	0	0	0
18 or older	0	0	0	0
Total+	370	22.16	21.89	0.54

Frequency missing=2

+ Percentage for total number of children in the region (excluding frequency missing)

Table 15. Providenciales: Prevalence of Dental Caries in the Primary Dentition (dmft >0), Untreated Decayed and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Filled (%)
5 or younger	16	43.75	43.75	0
6-8	143	36.36	36.66	0.7
9-11	154	19.48	18.83	0.65
12-14	55	1.82	1.82	0
15-17	205	0	0	0
18 or older	20	0	0	0
Total +	593	15.18	15.01	0.34

Frequency missing=4

+ Percentage for total number of surveyed children in the region (except for frequency missing)

Table 16. North Caicos: Prevalence of Dental Caries in the Primary Dentition (dmft >0), Untreated Decayed and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Filled (%)
5 or younger	18	27.78	27.78	0
6-8	63	58.73	58.73	0
9-11	88	55.68	44.32	0
12-14	64	18.75	18.75	0
15-17	50	2.00	2.00	0
18 or older	1	0	0	0
Total+	284	36.97	36.97	0

Frequency missing=3
+ Percentage for total number of children surveyed in the region (excluding frequency missing).

Table 17. Middle Caicos: Prevalence of Dental Caries in the Primary Dentition (dmft >0), Untreated Decayed and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Filled (%)
5 or younger	0	0	0	0
6-8	2	100.00	0	0
9-11	10	40.00	30	.10
12-14	6	50.00	50	0
15-17	0	0	0	0
18 or older	0	0	0	0
Total+	18	50.00	44.44	5.56

+ Percentage for total number of children surveyed in the region.

Table 18. South Caicos: Prevalence of Dental Caries in the Primary Dentition (dmft >0), Untreated Decayed and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Filled (%)
5 or younger	0	0	0	0
6-8	37	54.05	54.05	0
9-11	48	54.17	54.17	0
12-14	14	35.51	35.91	0
15-17	0	0	0	0
18 or older	0	0	0	0
Total+	99	51.52	51.52	0

+ Percentage for total number of children surveyed in the region

B. Permanent Dentition

Proportion of Dental Caries in the Permanent Dentition by Age Group and by Region

The children with the greatest proportion of dental caries in the permanent dentition were in the 12-14 year old group, with 45% (Table 19). Generally, as the children grew older, they had proportionately more caries in the permanent dentition.

Table 19. Proportion of children with dental caries in the permanent dentition in each age group (%)

Number	Age	N	Proportion (%)*
1	12-14	363	0.45730028
2	15-17	304	0.39144737
3	18 or older	22	0.27272727
4	5 or younger	97	0.22680412
5	6-8	257	0.13229572
6	9-11	502	0.29681275

Statistical testing, using SAS proc GLM showed that statistically significant differences between the groups of children under the age of 12 and those over the age of 12 for the proportions of caries in the permanent dentition with the exception of the 18 and older group. The reason could be that the 18 and older group may contain some miscoded individuals. Otherwise this is consistent with the fact that younger children have fewer permanent teeth and those they do have are relatively new and have only recently been exposed to the environment of the mouth which could result in carious lesions.

As shown in Table 20, Providenciales was the region with the smallest proportion of dental caries(20%) and statistical testing revealed that it was significantly different from Grand Turk (39%), Middle Caicos (77%) and North Caicos (41%), which were the regions where the children had the greater proportion of dental caries. South Caicos (28%) was only statistically different from Middle Caicos, the region with the smallest sample size. The results must be read carefully with respect to Middle Caicos as that group is considerably smaller than the others.

Table 20. Proportion of dental caries in the permanent dentition in each region

Number	Region	N	Proportion (%)
1	Grand Turk	372	0.39516129
2	Middle Caicos	18	0.77777778
3	North Caicos	287	0.41811847
4	Providenciales	597	0.20100503
5	South Caicos	99	0.28282828

The DMFT trend in the permanent dentition peaked in the 12-14 age group with 0.97 and declined in a consistent manner (Table 20). The DMFT for 12-year olds was 0.92 and for 15-year olds it was 1.09 (Tables 21 and 22). Only one child, a female age 13, was found to have a sealant. Most of the permanent molars in the sample (89%) were scored as D, M, or F.

