

# Dental caries prevalence in the Baffin Island Eskimo

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## Abstract

*A survey of 766 Eskimo children in Baffin Zone of the Northwest Territories showed high levels of dental caries comparable to those found elsewhere in the Arctic. Lowest caries rates were in Pond Inlet, one of the most isolated settlements. The fluoridation of water supplies in Frobisher Bay appeared to be effecting a reduction in dental caries in the permanent teeth but not in the deciduous teeth.*

## Introduction

Baffin Island is the third largest island in the world, yet it contains a sparse Eskimo population of some 6000 people living in 12 small settlements. These settlements are scattered across Baffin Island and several lesser islands in an area administratively known as Baffin Zone. Dental care is provided for this area by the Canadian Government through a system of traveling dentists based in the main settlement of Frobisher Bay.

Unlike most other areas of the Arctic, the original nomadic culture of the Baffin Eskimo persisted until the building of airfields on Baffin Island during the 1939-1945 war. This influx of military and, subsequently, administrative personnel introduced the European-North American culture to the Baffin Eskimo. As opposed to Greenland and Alaska where changes in life-styles and diet commenced at the turn of the present century,<sup>1,2</sup> the changes in Baffin Zone have been recent and very rapid.

Studies on the prevalence of dental caries in Greenland have been extensive and are well documented.<sup>3-7</sup> Correspondingly, in Alaska there have been several studies concerned with dental caries and dietary changes.<sup>2,8-10</sup> For the Canadian Eskimo, however, there are very little data documenting the prevalence of dental decay.

There are two studies on the high level of dental caries in the Keewatin Eskimo<sup>12,13</sup> and one report on the Labrador Eskimo by Waugh.<sup>14</sup> For the Eskimo of

the Arctic coastline, the McKenzie River Delta, and the area of Baffin Zone, there is only the limited study of Mayhall<sup>15</sup> in the settlement of Igloolik.

## Material and methods

Because of the vast area of land concerned and the scattered nature of the population, it was not possible to examine all of the Eskimo children within a short period of time. Dental examinations were carried out as each settlement was visited over the period of one year as part of a program to provide dental health care to the area. Examined during the year 1971 were 777 children living in 11 settlements. The distribution of these settlements within Baffin Zone is shown in Fig. 1.

Dental examinations were carried out using identical methods of caries diagnosis and recording as in a previous study.<sup>12</sup> Caries were diagnosed as such when an explorer penetrated into softened dentin; catches or surface defects were not considered as carious lesions. Equipment used included a portable dental light, and compressed air was available.

Frobisher Bay contained the largest percentage of the total study population and also had fluoridated water. There was some debate as to how effective the fluoridation had been, and accordingly, over a three month period, the water fluoride ion concentration was monitored using a colorimetric method.

Although social contacts of the Eskimo with whalers and explorers have occurred for over 100 years, intermarriage with Caucasians had increased considerably within the last 20 years. A notation was made as to the racial background of each child included in the study. This was assessed from information provided from Eskimo dental assistants as described previously.<sup>16</sup> Thus, children with one Eskimo and one Caucasian parent were given the notation "2/4," which means that two of the four grandparents were Eskimo. This was not a perfect system, bearing in mind the random contacts with whalers and explorers over the

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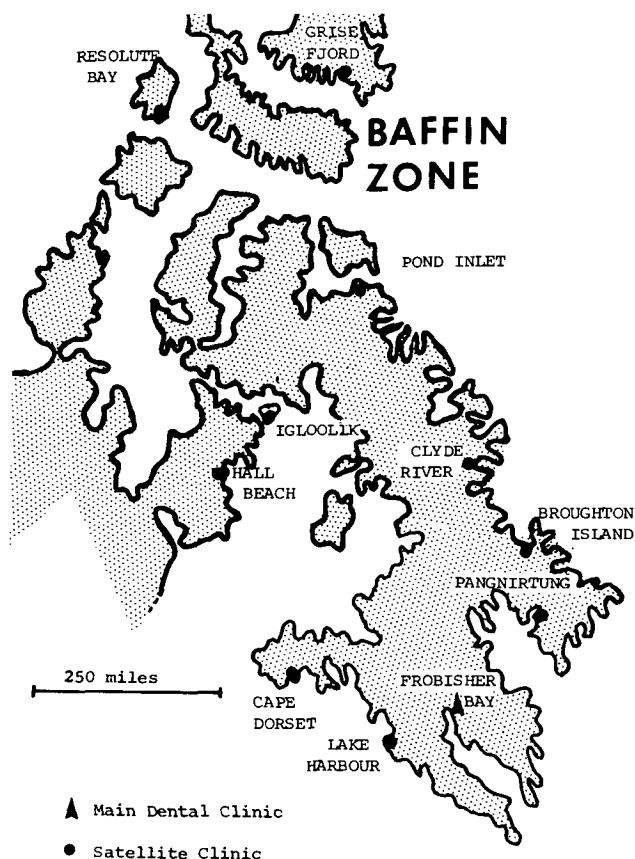


