NUTRITIONAL AND TOXICOLOGICAL COMPONENTS OF INUIT DIETS IN BROUGHTON ISLAND, NORTHWEST TERRITORIES

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October, 1989

Contract report presented to:
Elaine Berthelet, Assistant Deputy Minister
Department of Health, Northwest Territories
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Contract Numbers: NT-87-88-014-CO - HWC
SC-244137 - NWT
236-10 - McGill

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Summary

NUTRITIONAL AND TOXICOLOGICAL COMPONENTS OF INUIT DIETS IN BROUGHTON ISLAND, NORTHWEST TERRITORIES

This is a contract report to the Department of Health, Government of the Northwest Territories, for work done on a series of studies on dietary quality of Inuit people of Baffin Island. Studies were done on individual and family diets during eight interview periods which were structured to define seasonal and annual total use of traditional Inuit foods and marketed foods in the community of Broughton Island (population 430). More than 2,000 individual 24-hour recall dietary records and more than 530 family food frequency records were taken. Participation was regularly 60-70% of the community and evaluated to be representative of the whole community for traditional food use. Approximately 200 foods commonly used in the community were sampled raw and prepared, and were analyzed for nutrient and toxin contents. The dietary record data sets were then treated by computer with food composition data to determine nutrient adequacy and toxicological risk. It was found that traditional Inuit foods are still used extensively in daily diets and contribute major quantities of all essential nutrients. In particular, rich sources of iron, zinc, magnesium, protein, omega-3 fatty acids and retinol are found among the traditional Inuit foods.

Of the nutrients evaluated, calcium and retinol were found to be most limited in diets of several age and gender groups, even though good sources of these nutrients are available in traditional Inuit food resources. Taken as a whole, marketed foods available and used in the community have nutrient profiles that are inferior to the traditional Inuit foods.

It is also clear that PCB's are present in Inuit diets, with major dietary sources being fatty tissues of sea mammals. The provisional "tolerable" intake of 1 μg PCB's per kilogram body

weight was exceeded by a factor of 1-3x in several cases, with most of these being older individuals or men. Children and women in the "child-bearing" years who are presumed to be at greatest risk of PCB's (as for all potential environmental toxins) were mostly all within the "tolerable" intake. It was not possible to evaluate PCB intake of nursing infants in this study. However, four breast milk samples from the community were found to contain PCB's within the same range identified in Southern Canadian women.

It was concluded that because: (1) children and women in the "child-bearing" years are mostly all within the PCB "tolerable" intake, (2) the downward trend in the extent of use of traditional Inuit foods from historical times to the present will probably prevail and continue downward, (3) PCB's will probably not be increasing in Inuit food species since use in industrial countries will (hopefully) be even further reduced than they have been to date, and (4) the nutrition components of Inuit food are superb and are important enough for Inuit diets that they should, if anything, be increased; therefore the Inuit people of Broughton Island, and presumably in other Arctic areas, should continue use of their traditional food resources.

Suggestions for further research are included at the end of the report.

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FOREWARD

This report contains the results of a series of studies on dietary quality of the people of Broughton Island, Northwest Territories. The research was initiated from the concern for the environmental presence of polychlorinated biphenyls (PCB's) in the Eastern Arctic. The overall research effort involved many scientists and included studies on many kinds of environmental samples, including water, soils, wildlife and human blood. This report contains the findings for which the author has been responsible: the investigations of individual and family diets for PCB's and various nutritional components. The work involved the collection of seasonal dietary data and food samples from the community, their analysis in the laboratory and computer treatment. An overview of research activities is presented in the first section of the report.

As requested by the Department of Health, Government of the Northwest Territories, a major objective of this report is to present the findings in a style which is informative for the Northern reader. Target audiences are Inuit leaders and the health care team. Additional reports for the scientific audience will be presented elsewhere. The first written report of the results of the Broughton Island studies was prepared earlier for the Department of Health: the authors were D. Kinloch, H.V. Kuhnlein, and D. Muir, and it was entitled "Inuit Foods and Diet -An Assessment of Benefits and Risks".

BACKGROUND AND PROJECT ACTIVITIES

As early as 1984, media reports on the presence of polychlorinated biphenyls (PCB's) in Atlantic sea mammals, particularly whales and seals, aroused the concern of Inuit people who depend heavily on these species for their regular food supply. Requests were made through the Inuit leadership to several branches of the federal government of Canada to address this issue. The Department of Indian Affairs and Northern Development (DIAND) and Medical Services Branch of Health and Welfare Canada (MSB-HWC) initiated several inquiries of contaminants in the environment and in the Northern food chain. The long-standing research activities of the Department of Fisheries and Oceans (DFO) and the Department of the Environment (DOE) were called upon, and as well, several agencies of the Government of the Northwest Territories participated in these inquiries. An interagency committee, chaired by Mr. Garth Bangay of DIAND, developed the initiative for the research presented in this report. Dr. David Kinloch, who at the time was Medical Health Officer of the Northwest Territories with the Medical Services Branch of Health and Welfare Canada and a member of the aforementioned committee, contacted the author early in 1985 to develop a protocol for research into the extent of PCB contamination in the Inuit food system. A chronology of research activities is given in Table I.

The author accepted a contract to evaluate the dietary exposure to

PCB's during September, 1985, during which time Dr. Kinloch was in the community to take blood samples. At that time it was the intention to establish the protocol for the collection of dietary data to address seasonal differences in food use which would be continued every second month under local supervision.

Although efforts were made to collect dietary data in November, January and March (1985-86) it was concluded that a research supervisor needed to be present in the community to recruit and train the bilingual local interviewers, and to guide consistent data collection. Another area that needed attention specific for Broughton Island was the sampling of the food species for contaminant analysis. For the September, 1985, evaluation, contaminant values were used which were developed by Dr. Derek Muir (DFO) from results across the Canadian arctic for raw wildlife tissues. Foods harvested by and prepared for consumption by Broughton Island residents were judged to better meet the objectives of this investigation. In addition it was agreed that a thorough evaluation of the community's food use should include a nutritional component, since decisions on food supply and use cannot be made on contaminant data in isolation from basic nutritional considerations. Hence, an additional contract to investigate the Inuit food system in Broughton Island was written, agreed upon, and finally signed in May, 1987.

From September, 1985 to May, 1987, there were several important

changes which affected the due course of events, and their timing. First, the evolution of the transfer of government services to the Northwest Territories meant relocation of many personnel and redefinition of their responsibilities. During this time, and through to the completion of data collection, there were several transitions in personnel of the nursing station and the Hamlet Council offices in Broughton Island. The Department of Health in Yellowknife developed new leadership. Dr. Kinloch moved to Ottawa in a new post with the Laboratory Centre for Disease Control. Unrelated to the transfer of services to the Northwest Territories, the author also moved: from the University of British Columbia to McGill University in Montreal. Finally, in June, 1989, the author's contract was redefined and signed by officials of the Department of Health of the Northwest Territories and McGill University. Throughout these transitions, the commitment and cooperation to complete the research was consistent, although at times the definition of where the actual financial responsibility rested was not as clear.

The community leadership in Broughton Island was kept abreast of the progress of the research with written reports and by telephone, although it was difficult to continue the research process for so long without returning conclusive findings. These have just recently been finalized, and are now being written. The DIAND Committee's scientific sessions on contaminants in the North which took place in March, 1989, and the extensive media attention these

received even further pressed the demand from Broughton Island for results from the study of their community, which is completely understandable. In March and April, 1989, the community (first) and the government leaders of the Legislative Assembly of the Northwest Territories (second) were presented with preliminary findings of the research and recommendations for dietary use of the Inuit food species. This was done in context with the DIAND committee's scientific sessions. In essence, the conclusions reached were that (1) PCB's and other contaminants are present in Northern food species, and all possible attention must be given to this issue to demand a stop to further pollution, and (2) the current levels of intake of PCB's by the people of Broughton Island were not high enough to warrant advice to stop use of Inuit foods, particularly since (3) the Inuit foods are of very rich nutritional quality and they could not be replaced in equal nutritional value with marketed foods available to and used by community residents.

By special request, the author went to Broughton Island again in May, 1989, to reiterate the above conclusions in a public meeting. It is sincerely hoped that this meeting, as well as educational activities developed by the Department of Health of the Northwest Territories and the Baffin Regional Health Board report will fully inform the community and its leaders of current knowledge of the nutritional benefits and the PCB risks in their traditional food species.

Table 1. CHRONOLOGY OF RESEARCH ACTIVITIES

July, 1985	Preliminary visit to the community.
September,1985	First dietary interviews; 207 blood samples taken; 4 breast milk samples taken.
November, 1985-March, 1986	Unsuccessful follow-up dietary interviews; decision to discontinue these.
August, 1986	Report to Hamlet Council and request for permission to continue to get year-round interviews, pending funding. Permission given.
May, 1987	Contract approved, Medical Services, HWC.
July, 1987	Interviews re-initiated; food samples taken.
Sept. Nov., 1987 Jan., March, May, July, 1988	Interviews completed; food samples taken; Laboratory work initiated.
July, 1988 - May, 1989	Laboratory work continued.
Dec.- April, 1989	Media reports; DIAND scientific meeting; preliminary results given to Hamlet Council and GNWT leaders.
May, 1989	Public meeting, Broughton Island.
June, 1989	Contract re-negotiated, with NWT, Dept. of Health.
Sept. - Nov., 1989	Report finalized.

In all, the author travelled to Broughton Island a total of 12 times. McGill research activities were in the community nearly continuously from July, 1987, to August, 1988.

Literature

Native people throughout North America have experienced tremendous change in lifestyle since contact with Anglo-Europeans began 500 years ago. While it is recognized that evolution and change has been part of all cultural groups throughout history, the acceleration in loss of traditional food patterns has been the focus of research in recent years (Pelto and Vargas, 1989; Schaefer and Steckle, 1980).

Dietary patterns derived from traditional native foods have been shown to be ecologically sound, culturally appropriate, and nutritionally complete when quantities of foods are sufficient. (Kuhnlein, 1984b). The introduction of foods through market networks (hereafter called "marketed foods") has been accepted by native people throughout the continent, but it is known that the quality of marketed food supplies is variable and depends largely on access to transportation routes. In remote areas the foods available at acceptable cost are those that are not perishable and variety is limited. In the main, foods that are regularly purchased have long shelflife and are low in nutrient density. Overall they make a poor substitute, nutritionally, for the traditional native foods they replace in family diets.