Tables 21, 22, and 23, below show the mean DMFT and a breakdown showing the contribution of each element to the DMFT. It should be noted that there are few filled teeth compared to the average number of decayed teeth. There are very relatively few missing teeth. This was true among the 12 and 15-year-olds.

Table 21. Mean DMFT, Decayed, Missing and Filled Teeth in the Permanent Dentition by Age Group (n=1575)

Age	N	Mean DMF	Std. Dev.	Decayed	Std. Dev.	Missing	Std. Dev.	Filled	Std. Dev.
5 or younger	97	0.41	0.89	0.39	0.86	0.01	0.10	0	0
6-8	257	0.20	0.56	1.08	1.57	0.01	0.11	0.01	0.14
9-11	502	0.51	0.90	0.46	0.86	0.03	0.16	0.02	0.18
12-14	363	0.97	1.21	0.80	1.11	0.10	0.35	0.07	0.30
15-17	304	0.89	1.31	0.70	1.21	0.10	0.32	0.09	0.38
18 or older	22	0.41	0.80	0.36	0.73	0.05	0.21	0.09	0.38

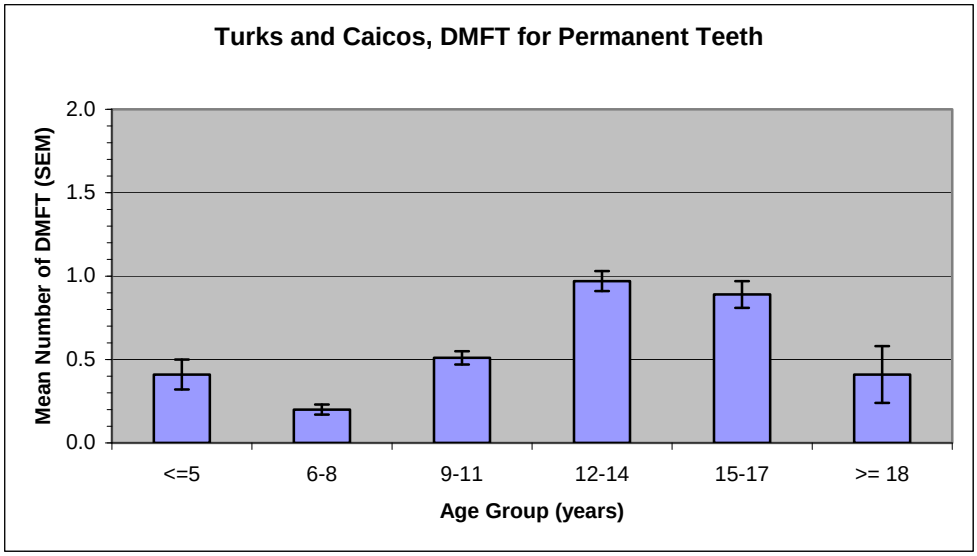
Table 22. Mean DMFT, Decayed, Missing and Filled Teeth in the Permanent Dentition among 12-Year-Olds

Age	N	Mean DMF	Std. Dev.	Decayed	Std. Dev.	Missing	Std. Dev.	Filled	Std. Dev.
12	158	0.92	1.16	0.76	1.02	0.10	0.36	0.06	0.26

Table 23. Mean DMFT, Decayed, Missing and Filled Teeth in the Permanent Dentition among 15-Year-Olds (n=127)

Age	N	Mean DMF	Std. Dev.	Decayed	Std. Dev.	Missing	Std. Dev.	Filled	Std. Dev.
15	127	1.09	1.61	0	0	0.14	0.39	0.08	0.35

Figure 2. DMFT for Permanent Teeth (N=1575)



Descriptive Tables

Tables 24-28 describe the proportion of dental caries greater than zero in the permanent dentition in each age group within each of the five regions sampled, as well as detailing the proportion of decayed and filled teeth. Because the number of children examined in each of the age groups in the regions varies and some are very small, it is difficult to make comparisons between regional age groups. The percentages of filled teeth as compared to decayed teeth are small as in the primary dentition.