Fig. 1. Map showing geographic area covered by Baffin Zone for Medical Services in 1971–1972 and settlements surveyed for dental caries prevalence in Eskimo children.

centuries, but it was felt to be as valid as possible under the circumstances.

## Results

The distribution of the Eskimo children examined is given in Table 1. Of the 777 children examined, 644 (82.9%) were found to be Eskimo as defined for this study, and a further 122 had two or three Eskimo grandparents. The number of non-Eskimos was small relative to the total number of children examined, so the data on these children are not reported further here.

Dental caries were found to be extensive throughout the population studied. The mean caries score for decayed, extracted, and filled deciduous teeth (DEFT) in the 3–5 year-old Eskimo population was 5.27. Individual settlements showed various scores with a high of 8.14 for Igloolik and a low of 3.75 for Clyde River. For the children aged 6–9 years, the overall mean score was 6.85 with a range of 5.93–11.36 for individual settlements.

Because of the extent of the caries prevalence, it was felt that the scores by number of surfaces affected

were more meaningful than a simple tooth count. In the deciduous dentition, the scores for decayed, extracted, and filled surfaces (DEFS) by settlement are given in Table 2. From the data accumulated during the treatment of these children, it was found that the extracted component of the DEFS score was an average of five surfaces for each tooth that had to be extracted. Accordingly, in calculating the mean DEFS scores, 5 was allowed for each tooth extracted for caries.

Table 1. Distribution of subjects examined within Baffin Zone of Northwest Territories

Village	Population	Child population (3–9 years)		
		Actual	Examined	%
Broughton Island	334	99	41	41
Cape Dorset	597	92	43	46
Clyde River	274	39	36	92
Frobisher Bay	2014	308	300	97
Grise Fjord	109	29	26	89
Hall Beach	263	38	29	76
Igloolik	563	115	47	41
Lake Harbour	189	41	40	97
Pangnirtung	690	125	50	40
Pond Inlet	416	125	93	74
Resolute Bay	184	72	72	100
Totals	5633	1083	777	72

Table 2. Caries indices for deciduous teeth for Baffin Eskimo children aged 3–9 by village

Village	n	Mean caries scores ( $\pm$ S.E.)	
		DFS	DEFS
Broughton Island	41	4.29 $\pm$ 0.64	21.00 $\pm$ 2.22
Cape Dorset	43	5.85 $\pm$ 0.92	23.83 $\pm$ 2.39
Clyde River	36	6.71 $\pm$ 0.99	17.85 $\pm$ 2.29
Frobisher Bay	300	7.11 $\pm$ 0.42	12.46 $\pm$ 0.74
Grise Fjord	26	2.34 $\pm$ 1.05	19.46 $\pm$ 4.30
Hall Beach	29	4.93 $\pm$ 0.83	19.93 $\pm$ 3.02
Igloolik	47	4.68 $\pm$ 0.94	13.65 $\pm$ 2.51
Lake Harbour	40	7.28 $\pm$ 1.19	18.94 $\pm$ 2.24
Pangnirtung	50	7.62 $\pm$ 1.03	24.50 $\pm$ 2.07
Pond Inlet	93	3.52 $\pm$ 0.47	9.69 $\pm$ 1.26
Resolute Bay	72	7.62 $\pm$ 1.21	14.07 $\pm$ 1.90
All Eskimos	777	6.14 $\pm$ 0.25	15.30 $\pm$ 0.53