In several areas, native elders have gone on record to voice their concern that the younger generations are not following the traditional food (and other) cultural patterns. Their general

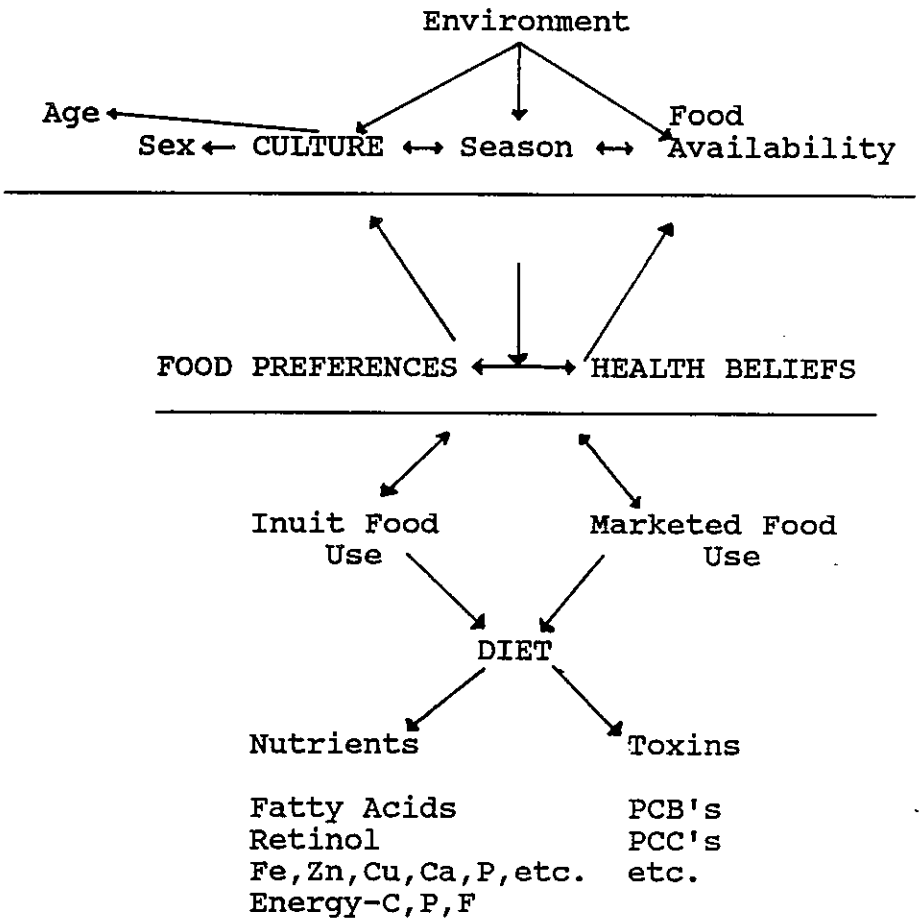
concern is that the health of young people is deteriorating, and they relate this primarily to use of inferior foods. The multitude of factors which contribute to the loss of use of traditional foods has been adapted from Kuhnlein (1984a) as follows:

- demographic changes (more people per land unit)
- restricted use of traditional harvest areas
- reduced food species density per harvest area unit
- availability of new foods
- acceptability of new foods because of media, social contact, education
- employment, and concerns for time, money and human energy available for traditional harvesting

The subject of this report is nutritional and toxicological components of Inuit diets. Factors influencing the selection of foods that Inuit people eat are shown in Figure 1. It is known that environment, culture, age and gender group, and the availability of foods (both traditional and marketed) all contribute to food preferences and health beliefs about food (Jerome et al, 1980; Sanjur, 1982). These, in turn, determine what people actually choose in their daily diets. Culture, food preferences and health beliefs are highlighted in this figure because they are major determinants of all dietary items. Diets of people are comprised of nutrients as well as other substances. In this report the other substances under study are polychlorinated biphenyls (PCBs), a mixture of chemicals that come from industrial activity in the

Figure 1

DETERMINANTS OF INUIT DIETARY CONSTITUENTS



South. The nutrients in Inuit diets under review here are several, but nevertheless only a portion of the total nutrients contained in food. Protein, fat and carbohydrate are the nutrients that provide energy in foods. As well, they each have special functions in the body as cellular components (Bureau of Nutritional Sciences, 1983). The polyunsaturated fatty acids, particularly the omega- fatty acids are food components known to be essential for health, and also known to be protective against cardiovascular disease and possibly cancer. These fats have been shown in high levels in some Inuit foods (Innis and Kuhnlein, 1987; Neuringer and Conner, 1986; Budowski, 1988). Retinol (Vitamin A) was studied because it is also a component of fats. It is important because it protects against infection, protects vision, and also protects against some kinds of cancer (Goodman, 1984). Several minerals known for their presence in animal foods were also studied in the Inuit diet. In particular, these were iron, zinc, calcium and copper. Each of these is essential in the body: iron for its role in forming healthy blood cells; zinc for wound-healing and prevention from infection; calcium for its role in bone and teeth development as well as muscle function; copper for its role in healthy blood cells. All of these nutrients are important in daily diets to provide growth and development of children and maintainance of health of adults (Bureau of Nutritional Sciences, 1983; Briggs and Calloway, 1984).

The recommended nutrient intakes (RNI's) for each nutrient are

agreed upon by a panel of nutritionists and regularly published by Health and Welfare Canada. The RNI's are determined to be the levels that meet the needs of practically all healthy people. The levels are set at two standard deviations* above the mean (average) level of known requirement to take into account individual variation. Different RNI's exist for the age and gender categories of people (Bureau of Nutritional Sciences, 1983).

The toxicological component under study in this report is polychlorinated biphenyls (PCB's). PCB's are a complex mixture of substances that move together, and which are sometimes difficult to analyze because of their many different components (Cairns and Siegmund, 1981). PCB's have been used in several industries since about 1930, but their use in North America has been restricted since the late 1970's because PCB's were shown to be persistent and to accumulate in the world's environments (Lauber, 1987). PCB's are known to accumulate up the food chain and have been shown to be present in all animals and people (Fuller and Hobson, 1987; Mes, 1987; Jensen, 1983). They increase in people with age, and more are present in males than in females. Women are known to lose PCB's through pregnancy and lactation (Davies and Mes, 1987). It has been known for several years that Arctic sea mammals contain PCB's (Wagemann and Muir, 1984; Wong, 1985).

* Two standard deviations above the mean include more than 97% of all healthy people.

Provisional "tolerable" levels of PCB's have been adopted by Health and Welfare Canada (personal communication, Dr. D. Grant). Although high doses have caused development problems and cancer in rat and mouse studies (Fuller and Hobson, 1987) the effects of low amounts in food of humans are not known. The provisional human "tolerances" were therefore set with a safety factor of 200-times the dose shown to cause problems in rats. Hence, the "tolerance" is 1 microgram for each kilogram of body weight in the human (1 ug/kg) of all age and gender categories. (Table 30. defines the units used in PCB calculations).

It is generally presumed that the growing fetus and nursing infant are at greater risk because their body weight is so low, they are developing rapidly, and their only nourishment (blood for the fetus; milk for the infant) contains small amounts of PCB's. Some researchers have claimed development problems in children breast fed by mothers who live in high PCB areas or who eat foods high in PCB's (Fein et al, 1984; Taylor et al, 1984; Rogan et al, 1985; Rogan et al, 1987). However, these effects have not been proven, and are still controversial because of the difficulties in knowing the amounts of PCB's eaten, the amounts of other toxins (such as alcohol, smoking, or other contaminants) taken, and in testing the development effects. The effects of PCB's on human poisoning have only been conclusively shown in people exposed for long term in a high-PCB work environment or in accidental PCB poisoning of foods in massive doses. (Lauber, 1987).

There have been few studies reported on the nutrition or food use of Inuit people, and none on their PCB intake. It is known that the Inuit diet is gradually changing away from the exclusive use of traditional Inuit food, and that for many people, nutritional problems are evident (Verdier et al, 1987; Wein, 1986; Health and Welfare Canada, 1975; Draper, 1977; Ellestad-Sayed, 1983). It is generally agreed that fewer chronic diseases existed when the Inuit followed their aboriginal diet.

The amount of wildlife harvested in the eastern Northwest Territories have been reported by Gamble (1984) for the Keewatin and Pattimore (1986) for Baffin Island. These harvest studies show that a great deal of sea mammal and land animal food species are still used per person. Of the Baffin Island communities reported in Pattimore (1986), Broughton Island was shown to have the highest use of traditional wildlife food species per person, and therefore was selected as the community for this research.

OVERVIEW OF METHODS

The methods used in this research were those of interviews, food sample collection and laboratory analysis, and computer treatment of the dietary records.

Procedures of dietary interviews

Community-wide dietary interviews were satisfactorily completed in September, 1985, in July, September, November, 1987, and in January, March, May and July, 1988. The intention was to do a complete calendar year which included seasonal variations in Inuit food use (July 87 - May 88) and to do repeat interviews of two seasons to get some assessment of yearly variations in food use (September, 1985 and 1987 and July, 1987 and 1988).

Before each period the hamlet secretary-manager (Ms. Robinson, Mr. O'Keefe or Mr. Johnston over the 3 year period) was informed of the itinerary of the research team and assisted with arrangements. Inuktitut radio messages by hamlet employees or members of the interview team kept the community informed of when the interviews would take place. A research assistant from McGill University worked with the secretary-manager to identify potential interviewers from among local bilingual residents. Household interviews could therefore take place in Inuktitut or English, and responses were recorded in English on the interview forms.

Throughout the 8 interview periods the following individuals were employed by the project, trained in the purposes of the study, and how to consistently take interview data from the community. The interviewer supervisors were Dr. Harriet Kuhnlein and Research Assistant Rula Soueida of McGill University.

Table 2. Broughton Island resident interviewers employed for the study*

Alookie, Tina	Kooneeliusee, Bertha
Angnako, Geela	Kooneeliusee, Ina
Arnaquq, Daisy	Kooneeliusee, Linda
Audlakiak, Daisy	Kooneeliusee, Sarah P.
Audlakiak, Geela	Kunilusee, Sarah N.
Audlakiak, Leena	Kopalie, Susie
Audlakiak, Ooleepeeka	Newkingna, Lucy
Audlakiak, Rosie	Newkingna, Monica
Audlakiak, Titusie	Nookiguak, Daisy
Joanasie, Anna	Nookiguak, Hanna
Kakka, Jeannie	Quaqqaq, Lizzie
Kanayuk, Gisapi	Toomasie, Jeannie
Kokseak, Solomonie	

* Some of these individuals were employed for only a few days; others over several interviewing periods.

Interviews began with getting permission to be interviewed (informed consent) and giving reassurance that personal results would be confidential and not attached to an individual by name. As well, interviewees were informed that they could stop the interview at any time, if they wished. In general, the interviewers had excellent cooperation from community members (60-70% of total), even though the quantitative aspects of the interviews were tedious to complete.