Table 24. Grand Turk: Prevalence of Dental Caries in the Permanent Dentition (DMFT >0), Untreated Decayed, Missing and Filled Teeth (% by age group and regional total)

Age	N	DMF > 0 (%)	Decayed (%)	Missing (%)	Filled (%)
5 or younger	41	26.83	24.39	2.44	2.44
6-8	6	33.33	33.33	0	0
9-11	115	37.39	30.43	2.61	5.22
12-14	160	53.75	47.50	7.5	7.50
15-17	48	60.42	47.92	14.58	18.75
18 or older	0	0	0	0	0
Total+	370	46.22	39.46	6.22	7.57

Frequency missing=2
+ Percentage for total number of children surveyed in the region (excluding frequency missing).

Table 25. Providenciales: Prevalence of Dental Caries in the Permanent Dentition (DMFT >0), Untreated Decayed, Missing and Filled Teeth (% by age group and regional total)

Age	N	Dmf > 0 (%)	Decayed (%)	Missing (%)	Filled (%)
5 or younger	16	0	0	0	0
6-8	143	5.59	5.59	0	0
9-11	154	18.83	18.83	1.30	0
12-14	55	36.36	25.45	5.45	9.09
15-17	205	39.51	30.73	8.29	5.85
18 or older	20	30	30.00	5.00	0
Total+	593	24.28	20.24	3.88	2.87

Frequency missing= 4
+ Percentage for total number of children surveyed in the region (excluding frequency missing).

Table 26. North Caicos: Prevalence of Dental Caries in the Permanent Dentition (DMFT >0), Untreated Decayed, Missing and Filled Teeth (% by age group and regional total)

Age	N	Dmf > 0 (%)	Decayed (%)	Missing (%)	Filled (%)
5 or younger	18	16.67	16.67	0	0
6-8	63	19.05	15.87	3.17	0
9-11	88	43.18	43.18	1.14	0
12-14	64	56.25	56.25	3.12	0
15-17	50	68	66.00	6.00	0
18 or older	1	0	0	0	0
Total+	284	43.31	42.25	2.82	0

Frequency missing=3
+ Percentage for total number of children surveyed in the region (excluding frequency missing).

Table 27. Middle Caicos: Prevalence of Dental Caries in the Permanent Dentition (DMFT >0), Untreated Decayed, Missing and Filled Teeth (% by age group and regional total)

Age	N	Dmf > 0 (%)	Decayed (%)	Missing (%)	Filled (%)
5 or younger	0	0	0	0	0
0	2	100.00	100.00	0	0
9-11	10	80.00	70.00	0	10.00
12-14	6	83.33	83.33	16.67	16.67
15-17	0	0	0	0	0
18 or older	0	0	0	0	0
Total+	18	83.33	77.78	5.56	11.11

+ Percentage for total number of children surveyed in the region.

Table 28. South Caicos: Prevalence of Dental Caries in the Permanent Dentition (DMFT >0), Untreated Decayed, Missing and Filled Teeth (% by age group and regional total)

Age	N	dmf > 0 (%)	Decayed (%)	Missing (%)	Filled (%)
5 or younger	0	0	0	0	0
6-8	37	37.84	29.73	2.70	5.41
9-11	48	27.08	25.00	0	2.08
12-14	14	35.71	35.71	7.14	0
15-17	0	0	0	0	0
18 or older	0	0	0	0	0
Total+	99	32.22	28.28	2.02	3.03

+ Percentage for total number of children surveyed in the region

7. Treatment Needs

The examiners indicated three children, representing 0.3% of the sample as treatment urgency cases for orthodontic reasons. Other conditions were found in 25 children (1.6%). The majority of this latter group were singled out for orthodontic treatment. Examiners found one cleft palate and three malocclusions. This information should be considered with caution since there is no information available about examiner calibration. Normally examiner calibration stresses the importance of asking children about pain in order to identify deep carious lesions (especially in temporary dentition), where infection could be present. Such cases indicate the need for emergency referrals. The information about treatment needs in this study appears to have focused more on rehabilitation needs (orthodontics and surgery).