Prior to a regular dental health care program, dental officers treated the relief of pain in outlying settlements by extractions only. The score for DEFS was probably biased by these extractions for the more remote settlements, and so the scores for decayed and filled surfaces (DFS) were calculated and are reported in Table 2. A student-Newman-Keuls multiple range

**Table 3. Caries indices for permanent teeth for Baffin Eskimo children aged 6-9 by village**

Village	n	Mean caries scores ( $\pm$ S.E.)			
		Teeth		Surfaces	
		DMFT	M*	DFS	DMFS
Broughton Island	41	1.62 $\pm$ 0.27	4.14	2.07 $\pm$ 0.39	6.21 $\pm$ 1.23
Cape Dorset	42	2.31 $\pm$ 0.28	1.31	4.09 $\pm$ 0.56	5.40 $\pm$ 0.91
Clyde River	31	2.24 $\pm$ 0.45	1.71	2.77 $\pm$ 0.64	4.48 $\pm$ 1.25
Frobisher Bay	153	1.74 $\pm$ 0.19	0.48	1.68 $\pm$ 0.17	2.16 $\pm$ 0.24
Grise Fjord	26	2.90 $\pm$ 0.48	2.11	5.92 $\pm$ 1.22	8.03 $\pm$ 1.78
Hall Beach	29	2.00 $\pm$ 0.32	1.38	3.93 $\pm$ 0.59	5.31 $\pm$ 1.07
Igloolik	33	1.50 $\pm$ 0.32	1.36	5.09 $\pm$ 1.41	6.45 $\pm$ 1.70
Lake Harbour	39	1.88 $\pm$ 0.37	1.67	3.71 $\pm$ 0.58	5.38 $\pm$ 1.01
Pangnirtung	46	2.22 $\pm$ 0.23	0.50	3.38 $\pm$ 0.37	3.88 $\pm$ 0.50
Pond Inlet	93	1.10 $\pm$ 0.18	0.91	2.01 $\pm$ 0.26	2.92 $\pm$ 0.41
Resolute Bay	57	2.40 $\pm$ 0.40	1.96	3.76 $\pm$ 0.53	5.72 $\pm$ 0.94
All Eskimos	590	1.88 $\pm$ 0.09	1.17	2.75 $\pm$ 0.14	3.92 $\pm$ 0.22

\* Mean, M permanent teeth.

test on the DFS scores indicated that Pond Inlet had significantly lower scores than did all other settlements.

In the permanent dentition, dental caries were not so extensive as in the deciduous dentition; the scores for decayed, missing, and filled surfaces (DMFS) and for decayed, missing, and filled teeth (DMFT) for the 6-9 year olds are given in Table 3. For interpretation, the permanent teeth at risk that were scored were incisors, premolars, and the first permanent molars. For DFS scores, Frobisher Bay had significantly lower scores than Grise Fjord when tested by a multiple range test. The mean DFS score in Frobisher Bay at 1.68 was nearly one-half a surface lower than similar scores for all other settlements.

It was interesting that the lowest missing (M) scores were in Frobisher Bay and Pangnirtung, the settlements which had the highest provision of dental services. In contrast, the highest M scores were in Broughton Island and Grise Fjord. These differences may well be related to the type of dental services provided. An analysis of the DFS scores by racial background showed mean scores for Eskimos (4/4, grandparents) to be 6.22, for part Eskimos (3/4) to be 5.24, and for interracial children (2/4) to be 7.03. These differences were not statistically different. The number of dental caries was higher in the deciduous dentition in males and higher in the permanent dentition in females. Both these differences were statistically significant.