The following interviews made were:

(1) Frequency of seasonal use of individual Inuit food species by household
(2) Household demographic profile
(3) Quantitative 24-hour recall of food use by household members
(4) Interviews on food practices and 24-hour recalls of pregnant/lactating women

Interviewers were instructed to try to complete each household series before going on to the next household. Depending on the number of individuals in one home, and the diversity in what was eaten, the interviews routinely took from one to one-and-one-half hours per household in each interviewing period. Once each day the interviewers met with the research supervisor at the research station in the Hamlet Council Building to review the forms, clarify

any necessary points, and to take new forms. Usually, during one interview period, 4-6 interviewers were employed, and it took 4-5 weeks to canvas the entire community.

It is always a concern that when less than 100% of a community participates in a study, that a bias is introduced when particular characteristics of interest are concentrated in the non-responders. Because this study needed to ensure that the traditional Inuit food use patterns of the entire community were represented, a community profile of traditional food use was created from knowledge of the interview team. This profile was then confirmed with the household food frequency interviews. In essence, community households were divided into 5 categories of use of traditional Inuit foods, and the percentage of households in each category were matched in the number of households actually interviewed. Hence, although only 60-70% of the community participated in any one survey period, those interviewed paralleled the community as a whole for traditional food use. This permitted the extrapolation of partial data (60-70%) for the community to the total population.

The percentages of total households and of those interviewed in the 5 food-use categories are given in Table 3.

Table 3. Household Traditional Inuit Food Use by Use Category: Broughton Island

Category	Total*	Interviewed
	----------%----------	
Very Low	3	3
Low	17	17
Medium	31	32
Medium-High	18	16
High	30	33

* 85 households: Summary of 6 interview periods when 58-73 households were interviewed

Food Sample Collection

With the assistance of community hunters and elders, the interview teams, and information contained in the dietary interviews, a list of foods was prepared for collection for laboratory analysis of nutrient and toxic constituents. Since some foods are eaten either raw or cooked by community members, portions of both were taken. A list of the foods sampled is given in Table 4. In addition, 4 breast milk samples were provided in 1985.

The foods were harvested by community members and prepared under their supervision, usually with the assistance of the interviewers. The samples were frozen (-20°C) immediately after preparation, and shipped frozen by air to the McGill laboratory. Usually they were transported by the research assistant at the end of each survey period. In the laboratory, samples were portioned for the various analyses and either shipped to other laboratories or analyzed at McGill.

TABLE 4.

Foods Collected for Nutrient and Toxin Contaminants Study:

Broughton Island 1987/88

Food Name	Food Code		Date Collected	Amount (g) Collected
RINGED SEAL				
meat,raw	4001		31-July-87	200
	4001		9-Aug -87	478
	4001		2-Aug -87	250
	4001		20-Nov -87	196
meat,boiled	4054		2-Aug -87	180
	4054		9-Aug -87	190
	4054		17-Nov -87	288
	4054		20-Nov -87	310
meat,aged	4079		29-July-87	475
blubber,raw	4002		31-July-87	192
	4002		9-Aug -87	536
	4002		2-Aug -87	466
	4002		20-Nov -87	110
blubber,aged	4004	(liquid)	25-July-87	500
	4004	(solid)	29-July-87	480
	4004	(liquid)	24-Mar -88	230
	4004	(solid)	24-Mar -88	150
blubber,boiled	4055		2-Aug -87	145
	4055		9-Aug -87	122
	4055		17-Nov -87	178
	4055		20-Nov -87	136
broth	4056		17-Nov -87	172 ml
	4056		20-Nov -87	342 ml
	4056		2-Aug -87	300 ml
	4056		9-Aug -87	125 ml
liver,raw	4003		31-July-87	86
	4003		9-Aug -87	508
	4003		16-Nov -87	440
flippers,aged (matt)	4057		22-Nov -87	140
flippers,aged (blub)	4057		22-Nov -87	30
heart,raw	4058		31-July-87	90
	4058		9-Aug -87	274
	4058		16-Aug -87	456
brain,raw	4059		9-Aug -87	172
	4059		27-Sept-87	96
	4059		16-Nov -87	178
eyes,raw	4060		27-Sept-87	92
	4060		28-Jan -88	80
	4060		26-Sept-87	92
	4060		16-Nov -87	94
	4060		28-Jan -88	68

	4060	28-Jan -88	79
BEARDED SEAL			
meat,raw	4005	25-Sept-87	470
	4005	18-Nov -87	496
meat,boiled	4061	25-Sept-87	342
	4061	18-Nov -87	396
broth		18-Nov -87	334 ml
intestine,raw	4008	18-Nov -87	496
intestine,boiled	4062	18-Nov -87	410
NARWHAL			
meat,dried	4013	30-July-87	500
	4013	29-Sept-87	440
blubber,raw	4014	18-Sept-87	505
	4014	19-Sept-87	512
blubber,aged	4015	23-Sept-87	310
blubber,boiled	4063	19-Sept-87	452
	4063	23-Sept-87	462
mattak,raw	4016	18-Sept-87	462
	4016	19-Sept-87	488
mattak,aged	4064	23-Sept-87	520
mattak,boiled	4065	18-Sept-87	412
	4065	19-Sept-87	530
flippers,aged (matt)	4066	20-Nov -87	380
flippers,aged (blub)	4066	20-Nov -87	508
	4066	31-Jan -88	300
BELUGA			
meat,dried	4017	31-July-88	140
mattak,raw	4020	31-July-88	458
blubber,raw	4018	31-July-88	156
WALRUS			
meat,raw	4021	27-July-87	500
	4021	22-Nov -87	500
meat,aged	4067	17-Nov -87	476
	4067	27-July-87	520
	4067	22-Nov -87	150
meat,boiled	4068	29-July-87	500
	4068	22-Nov -87	322
blubber,raw	4022	27-July-87	465
	4022	22-Nov -87	500
blubber,aged	4023	9-Aug -87	234
	4023	22-Nov -87	490
	4023	27-July-87	112
	4023	6-Aug -87	220
	4023	17-Nov -87	100
blubber,boiled	4082	22-Nov -87	350
broth		22-Nov -87	322 ml
mattak,raw	4024	27-July-87	410
	4024	2-Nov -87	496
mattak,aged	4069	27-July-87	392

	4069	22-Nov -87	508	
mattak,aged	4069	17-Nov -87	400	
flippers,aged (matt)	4070	22-Nov -87	160	
flippers,aged (blub)	4070	22-Nov -87	180	
POLAR BEAR				
meat,raw	4025	1-Aug -87	580	
	4025	26-Nov -87	546	
meat,boiled	4071	1-Aug -87	300	
	4071	26-Nov -87	380	
fat,raw	4026	1-Aug -87	420	
	4026	26-Nov -87	150	
fat,boiled	4072	1-Aug -87	378	
	4072	26-Nov -87	162	
CARIBOU				
meat,raw	4027	21-Sept-87	500	
	4027	22-Nov -87	220	
		24-Jan -88	364	One
		20-Mar -88	98	Sample
meat,dried	4073	21-Sept-87	356	
	4073	24-Jan -88	40	
meat,boiled	4074	21-Sept-87	500	
	4074	20-Mar -88	140	
fat,raw	4028	21-Sept-87	422	
	4028	29-Sept-87	322	
brain,raw	4030	24-Jan -88	235	One
		20-Mar -88	82	Sample
brain,boiled	4083	20-Mar -88	92	
		24-Mar -88	184	One
		22-Nov -87	138	Sample
tongue,raw	4084	22-Nov -87	160	
		24-Jan -88	150	One
		20-Mar -88	72	Sample
		24-Mar -88	104	
stomach,raw	4085	30-Nov -87	500	One
		24-Mar -88	314	Sample
stomach contents	4086	24-Jan -88	116	One
		24-Mar -88	310	Sample
heart,raw	4087	22-Nov -87	448	
		24-Jan -88	60	One
		20-Mar -88	162	Sample
		24-Mar -88	346	
lungs,raw	4088	22-Nov -87	44	
		24-Jan -88	68	One
		20-Mar -88	120	Sample
		24-Mar -88	192	
bone marrow (fatty)	4031	20-Mar -88	28	
bone marrow	4031	24-Jan -88	16	One
(non-fatty)		20-Mar -88	52	Sample

Table 4. (cont'd)

ARCTIC CHAR				
meat,raw	4032	20-Nov -87	408	
meat+skin,raw	-	24-July-87	520	
meat,boiled	4075	24-July-87	520	
	4075	20-Nov -87	364	
meat,dried	4076	28-Jan -88	490	
meat+skin,dried	-	25-July-87	500	
skin,raw	4033	20-Nov -87	74	
		2-Feb -88	38	One
		2-Feb -88	58	Sample
skin,boiled	4089	24-July-87		
skin,dried	4090	28-Jan -88	40	
whole fish,raw	-	4-Feb -88		
SCULPIN				
meat+bones+ insides (raw)	4034	22-July-87	500	
PTARMIGAN				
meat,raw	4037	23-Mar -88	124	
DUCK				
meat,raw	4039	22-Nov -87	106	
meat,boiled	4091	22-Nov -87	130	
MUSSELS				
contents,no shell(raw)	4043	19-May -88	70	
contents,no shell (boiled)	4092	19-May -88	40	
CLAMS				
contents, no shell (raw)	4044	2-Feb -88	50	
contents, no shell (boiled)	4078	2-Feb -88	28	
KELP				
raw	4045	4-Aug -87	712	
BLACKBERRIES				
raw	4046	23-Sept-87	500	
GREENS				
"Oongooli", raw	4050	26-July-87	200	
(Oxyria digyna)	4050	9-Aug -87	220	
"Okawyot", raw (Salix reticulata)	4049	9-Aug -88	104	

BABY R. SEAL			
meat,raw	4093	21-May -88	80
meat,boiled	4094	21-May -88	62

Standard published techniques were used for determinations of proximate composition (protein, fat, moisture, ash, carbohydrate, energy), minerals, retinol and fatty acids. Dr. Derek Muir completed the PCB analyses in Winnipeg at the Freshwater Institute and returned the results to the author. These results were then reviewed and compiled into a computer program for analysis of the dietary records.

Computer Analysis

Individual data were recorded with a consistent numbering system throughout the study. It was found that there was considerable movement of individuals among households (particularly younger people), but it was possible to retain unique information by individual. In the Appendix (Table 29), the change in unique individuals in each households is given for the various time periods of the study. This data is presented to the Health Department for potential study in epidemiology.

Information on the 24-hour recall records and the household food frequency records were coded onto discs and treated with SAS statistical techniques. Michael Gilman, of McGill University and Tryfax Computing, Montreal, was the programmer for the results reported here.

A summary of the extent of the data coded and entered is shown in

the next several tables. In Table 5. is shown the number of participants in the 24-hour recall interviews by season. Table 6. gives the number of individuals with various numbers of 24-hour recalls, using 1 recall each interview period. Table 7. gives the number of households participating in the food frequency interviews during each season.