8. Enamel Fluorosis

Enamel fluorosis was diagnosed in 66 (4.2%) of the 1575 children surveyed. Forty children or 60% of those diagnosed were found to have moderate or mild fluorosis, according to Dean's index criteria[4]. Fifty one (77.52%) of those diagnosed were age 9 or over. Dental fluorosis is a function of exposure to fluoride over time and is considered rare in primary teeth. (ref. dental textbook). Unless there is another explanation, the children aged 5 and younger and in the 6-8 age group, a total of 15, may have been exposed to naturally occurring fluoride or may have had another condition that was mistaken for fluorosis. Five of those diagnosed with moderate to mild fluorosis were in these two groups.

Table 29 details the diagnosis of dental fluorosis by age group, while tables 30 to 34 describe the frequency of dental fluorosis by region. The region with the largest number of children diagnosed with dental fluorosis is Providenciales (38), followed by North Caicos (18), Grand Turk (5) and North (1) and South Caicos (1). As mentioned above, Providenciales has the lowest proportion of children affected by dental caries in the primary and the permanent dentition. It is not known whether there is any relationship between that fact and the higher diagnoses of flourosis in that region. This observation points to a consistently greater exposure to fluorides, whether through natural occurring fluorides, preventive fluoride treatments or fluoride toothpaste is also unknown.

In view of the lack of information about calibration of examiners, these data should be considered with caution and as a starting point for further research.

Table 29: Dental Fluorosis by Age Group

Age	Fluorosis					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	1 1.52	0 0.00	1 1.52
6-8	1 1.52	6 9.09	3 4.55	4 6.06	0 0.00	14 21.21
9-11	3 4.55	6 9.09	3 4.55	12 18.18	0 0.00	24 36.36
12-14	2 3.03	1 1.52	1 1.52	7 10.61	0 0.00	11 16.67
15-17	0 0.00	0 0.00	0 0.00	10 15.15	5 7.58	15 22.73
18 and older	0 0.00	0 0.00	0 0.00	1 1.52	0 0.00	1 1.52
Total	6 9.09	13 19.70	7 10.61	35 53.03	5 7.58	66 100.00

An examination of the fluorosis data by region reveals that Providenciales had 38 diagnoses of fluorosis. Of these, 14 were in children ages 9-11, 12 among the 6-8 year olds and 9 in the 15-17 age group. A total of children were diagnosed with fluorosis in North Caicos, 6 each in the 12-14 and 15-17 age groups and five in the 9-11 age group. Five cases were diagnosed on Grand Turk and one each on Middle and South Caicos.

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Table 30: Dental Fluorosis by Age and Region: Grand Turk

Age	Fluorosis by Region: Grand Turk					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
6-8	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
9-11	0 0.00	1 20.00	1 20.00	2 40.00	0 0.00	4 80.00
12-14	0 0.00	0 0.00	0 0.00	1 20.00	0 0.00	1 20.00
15-17	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
18 and older	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Total	0 0.00	1 20.00	1 20.00	3 60.00	0 0.00	5 100.00

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Table 31: Dental Fluorosis by Age and Region: Providenciales

Age	Fluorosis: Providenciales					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	1 2.63	0 0.00	1 2.63
6-8	0 0.00	6 15.79	2 5.26	4. 10.53	0 0.00	12 31.58
9-11	1 2.63	3 7.89	2 5.26	8 21.05	0 0.00	14 36.84
12-14	0 0.00	0 0.00	1 2.63	0 0.00	0 0.00	1 2.63
15-17	0 0.00	0 0.00	0 0.00	6 15.79	3 7.89	9 23.68
18 and older	0 0.00	0 0.00	0 0.00	1 2.63	0 0.00	1 2.63
Total	1 2.63	9 23.68	5 13.16	20 52.63	3 7.89	38 100.00

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Table 32: Dental Fluorosis by Age and Region: North Caicos