Monitoring of the fluoride levels of the Frobisher Bay water supplies showed that concentrations varied between 0.25 and 3.00 mg/l, depending upon the day and place of sampling. In Frobisher Bay, two systems of water supplies were used.<sup>17</sup> Water was piped directly to some houses, but the majority received their supply

daily by water-truck delivery. The fluoride concentration was more consistent in the piped supplies than in water trucked to individual homes. Overall, however, the mean fluoride concentration over the three months of water analyses was 1.42 mg per liter. This was slightly higher than the recommended level of 1.2 mg per liter, based upon the mean annual temperature.<sup>18</sup>

## Discussion

It would appear that the level of dental caries in Baffin Zone is very similar to those reported in Eskimo children elsewhere in the Arctic, Table 4, even though the changes in life-style in Baffin Zone have been more recent than in other areas. In all probability, the caries level in other parts of the Canadian Arctic will be found to be comparable, although areas such as the McKenzie Delta have, as yet, not been surveyed.

In comparing some of the most recent reports on caries in the Eskimo, Table 4, it is evident that the deciduous dentitions are very badly affected. By the end of the pre-school period, over one-half the deciduous dentition can be decayed. The extent of caries in the Eskimo child's permanent dentition is of a comparable level to those of Caucasians living in the south of Canada, as has been noted before.<sup>12</sup>

Exploration and development of the Baffin area commenced during the 1939-1945 war, and it has since continued at an increasing pace with the search for minerals and oil. As a result, the financial ability of the Eskimo to purchase all types of foods brought in from the South has increased bringing about a rapid change in diet. The original nomadic, hunting way of life has now all but disappeared. When the present study was carried out, there were a few bands of Eskimos still living in seminomadic hunting camps, but their numbers were very small in relation to the

**Table 4. Comparison of caries findings in recent surveys of Eskimo children**

Author (year)	Country (area)	Age group used	Mean scores	
			DEFT	DMFT
Mayhall <i>et al.</i> (1970)	Alaska (Wainwright)	6-10	3.90	6.44
Curzon and Curzon (1970)	Canada (Keewatin)	3-9	8.48	
McPhail <i>et al.</i> (1972)	Canada (Keewatin)	7-9		1.94
		5-7	7.58	1.47
Møller <i>et al.</i> (1972)	Greenland (Godhavn)	8-9		2.54
		5-9		3.90
Mayhall <i>et al.</i> (1975)	Canada (Igloodik)*	0-5	7.62	
This study	Canada (Baffin)	6-10		6.17†
		3-9	5.27	
		6-9	6.85	1.88

\* Females only.

† Combined DEFT and DMFT.

total number of Eskimos on Baffin Island. In Clyde River, there were some 10 children at the time of the survey who had just moved into the settlement from nomadic camps during the winter of 1970-1971. It is of note that the mean caries scores for the Clyde River children were lower than those for the Broughton Island children, although the isolation of the two settlements was similar. As the influx of the camp Eskimo may have altered the mean scores for Clyde River, the data for the camp Eskimo children were removed. On recalculating the Clyde River data, the mean DEFT scores changed from 5.93-6.52, which was closer to the mean score for Broughton Island.

Fluoridation of water supplies has been in operation in Frobisher Bay since 1965, and this may account for the lower DMFS scores in that settlement. The data from our survey show that there is little or no effect of the fluoride on the deciduous dentition. As there are no nonfluoridated settlements in Baffin Zone which can be compared directly with Frobisher Bay in terms of isolation and population size, it is difficult to determine the percentage reduction in caries prevalence that has been achieved by water fluoridation. The level of dental treatment provided in Frobisher Bay which has a permanent dental clinic was naturally much higher than in other settlements. Pangnirtung, however, received five field visits by dental officers in 1971 which totalled 12 weeks. In comparison, there was 45% less decay in Frobisher Bay than in Pangnirtung.

The high level of dental caries in the Eskimo children in Baffin Zone must be a cause of great concern, particularly the devastation of the pre-school child's dentition with all the pain and discomfort caused. Our dental records showed that an average of 2.4 hours of treatment was required to render each Eskimo pre-school child dentally fit. By calculation, it was estimated that 20 dental officers would be needed to render the whole school population dentally fit within

one year. This compared with the dental staffing for Baffin Zone in the years 1970-1975 with an average of three dental officers per year. A greater dentist-to-population ratio is obviously required if the current level of caries prevalence in Baffin Zone is to be brought under control. Alternatively, an intensive preventive program is required to attempt to bring the disease under control.

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