TABLE 5

Number of Participants in 24-Hour Recall Interviews by Age, Gender and Season

Sex	Age Range	Sept. 85	July 87	Sept. 87	Nov. 87	Jan. 88	March 88	May 88	July 88
Female	0-12	59	54	50	53	50	52	46	51
	13-19	25	18	18	22	21	17	13	15
	20-40	48	45	44	43	50	51	39	47
	41-60	22	26	23	22	22	18	20	26
	>60	8	6	10	10	10	9	9	8
	ALL	162	149	145	150	153	147	127	147
Male	0-12	49	41	46	44	46	50	41	48
	13-19	26	12	16	20	13	19	11	18
	20-40	39	32	27	33	33	31	19	23
	41-60	18	14	18	18	20	15	10	14
	>60	8	5	6	6	6	5	3	6
	ALL	140	104	113	121	118	120	84	109
ALL	0-12	108	95	96	97	96	102	87	99
	13-19	51	30	34	42	34	36	24	33
	20-40	87	77	71	76	83	82	58	70
	41-60	40	40	41	40	42	33	30	40
	>60	16	11	16	16	16	14	12	14
	ALL	302	253	258	271	271	267	211	256

TABLE 6

Number of 24-Hour Recall Interviews Contributed by Individuals

Sex	Age Range	Number of Diet Records								ALL
		1	2	3	4	5	6	7	8	
Females	0-12	10	5	4	7	11	9	18	13	77
	13-19	6	2	3	7	3	8	3	1	33
	20-40	7	10	5	6	10	12	14	13	77
	41-60	3	.	.	2	2	3	5	13	28
	>60	.	.	1	1	1	2	4	3	12
	ALL	26	17	13	23	27	34	44	43	227
Males	0-12	5	8	3	11	12	11	13	7	70
	13-19	13	7	6	7	3	8	1	.	45
	20-40	14	9	6	9	13	8	3	3	65
	41-60	1	.	2	6	7	2	5	2	25
	>60	2	3	.	.	1	2	3	1	12
	ALL	35	27	17	33	36	31	25	13	217
ALL	0-12	15	13	7	18	23	20	31	20	147
	13-19	19	9	9	14	6	16	4	1	78
	20-40	21	19	11	15	23	20	17	16	142
	41-60	4	.	2	8	9	5	10	15	53
	>60	2	3	1	1	2	4	7	4	24
	ALL	61	44	30	56	63	65	69	56	444

TABLE 7

Number of Households Participating in Food Frequency Interviews by Season

Season	Number of Households
Sept. 85	74
July 87	70
Sept. 87	68
Nov. 87	63
Jan. 88	68
March 88	67
May 88	56
July 88	64

RESULTS

Community Profile

Broughton Island is a small island located on the eastern coast of Baffin Island. The Inuktitut name of the island, and the community, is Qikiqtarjuaq. Broughton Island is at 67°N latitude, just inside the Arctic Circle. The community faces to the west on a sheltered bay viewing to the eastern shores of Baffin. Access to the community is by barge, during ice break-up (about 3 months); by foot/boat, skidoo or dogsled from Pangnirtung over the Pangnirtung Pass in Auyuittuq National Park; or by air serviced by First Air from Iqaluit several times per week. It is located in classically beautiful, rugged and mountainous Arctic terrain.

The community was settled in 1956-57 to help build and maintain services for the Detection Early Warning (DEW) Line station located on the highest point of the island, (NWT Data Book, 1984). Today the primary livelihood for food resources is subsistence hunting and fishing. Income is derived from services in the community or from welfare payments. Following the 1983 European ban on white coated sealskins, the entire sealskin market collapsed, and the income that had been derived from selling seal skins is no longer a major source of family funds.

There are approximately 430 individuals living in the community of Broughton Island in a total of 85 households. It is a young

population with about 80% 40 years of age or less, and only 18 residents (4%) over 60 years of age.

The numbers of employed individuals by age are given Table 8. Of adults 20 to 60 years of age (total = 201), 60 (30%) are full-time employed and 20 (10%) are part-time employed.

Families (average of 5 persons/household) can spend from $50 to more than $200 per week at the Bay or Co-op stores on food, clothing or other household items (Table 9.).

The numbers of hunters/fishermen in households and the time spent in these activities are given in Tables 10., 11. and 12. In Table 10 it is seen that 70 households have at least 1 resident hunter and only 19 (21%) households have no resident hunters. It must be kept in mind that much harvested wildlife food is shared in extended families, so that even though a family does not have a resident hunter, this does not mean these families do not use these foods. In Table 11. it is shown that 63 of 85 families (74%) spend some time together out on the land in hunting camps. The number of months and the number of person-months per household in this activity are given in Table 12.

It is clear from this information that hunting and fishing are important activities, and they provide essential food resources for the people of Broughton Island.

TABLE 8

Community Profile: Employment in Households by Age

Age Range	Full Time	Not Employed	Part Time	No Data	ALL
Born after July 15 1987	0	3	0	22	25
0-12	0	122	0	19	141
13-19	1	77	0	8	86
20-40	47	68	14	18	147
41-60	13	34	6	1	54
>60	1	17	0	0	18
ALL	62	321	20	68	471

Age Calculated Using July 15, 1987, as Reference Date

TABLE 9

Community Profile: Money Spent at Food Store per Week by Households and Whether it is Higher or Less than Usual

	Higher than Usual	About the Same	Less than Usual	No Data	ALL
Money Spent at Store					
< $50 / week	2	1	5	0	8
$51 - $ 100 / week	4	14	5	0	23
$101 - $ 150 / week	1	6	2	0	9
$151 - $ 200 / week	4	5	4	0	13
> $200 / week	3	11	9	0	23
Missing	0	0	0	9	9
ALL	14	37	25	9	85

TABLE 10

Community Profile: Number of Households with Resident Hunters

	Number of Household Hunters				ALL
	0	1	2	3	
Number of Households	14	58	10	3	85

TABLE 11

Community Profile: Number of Households with Family Members Who Go "Out on the Land"

Family on Land			ALL
On the Land	Not on the Land	No Data	
63	21	1	85

TABLE 12.1

Community Profile: Number of Months Household Members are Hunting Each Year

	Months Household Members are Hunting									ALL
	0 months	1 month	2 months	3 months	4 months	5 months	6 months	8 months	11 months	
Households	25	20	13	12	7	5	1	1	1	85

TABLE 12.2

Community Profile: Number of Person-Months Household Members are Hunting Each Year

	Person-Months Household Members are Hunting																ALL
	0 months	1 month	2 months	3 months	4 months	5 months	6 months	7 months	8 months	9 months	10 months	12 months	20 months	22 months	24 months	25 months	
Households	21	6	6	7	2	3	2	4	1	2	2	28	1	1	2	1	89

Person-Month is the Summation of the Months Spent Hunting for All House Members

Food Use

Both the 24-hour recall interviews of individuals and the food frequency interviews of families are used to describe the kinds and amounts of Inuit foods and marketed foods used in the community.

In Table 13., the rank order (most important at the top) is given of the Inuit food species reported in the family food frequency interviews. The higher count numbers reflect use by more families over the 8 interview periods. It can be seen that the most important foods (with counts of 100 or more) are foods from ringed seal, caribou, char, narwhal, kelp, berries, walrus, duck and other birds, shellfish, and bird eggs. The foods mentioned least often are flippers of narwhal and walrus, liver of beluga and bearded seal, boiled polar bear meat and boiled char. It is important to keep in mind that this table shows relative use among the different foods, and not actual number of times used by families.

A similar listing is shown in Table 14. using the 24-hour recall individual data. In this table more careful definition is made of the raw or cooked state of the foods used. It can be seen that of the most important Inuit foods reported in the interviews of both men and women of actual personal foods eaten, that seal, caribou, narwhal, char, kelp and berries are the most significant.

Again, it is important to note these foods only in their relative

TABLE 13

Frequency of Mention of Use of Inuit Foods For Households: 8 Interview Periods (Food Frequency Interviews).

Listed in Descending Frequency Order

Code	Description	Frequency of Mentions
4001	R. SEAL meat	573
4027	CARIBOU meat	532
4032	ARCTIC CHAR meat	496
4002	R. SEAL blubber	451
4033	ARCTIC CHAR skin	422
4016	NARWHAL mattak	319
4003	R. SEAL liver	308
4028	CARIBOU fat	269
4014	NARWHAL blubber	228
4045	KELP	172
4046	BLACKBERRIES	160
4058	R. SEAL heart	147
4047	BLUEBERRIES	145
4005	B. SEAL meat	144
4013	NARWHAL meat, dried	144
4021	WALRUS meat	139
4039	DUCK meat	138
4044	CLAMS	137
4037	PTARMIGAN meat	131
4043	MUSSELS	130
4031	CARIBOU bone marrow	115
4022	WALRUS blubber	112
4006	BEARDED SEAL Blubber	106
4059	R. SEAL brain	103
4042	CANADA GOOSE or DUCK EGGS	100
4060	R. SEAL eyes	75
4025	POLAR BEAR meat	70
4026	POLAR BEAR fat	70
4067	WALRUS meat, aged	67
4038	CANADA GOOSE meat	59
4008	B. SEAL intestine	55
4036	ARCTIC HARE	54
4023	WALRUS blubber	53
4050	GREENS oongooli	50
4020	BELUGA mattak	40
4069	WALRUS mattak, aged	39
4018	BELUGA blubber	30
4029	CARIBOU liver	29
4017	BELUGA meat, dried	23
4034	SCULPIN	22
4057	R. SEAL flippers, aged	16

4076	ARCTIC CHAR meat, dried	11
4030	CARIBOU brain	10
4024	WALRUS mattak	9
4064	NARWHAL mattak, aged	9
4049	GREENS okowyot	7
4004	R. SEAL blubber, aged	5
4073	CARIBOU meat, dried	5
4015	NARWHAL blubber, aged	4
4041	GULL EGGS	4
4019	BELUGA Liver	3
4066	NARWHAL flippers, aged	3
4007	Bearded Seal Liver, raw	2
4070	WALRUS flippers, aged	2
4061	B. SEAL meat, boiled	1
4071	POLAR BEAR meat, boiled	1
4075	ARCTIC CHAR meat, boiled	1

context.

In Table 15. is shown the total grams reported to be consumed in the 24-hour recall interviews of men and women. Again, it is clear that the greatest amounts of foods used by the community are seal meat, caribou meat, blackberries, narwhal mattak, and char.

Figure 2. shows the total amounts of Inuit food consumed per day in the 6 interview periods of the calendar year (July 87 to May 88) and the year's average. This figure shows the seasonal fluctuations in the use of the foods. Because the research process was careful to insure representativeness of those interviewed to the community as a whole it was possible to adjust the daily food use figures to represent the total population. If ever needed, these figures could be multiplied X 60 days (each interview period covered 2 months or 60 days) for each period to give the gross annual community consumption of any one species. Alternatively, figures in the yearly average could be multiplied X 365 to get the annual total.