Age	Fluorosis: North Caicos					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
6-8	1 5.56	0 0.00	0 0.00	0 0.00	0 0.00	1 5.56
9-11	2 11.11	2 11.11	0 0.00	1 5.56	0 0.00	5 27.78
12-14	1 5.56	1 5.56	0 0.00	4 22.22	0 0.00	6 33.33
15-17	0 0.00	0 0.00	0 0.00	4 22.22	2 11.11	6 33.33
18 and older	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Total	4 22.22	3 16.67	0 0.00	9 50.00	2 11.11	18 100.00

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Table 33: Dental Fluorosis by Age and Region: Middle Caicos

Age	Fluorosis: Middle Caicos					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
6-8	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
9-11	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
12-14	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00	1 100.00
15-17	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
18 and older	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Total	1 100.00	0 0.00	0 0.00	0 0.00	0 0.00	1 100.00

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Table 34: Dental Fluorosis by Age and Region: South Caicos

Age	Fluorosis: South Caicos					
Frequency Percent	1	2	3	4	5	Total
5 and younger	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
6-8	0 0.00	0 0.00	1 100.00	0 0.00	0 0.00	1 100.00
9-11	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
12-14	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
15-17	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
18 and older	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00	0 0.00
Total	0 0.00	0 0.00	1 100.00	0 0.00	0 0.00	1 100.00

9. Conclusion

A total of 1575 children were examined for this survey in five regions of the Turks and Caicos archipelago. These were Grand Turk, Providenciales, North, Middle and South Caicos.

Data concerning age was available for 1545 children. The 502 children in the 9-11 age group accounted for 32.49% of the sample while there were 363 (23.50%) 12-14 year olds, followed by 304 (19.68%) 15-17 year olds. A total of 257 children in the 6-8 group made up 16.63% of the sample.

Forty four percent of the decay in the primary or deciduous dentition was found in the 6-8 year olds. Comparatively, the smallest proportion of decay was found in Providenciales (15%) and the largest in South Caicos. The number of diseased missing and filled teeth (dmft) in the primary or deciduous dentition peaked at a mean of 1.09 in the 6-8 age group, decreasing to 0 in the 15-17 age group. For 12 year olds the mean dmf was 0.30. As children shed their deciduous teeth the dmft decreased.

Dental caries were most prevalent (45%) among the 12-14 year olds. Again Providenciales had the smallest proportion (20%) of caries, while North Caicos had the greatest (42%). The DMFT in the permanent dentition increased consistently, peaking in the 12-14 age group with a mean of 0.97. It began to decline in the 15-17 year olds at 0.89. The DMFT for 12-year olds was 0.92, while for 15-year olds it was 1.09.

While the study revealed that dmft and DMFT were low in Turks and Caicos, there was also some evidence that children were not getting the dental services they needed. This may be because the survey data review very few fillings compared to decay giving the impression that much of the decay appears not to have been addressed.

Enamel fluorosis was diagnosed in 66 (4.2%) of the 1575 children surveyed. Sixty percent (40) of those diagnosed with fluorosis were found to have moderate or mild fluorosis. The greatest number of diagnoses for enamel fluorosis were made in Providenciales, a total of 38 out of 66.

Providenciales was the region with the smallest proportion of children affected by caries in the primary (15%) and permanent dentition (20%). The other regions had larger proportions of children affected by caries. In addition, Providenciales is the region with the largest population as well as the only urban center. This could point to a difference in access to services between this populated urban center and other populations in the Turks and Caicos Islands. There are also

questions about fluoride exposure since the largest number of cases were diagnosed in Providenciales.

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[1] PAHO, Turks and Caicos Islands: Basic Country Health Profiles, Summaries 1999, updated to 2002, http://www.paho.org/English/DD/AIS/turkscaicos.
[3] Ibid.
[4] Dean HT. The investigation of physiological effects of the epidemiological method. In: Moulton FR, ed, *Fluoride and Dental Health*. Washington, D.C., American Association for the Advancement of Science, 1942 (Publication No. 19); 23-31.