Figure 3. shows the daily average of all Inuit foods consumed by age and gender categories. It can be seen that men consume more than women in the adult ages, but that girls consume more than boys in the childhood years. On the average, adults consume from 300

TABLE 14.1

Frequency of Mentions of Use of Inuit Foods by Individuals:
8 Interview Periods (24-hour Recall Interviews)

FEMALES

Listed by Descending
Total Number of Mentions.

Food Code	Description	Total Number of Mentions
4054	R. SEAL meat, boiled	232
4074	CARIBOU meat, boiled	138
4046	BLACKBERRIES , raw	121
4055	R. SEAL blubber, boiled	110
4027	CARIBOU meat, raw	109
4056	R. SEAL broth, boiled	91
4001	R. SEAL meat, raw	89
4016	NARWHAL mattak, raw	85
4028	CARIBOU fat, raw	73
4002	R. SEAL blubber, raw	48
4014	NARWHAL blubber, raw	48
4075	ARCTIC CHAR meat, boiled	46
4032	ARCTIC CHAR meat, raw	44
4045	KELP , raw	28
4013	NARWHAL meat, dried	25
4047	BLUEBERRIES	23
4023	WALRUS blubber, aged	22
4067	WALRUS meat, aged	21
4003	R. SEAL liver, raw	15
4033	ARCTIC CHAR skin, raw	15
4073	CARIBOU meat, dried	13
4031	CARIBOU bone marrow(nf), raw	12
4004	R. SEAL blubber, aged	10
4005	B. SEAL meat, raw	9
4065	NARWHAL mattak, boiled	9
4079	R. SEAL meat, aged	9
4088	ARCTIC CHAR Skin, boiled	9
4034	SCULPIN meat&bone&inside, raw	8
4061	B. SEAL meat, boiled	8
4057	R. SEAL flippers, aged	7
4058	R. SEAL heart, raw	7
4063	NARWHAL blubber, boiled	7
4080	BEARDED SEAL Meat, dried	7
4081	BEARDED SEAL Blubber, boiled	7
4092	BABY R.SEAL meat, boiled	7
4068	WALRUS meat, boiled	6
4076	ARCTIC CHAR meat, dried	6
4090	BABY R.SEAL meat, raw	6
4093	BABY R. SEAL Blubber, boiled	6

4006	BEARDED SEAL Blubber, raw	5
4022	WALRUS blubber, raw	5
4069	WALRUS mattak, aged	4
4021	WALRUS meat, raw	3
4037	PTARMIGAN meat, raw	3
4043	MUSSELS contents,no shell, raw	3
4059	R. SEAL brain, raw	3
4064	NARWHAL mattak, aged	3
4078	CLAMS, raw	3
4086	CARIBOU heart, raw	3
4089	DUCK, boiled	3
4091	BABY R. SEAL Blubber, raw	3
4020	BELUGA mattak, raw	2
4044	CLAMS contents,no shell, raw	2
4062	B. SEAL intestine, boiled	2
4087	CARIBOU lungs, raw	2
4018	BELUGA blubber, raw	1
4036	ARCTIC HARE, raw	1
4039	DUCK meat, raw&boiled	1
4042	CANADA GOOSE or DUCK EGGS	1
4083	CARIBOU tongue, raw	1
4085	CARIBOU stomach contents, raw	1

TABLE 14.2

Frequency of mentions of use of Inuit foods by individuals:
8 Interview Periods (24-hour Recall Interviews)

MALES

Sorted by descending
Total Number of mentions.

Food Code	Description	Total Number of Mentions
4054	R. SEAL meat, boiled	187
4074	CARIBOU meat, boiled	102
4027	CARIBOU meat, raw	96
4055	R. SEAL blubber, boiled	90
4001	R. SEAL meat, raw	78
4046	BLACKBERRIES , raw	78
4016	NARWHAL mattak, raw	72
4056	R. SEAL broth, boiled	60
4002	R. SEAL blubber, raw	51
4014	NARWHAL blubber, raw	50
4075	ARCTIC CHAR meat, boiled	45
4028	CARIBOU fat, raw	39
4032	ARCTIC CHAR meat, raw	31
4013	NARWHAL meat, dried	16
4022	WALRUS blubber, raw	13
4068	WALRUS meat, boiled	13
4061	B. SEAL meat, boiled	11
4073	CARIBOU meat, dried	11
4003	R. SEAL liver, raw	10
4033	ARCTIC CHAR skin, raw	10
4005	B. SEAL meat, raw	9
4047	BLUEBERRIES	9
4088	ARCTIC CHAR Skin, boiled	9
4023	WALRUS blubber, aged	8
4043	MUSSELS contents,no shell, raw	7
4067	WALRUS meat, aged	7
4076	ARCTIC CHAR meat, dried	7
4081	BEARDED SEAL Blubber, boiled	7
4045	KELP , raw	6
4044	CLAMS contents,no shell, raw	5
4089	DUCK, boiled	5
4092	BABY R.SEAL meat, boiled	5
4093	BARY R.SEAL Blubber, boiled	5
4006	BEARDED SEAL Blubber, raw	4
4063	NARWHAL blubber, boiled	4
4065	NARWHAL mattak, boiled	4
4080	BEARDED SEAL Meat, dried	4
4042	CANADA GOOSE or DUCK EGGS	3
4064	NARWHAL mattak, aged	3

4090	BABY R.SEAL meat, raw	3
4015	NARWHAL blubber, aged	2
4020	BELUGA mattak, raw	2
4021	WALRUS meat, raw	2
4031	CARIBOU bone marrow(nf), raw	2
4037	PTARMIGAN meat, raw	2
4058	R. SEAL heart, raw	2
4078	CLAMS, raw	2
4083	CARIBOU tongue, raw	2
4091	BABY R. SEAL Blubber, raw	2
4017	BELUGA meat, dried	1
4018	BELUGA blubber, raw	1
4050	GREENS oongooli, raw	1
4059	R. SEAL brain, raw	1
4062	B. SEAL intestine, boiled	1
4069	WALRUS mattak, aged	1
4070	WALRUS flippers, aged	1
4071	POLAR BEAR meat, boiled	1
4072	POLAR BEAR fat, boiled	1
4079	R. SEAL meat, aged	1
4086	CARIBOU heart, raw	1
4087	CARIBOU lungs, raw	1

TABLE 15.1

Rank Order of Grams Inuit Food Used by Individuals:
8 Interview Periods (24-hour Recall Interviews)

FEMALES

Listed by Descending
Total Grams Consumed

Food Code	Description	Total Grams Consumed
4054	R. SEAL meat, boiled	65,833
4074	CARIBOU meat, boiled	38,195
4027	CARIBOU meat, raw	33,150
4001	R. SEAL meat, raw	26,855
4046	BLACKBERRIES , raw	23,749
4016	NARWHAL mattak, raw	23,203
4056	R. SEAL broth, boiled	18,374
4032	ARCTIC CHAR meat, raw	11,580
4075	ARCTIC CHAR meat, boiled	11,500
4013	NARWHAL meat, dried	7,730
4045	KELP , raw	6,820
4067	WALRUS meat, aged	5,735
4055	R. SEAL blubber, boiled	4,647
4002	R. SEAL blubber, raw	3,021
4092	BABY R.SEAL meat, boiled	2,560
4014	NARWHAL blubber, raw	2,472
4005	B. SEAL meat, raw	2,330
4023	WALRUS blubber, aged	2,275
4028	CARIBOU fat, raw	2,195
4065	NARWHAL mattak, boiled	2,185
4061	B. SEAL meat, boiled	2,110
4079	R. SEAL meat, aged	1,890
4068	WALRUS meat, boiled	1,835
4047	BLUEBERRIES	1,797
4073	CARIBOU meat, dried	1,785
4090	BABY R.SEAL meat, raw	1,750
4080	BEARDED SEAL Meat, dried	1,640
4064	NARWHAL mattak, aged	1,625
4057	R. SEAL flippers, aged	1,515
4043	MUSSELS contents,no shell, raw	1,350
4003	R. SEAL liver, raw	1,333
4069	WALRUS mattak, aged	1,145
4021	WALRUS meat, raw	1,000
4089	DUCK, boiled	995
4034	SCULPIN meat&bone&inside, raw	750
4037	PTARMIGAN meat, raw	750
4020	BELUGA mattak, raw	715
4076	ARCTIC CHAR meat, dried	700
4004	R. SEAL blubber, aged	533
4033	ARCTIC CHAR skin, raw	526

4039	DUCK meat, raw&boiled	500
4031	CARIBOU bone marrow(nf), raw	498
4058	R. SEAL heart, raw	460
4088	ARCTIC CHAR Skin, boiled	369
4078	CLAMS, raw	340
4062	B. SEAL intestine, boiled	310
4081	BEARDED SEAL Blubber, boiled	243
4059	R. SEAL brain, raw	175
4063	NARWHAL blubber, boiled	175
4044	CLAMS contents,no shell, raw	172
4086	CARIBOU heart, raw	170
4018	BELUGA blubber, raw	160
4093	BABY R. SEAL Blubber, boiled	150
4036	ARCTIC HARE, raw	125
4091	BABY R. SEA Blubber, raw	125
4006	BEARDED SEAL Blubber, raw	110
4022	WALRUS blubber, raw	96
4087	CARIBOU lungs, raw	75
4083	CARIBOU tongue, raw	60
4042	CANADA GOOSE or DUCK EGGS	50
4085	CARIBOU stomach contents, raw	30

TABLE 15.2

Rank Order of Grams Inuit Food Used by Individuals:
8 Interview Periods (24-hour recalls Interviews)

MALES

Sorted by Descending
Total Grams Consumed

Food Code	Description	Total Grams Consumed
4054	R. SEAL meat, boiled	57,810
4027	CARIBOU meat, raw	36,825
4074	CARIBOU meat, boiled	30,775
4001	R. SEAL meat, raw	29,231
4016	NARWHAL mattak, raw	28,935
4046	BLACKBERRIES , raw	19,348
4075	ARCTIC CHAR meat, boiled	15,560
4056	R. SEAL broth, boiled	11,053
4032	ARCTIC CHAR meat, raw	8,775
4013	NARWHAL meat, dried	6,105
4055	R. SEAL blubber, boiled	4,715
4061	B. SEAL meat, boiled	4,565
4005	B. SEAL meat, raw	4,280
4068	WALRUS meat, boiled	3,860
4002	R. SEAL blubber, raw	3,549
4067	WALRUS meat, aged	3,285
4014	NARWHAL blubber, raw	2,805
4089	DUCK, boiled	2,625
4073	CARIBOU meat, dried	2,010
4092	BABY R.SEAL meat, boiled	2,000
4045	KELP , raw	1,900
4090	BABY R.SEAL meat, raw	1,750
4043	MUSSELS contents,no shell, raw	1,730
4023	WALRUS blubber, aged	1,420
4047	BLUEBERRIES	1,382
4065	NARWHAL mattak, boiled	1,375
4003	R. SEAL liver, raw	1,170
4044	CLAMS contents,no shell, raw	1,105
4028	CARIBOU fat, raw	1,100
4022	WALRUS blubber, raw	965
4064	NARWHAL mattak, aged	875
4076	ARCTIC CHAR meat, dried	838
4020	BELUGA mattak, raw	750
4081	BEARDED SEAL Blubber, boiled	628
4042	CANADA GOOSE or DUCK EGGS	625
4080	BEARDED SEAL Meat, dried	580
4088	ARCTIC CHAR Skin, boiled	524
4033	ARCTIC CHAR skin, raw	508
4021	WALRUS meat, raw	500

4069	WALRUS mattak, aged	500
4071	POLAR BEAR meat, boiled	500
4079	R. SEAL meat, aged	500
4063	NARWHAL blubber, boiled	450
4058	R. SEAL heart, raw	330
4078	CLAMS, raw	325
4037	PTARMIGAN meat, raw	265
4018	BELUGA blubber, raw	250
4062	B. SEAL intestine, boiled	250
4070	WALRUS flippers, aged	250
4086	CARIBOU heart, raw	250
4006	BEARDED SEAL Blubber, raw	240
4093	BABY R. SEAL Blubber, boiled	210
4031	CARIBOU bone marrow(nf), raw	185
4091	BABY R. SEAL Blubber, raw	185
4017	BELUGA meat, dried	125
4072	POLAR BEAR fat, boiled	90
4083	CARIBOU tongue, raw	90
4059	R. SEAL brain, raw	80
4087	CARIBOU lungs, raw	60
4015	NARWHAL blubber, aged	35
4050	GREENS oongooli, raw	17

Figure 2

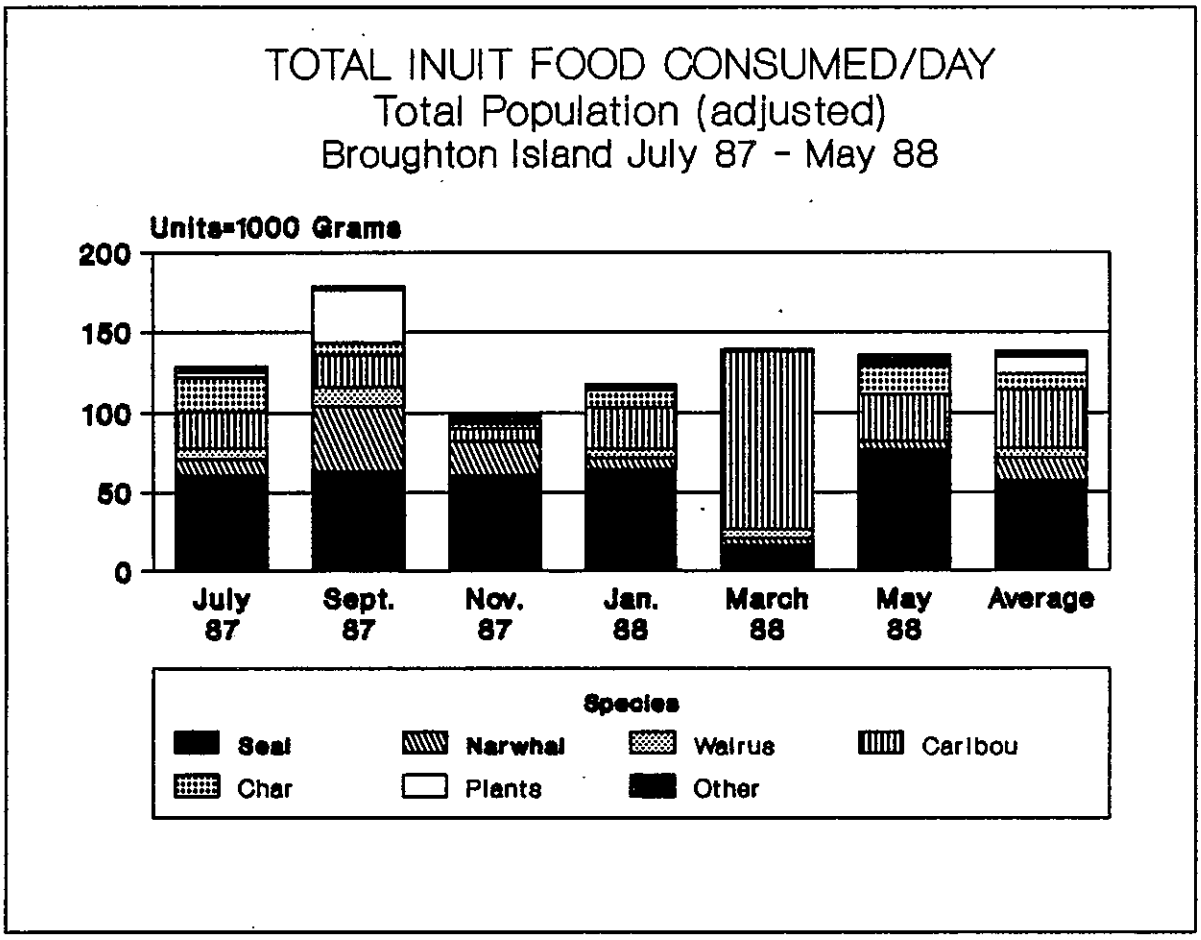
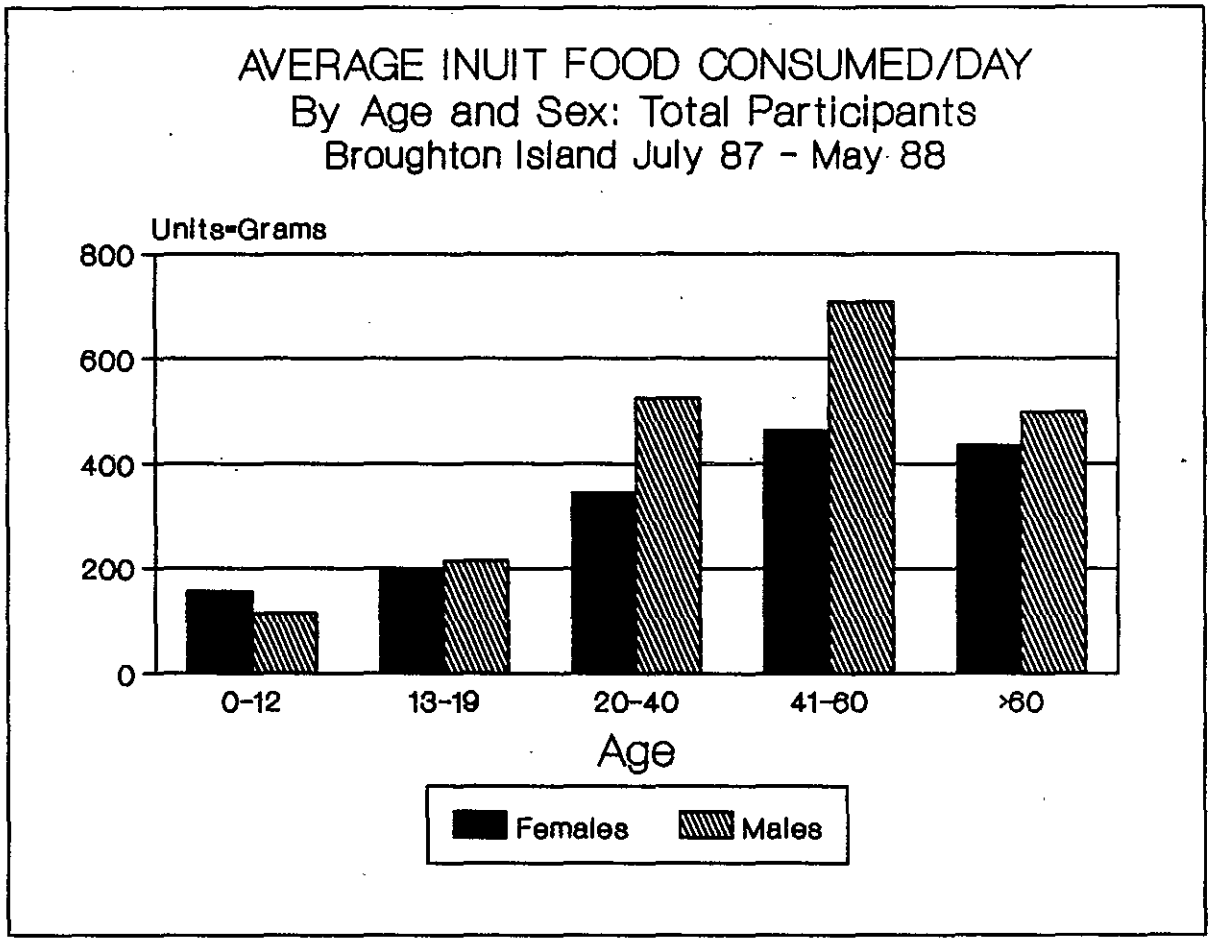

TOTAL INUIT FOOD CONSUMED/DAY
Total Population (adjusted)
Broughton Island July 87 - May 88
Units=1000 Grams
200
150
100
50
0
July 87
Sept. 87
Nov. 87
Jan. 88
March 88
May 88
Average
Species
Seal
Narwhal
Walrus
Caribou
Char
Plants
Other

Figure 3


AVERAGE INUIT FOOD CONSUMED/DAY
By Age and Sex: Total Participants
Broughton Island July 87 - May 88
Units=Grams
800
600
400
200
0
0-12
13-19
20-40
41-60
>60
Age
Females
Males

to 700 grams of Inuit foods each day. When it is realized that an adult eats about a kilogram of food (not counting liquids) each day, there is no question of the important quantitative amounts the Inuit foods represent in the total diet.

Figure 4. shows the average portion sizes consumed by those people who actually eat the Inuit foods during each of the seasons. In the yearly average it can be seen that 200-400 grams of a food are eaten daily when someone eats that particular food. This figure should not be misinterpreted to mean that a person would eat all of these foods in a single day. Rather, it shows that in each one of the seasons, most of the important foods are used by some people. Foods from narwhal and walrus, for example, are stored and eaten in large quantities at later times (such as March) when foods may be difficult to hunt.

Figure 5. shows how seasonal intake can vary between years. This figure shows the average amount of all Inuit food consumed by each person 20-40 years of age in two different years. There was a total difference of about 60g. in September, with 1987 showing greater use than 1985. In comparing July 1987 to July 1988, the average individual (per capita) food use by 20-40 year old was higher in 1987 by about 110 grams. The variation was greatest for seal and caribou use.

Table 16. shows the marketed foods used most often in Broughton

Figure 4

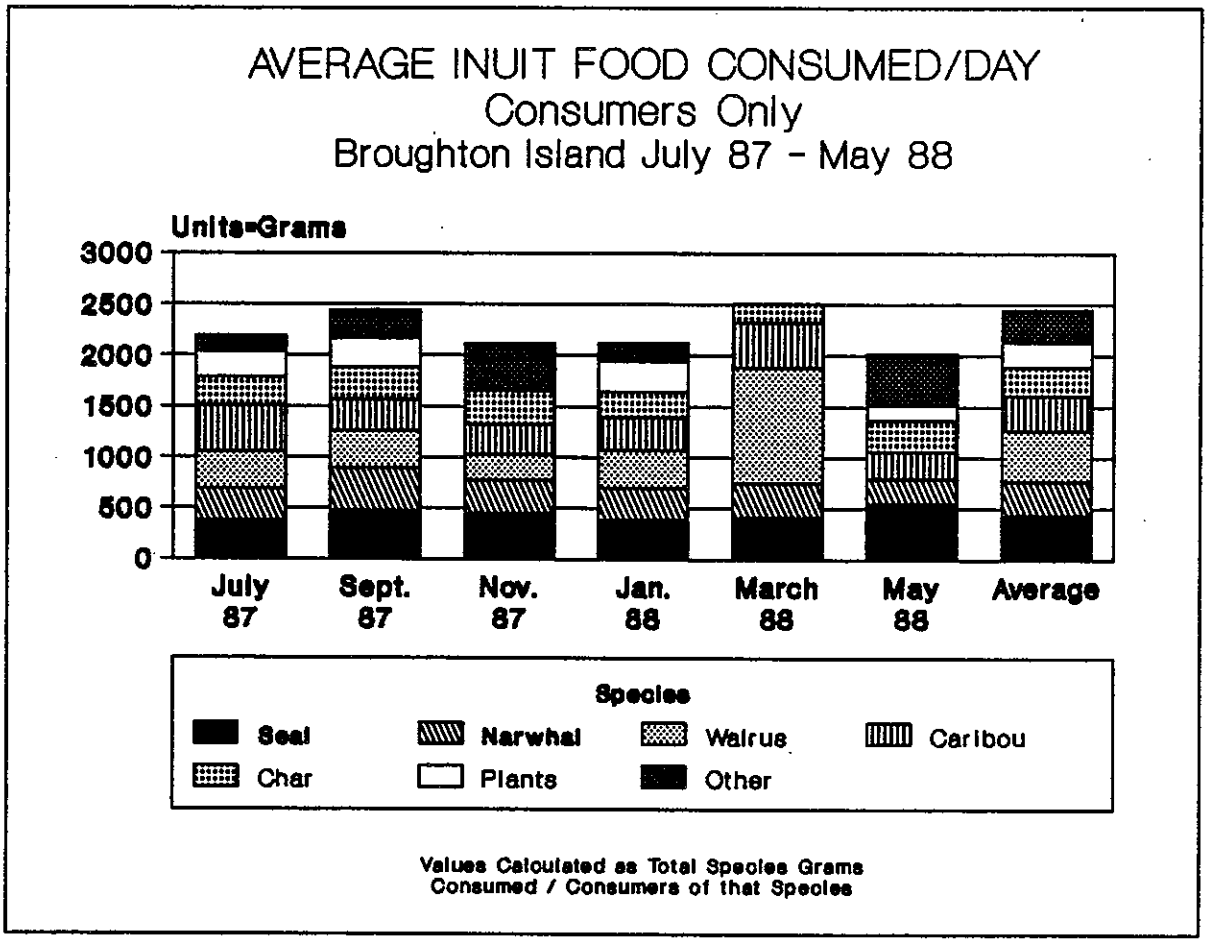
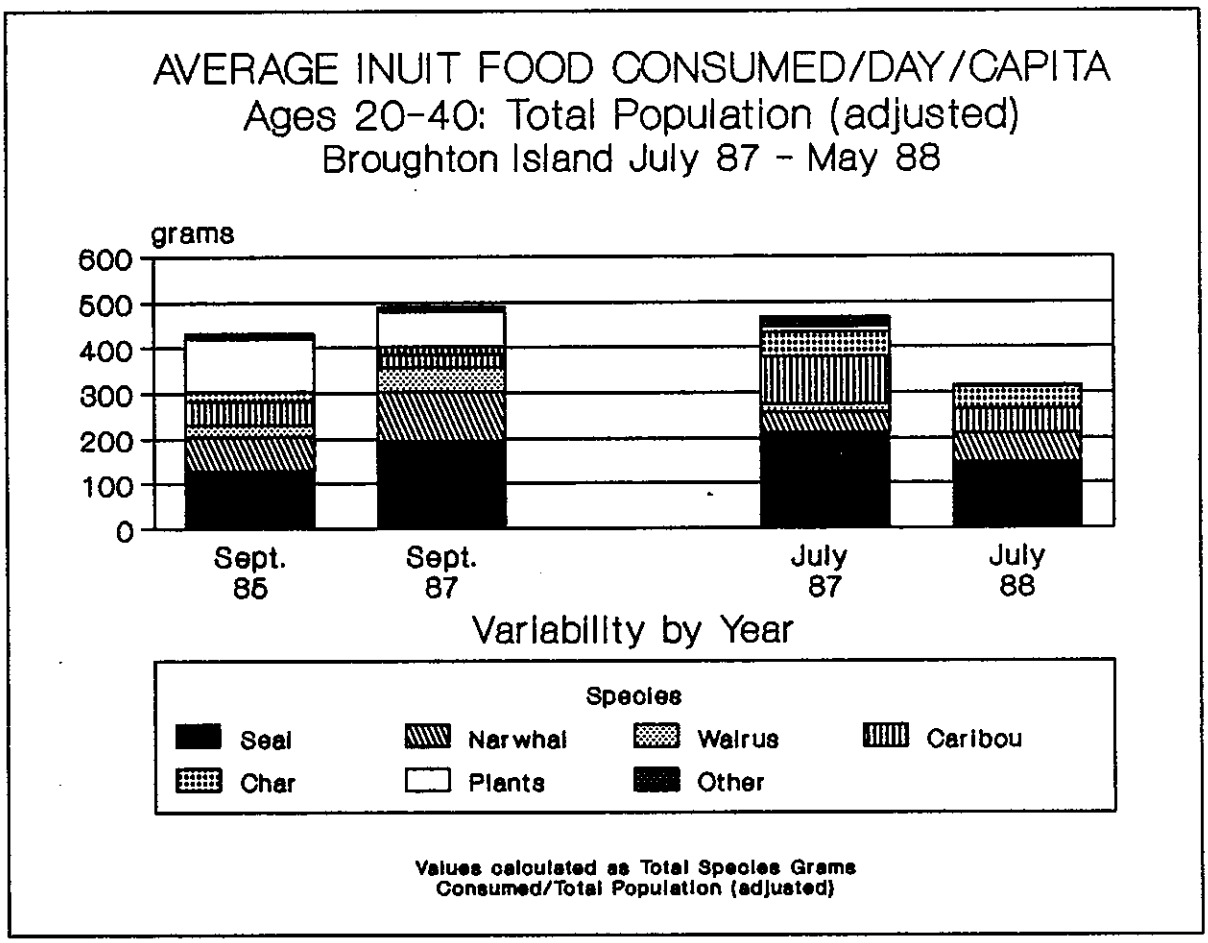

AVERAGE INUIT FOOD CONSUMED/DAY
Consumers Only
Broughton Island July 87 - May 88
Units=Grams
3000
2500
2000
1500
1000
500
0
July 87
Sept. 87
Nov. 87
Jan. 88
March 88
May 88
Average
Species
Seal
Narwhal
Walrus
Caribou
Char
Plants
Other
Values Calculated as Total Species Grams Consumed / Consumers of that Species

Figure 5


AVERAGE INUIT FOOD CONSUMED/DAY/CAPITA
Ages 20-40: Total Population (adjusted)
Broughton Island July 87 - May 88
grams
600
500
400
300
200
100
0
Sept. 85
Sept. 87
July 87
July 88
Variability by Year
Species
Seal
Narwhal
Walrus
Caribou
Char
Plants
Other
Values calculated as Total Species Grams Consumed/Total Population (adjusted)

Island. It shows the number of times a food was mentioned in the 2009 24-hour recalls taken in the community. Each food was recorded only once for each 1-day interview. The foods mentioned most often (more than 400 in 2009 times) are tea, powdered drinks, sugar, bannock (biscuits), crackers, white bread and canned milk (put into hot beverages). Of the carbohydrate/starch foods, the most important are bannock, crackers (pilot biscuits), white bread, corn flakes, potatoes (as chips, instant mashed, or boiled), spaghetti and rice. Marketed meats used are frankfurters, (prepackaged) hamburger patties, and canned or fried chicken. Canned and dried soups and stews and processed cheese also give small amounts of protein. Apart from potatoes and what is contained in processed soups and stews, vegetables are rarely used. Canned corn (135 mentions) onions (83 mentions) and peas (46 mentions) are the most often used, except for tomato contained in processed pasta foods and catsup. Apple (68 mentions), apple juice (68 mentions), raisins (37 mentions) are the rarely used fruits. Oranges were infrequently used (28 mentions). Other fruits and vegetables (bananas, cabbage, etc.) were mentioned less than 20 times in the 2009 dietary records during the 8 interviewing periods.

TABLE 16

Marketed Foods Used by All Participants in Descending Order of Frequency (24-Hour Recall Interviews, All Periods)

Food Code	Description	Total Mentions
2277	TEA	1744
2230	SUGAR	1554
416	BANNOCK/BISCUITS	1137
1252	POWDERED DRINKS	1033
916	CRACKERS	871
1324	MILK EVAP CND	657
461	BREAD WHITE ENRICHED MADE	490
866	CORN FLAKES	372
800	COFFEE INSTANT BEVERAGE	336
505	BUTTER	327
404	COLA TYPE CARBONATED BEV	313
407	GINGERALE	249
1809	POTATO CHIPS	242
929	CREAM /POWDERED OR FRESH	233
1999	FRANKFURTERS CKD	230
747	CHICKEN CND BONED	223
947	EGGS	212
999	FAT VEGETABLE COOKING	211
2079	SOUP CHIC NOODLE	210
1793	POTATOES MASHED	186
1149	JELLIES	181
370	BEEF. HAMBURGER	169
689	CHICKEN FRYERS FRIED	164
587	CHOCOLATE PLAIN MILK	157
1789	POTATOES FRENCH FRIES	157
1304	MACARONI & CHEESE	147
1317	MARGARINE	144
850	CORN SWEET WHITE&YELLOW CND	135
1320	MILK WHOLE	122
1497	PEANUT BUTTER	109
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE HOMECKD	108
2286	TOMATO CATSUP BOILED	102
812	COOKIES ASSORTED	101
1872	RICE WHITE POLISHED ENRICHED CKD	99
2104	SOUP VEG BEEF	97
371	BEEF&VEG STEW	95
1683	PORK LEAN CUTS MED FAT	95
1328	MILK DRY NONFAT SOLIDS INST	88
1788	POTATOES BOILED PARED	86
1413	ONIONS MATURE BOILED	83
653	CHEESE PROCESSED	81
2159	SPAGHETTI ENRICHED CKD	75

2099	SOUP TOMATO	74
13	APPLE RAW	68
27	APPLEJUICE CND	68
2701	OIL CORN	59
1963	SALT TABLE	57
649	CHEESE CREAM	55
1783	PORK HAM CND	52
1241	LARD	48
126	BACON CURED CND	47
1391	OATMEAL CKD	46
1518	PEAS GREEN IMMATURE CND	46
1633	PIZZA W/CHEESE	46
2164	SPAGHETTI IN TOM SAUCE W/CHEESE CND	46
1457	PANCAKES	44
1140	ICE CREAM	43
977	EGGS SCRAMBLED	42
581	CARAMELS PLAIN OR CHOC	41
1846	RAISINS UNCOOKED	37
2014	PORK SAUSAGE CKD	37
379	HASH, CORNED BEEF, CND	34
2404	VEG MIXED FRZN BOILED	33
620	CARROTS BOILED	32
1032	GELATIN DESSERT PLAIN	31
1636	FROZEN DINNER, FRIED CHICKEN, MASHED POT, MIXED V	30
1938	MAYONNAISE	30
1420	ORANGE RAW	28
554	CAKE COFFEECAKE MADE W/EGG, MILK	27
547	CAKE DEVILS FOOD W/CHOCOLATE ICING	26
2018	SALAMI CKD	26
1258	LETTUCE CRISPHEAD RAW	25
2284	TOMATOES CND SOL&LIQ	24
1323	MILK PART SKIM &2 NONFAT SOLIDS	23
1654	POPCORN POPPED	23
2282	TOMATOES RIPE RAW	23
550	CAKE ANGELFOOD	22
569	CAKE YELLOW W/CHOCOLATE ICING	22
2051	SYRUP CORN LIGHT AND DARK	22
512	CABBAGE RAW	21
1616	PINEAPPLE CND HEAVY SYRUP	21
29	APPLESAUCE SWEETENED CND	20
141	BANANA RAW	20
186	BEANS, SNAP GREEN CND	20
646	CHEESE CHEDDAR	20
1340	MOLASSES MED	20
377	BEEF CORNED CND MED FAT	19
780	COCOA MIX FOR HOT CHOC	19
1786	POTATOES BAKED IN SKIN	19
2600	GRAVY MEAT BROWN	19
619	CARROTS RAW	18
2156	SOY SAUCE	16
2229	SUGAR BROWN	16
857	CORN SWEET FRZN BOILED DRAINED	15

820	COOKIES FIG BARS	14
1017	FISH STICKS FRZN CKD	14
1437	ORANGE JUICE FRZN CONC DILUTED	14
1611	PINEAPPLE RAW	14
1322	MILK SKIM	13
434	BOUILLON CUBES OR POWDER	12
847	CORN SWEET WHITE&YELLOW CND CREAM STYLE	12
1378	NOODLES EGGS ENRICHED CKD	12
2075	SOUP CRM CHICK W/EQ MILK	12
156	BEANS WHITE CND W/PORK&TOM SAUCE	11
353	BEEF ROUND BROILED	11
845	CORN SWEET WHITE&YELLOW BOILED	11
1355	MUSHROOMS CND SOL&LIQ	10
1972	SARDINES CND DRAINED	10
2456	WHEAT FLAKES	10
3030	CREAM, WHIPPED	10

Foods Were Coded Only Once for Each 24-Hour Recall
Total n=2004 Recalls

Nutrient Intake

Table 17. shows the yearly average for daily nutrient intakes from all foods by age and gender. These were computed from dietary records taken from July, 1987, to May, 1988. The means (average) and standard deviations from the mean are given to show the variability among individuals. The average for each individual was calculated by computer from all of the 1-day food interviews each individual contributed. The total number of individuals represented in the mean is given at the bottom of the age and gender column. These calculations were possible after the laboratory chemistry on the food samples was completed and entered into the computer together with the amount of each food eaten by each individual in all the dietary periods.

Means and standard deviations of nutrients contained in diets of groups of individuals can be used with standards for adequate nutrient intake (RNI) published by Health and Welfare Canada to see how well nourished people are.

Table 18. shows how well women 20-40 years of age are meeting the standards (RNI) for the nutrients on the left side of the table. The nutrients represented here with their standards are energy (kilocalories) protein, vitamin A, calcium (Ca) phosphorus (P), iron (Fe), magnesium (Mg) and zinc (Zn). Two nutrients of concern because many women have diets that contain less than half of their

daily standard are vitamin A and calcium. Otherwise, most women, on an average basis, are meeting their needs for energy, protein, phosphorus, iron, magnesium and zinc with the kinds of Inuit and marketed foods that they are eating.

Table 19. shows how women's diets contribute the nutrients under study from the Inuit and marketed foods. Calcium (Ca) and vitamin A (vit A) are two nutrients that are contained in certain Inuit foods (A - blubber and liver; Ca- kelp and char skin, for example) but not enough of those foods are eaten to meet daily needs. Marketed foods are also shown to provide some of these nutrients. As a whole, however, not enough total vitamin A and calcium are contained in women's diets.

The majority of energy comes from marketed foods, especially as sugars, starches, and fats used for cooking. On the other hand, much more of the protein, iron and zinc come from the Inuit foods being eaten.

Table 20. shows the rank order of the 10 most important foods giving the nutrients in the foods eaten by women 20-40 years of age. It is very clear that the Inuit foods in women's diets are providing very important amounts of all the nutrients reported here. There are many other nutrients not included in this report because laboratory values were not determined on the Inuit foods.

TABLE 17

Average Daily Nutrient Intake From Both Inuit and Marketed Foods By Age and Sex.
24-hour recall interviews July 87 to May 88.

Mean ± Standard Deviation

	Female 0-12	Female 13-19	Female 20-40	Female 41-60	Female >60	Male 0-12	Male 13-19	Male 20-40	Male 41-60	Male >60
KCAL	1677±730	2164±789	2180±705	1940± 458	1748± 544	1436±704	2116±962	2655± 819	2771±955	1755±81
CHO-T,g	198± 93	269±125	210± 61	166± 46	141± 73	171± 92	260±126	240± 96	209±112	135+06
PRO,g	85± 45	93± 38	136± 64	147± 40	125± 37	67± 35	112± 90	187± 96	210± 69	142±08
FAT, g	61± 31	79± 35	87± 41	73± 29	73± 33	54± 32	68± 36	101± 43	115± 65	67±04
SFA, g	20± 10	22± 12	24± 11	15± 7	13± 5	18± 11	20± 13	25± 9	21± 13	11±00
UFA, g	13± 8	21± 18	18± 10	17± 7	15± 5	12± 9	21± 12	24± 12	26± 12	16±00
FE, mg	28± 26	31± 21	52± 40	75± 45	58± 25	21± 17	31± 18	60± 48	101± 48	70±04
CU, mg	1± 1	1± 1	2± 1	2± 0	1± 1	1± 0	2± 1	2± 2	2± 1	2+00
ZN, mg	11± 6	12± 7	19± 11	21± 8	17± 7	9± 6	16± 16	28± 18	31± 12	20+01
CA, mg	551±302	610±455	538±335	424± 181	340± 118	558±392	571±365	638± 324	581±261	462±25
P, mg	1109±526	1310±628	1604±765	1642± 452	1442± 557	952±432	1344±834	2119±1029	2259±679	1751±94
MG, mg	166± 81	205± 83	244±121	208± 51	173± 68	136± 58	190± 92	294± 134	273± 84	221±11
A, RE	384±301	426±431	653±993	925±1340	664±1197	326±238	541±912	666± 443	1011±988	306±19
	(n=68)	(n=31)	(n=69)	(n=26)	(n=11)	(n=67)	(n=37)	(n=55)	(n=25)	(n=9

TABLE 18

Average Daily Nutrient Intake from Both Inuit and Marketed Foods for Women 20-40 Years of Age.

24-Hour Recall Interviews July 87 to May 88

	TOTAL	INUIT	MARKETED
	Mean ±	Standard Deviation	
KCAL	2180±705	660±506	1520±484
CHO-T, g	210± 61	4± 8	206± 61
PRO,g	136± 64	87± 63	49± 24
FAT, g	87± 41	30± 29	57± 26
SFA, g	24± 11	4± 4	20± 11
UFA, g	19± 10	4± 4	15± 8
FE, mg	52± 40	42± 40	10± 3
CU, mg	2± 1	1± 1	1± 1
ZN, mg	19± 11	13± 11	6± 3
CA, mg	538±335	58± 83	480±309
P, mg	1604±765	876±652	728±329
MG, mg	244±121	114±102	130± 51
A, RE	653±993	320±958	333±282

n = 69 women, 365 recall interviews

The nutrients listed are energy (KCAL), carbohydrate (CHO-T), protein (PRO), fat, saturated fat (SAT), unsaturated far (UFA), iron (FE), copper (CU), zinc (ZN), calcium (CA), phospherus (P), magnesium (MG), and vitamin A.

TABLE 19

Number of Women 20-40 Years* of Age Who Meet Canadian Recommended Nutrient Intake (RNI)

(Selected Nutrients)

	<1/2 RNI	>=1/2 &** <2/3 RNI	>=2/3 & < RNI	>=RNI
KCAL	4	2	26	37
PRO,g	3	1	0	65
FE, mg	2	4	4	59
ZN, mg	4	0	5	65
CA, mg	28	10	18	13
P, mg	2	1	2	64
MG, mg	3	5	21	40
A, RE	35	9	15	10

* n = 69 women, 365 recall interviews

** Equal to or greater than 1/2 but less than 2/3 of the RNI

TABLE 20

10 Most Important Food Contributors to Nutrients in Diets of Women 20-40 Years of Age, July 87 to May 88

In Descending Order of Total Nutrient Values Reported from All Records

Code	Description	Protein, g
4054	R. SEAL MEAT, BOILED	4,554
4074	CARIBOU MEAT, BOILED	3,842
4027	CARIBOU MEAT, RAW	3,025
4001	R. SEAL MEAT, RAW	1,429
4016	NARWHAL MATTAK, RAW	1,328
747	CHICKEN CND BONED	1,212
370	BEEF, HAMBURGER	1,011
4013	NARWHAL MEAT, DRIED	934
689	CHICKEN FRYERS, FRIED	826
4075	ARCTIC CHAR MEAT, BOILED	567

Code	Description	Iron, mg
4054	R. SEAL MEAT, BOILED	3,638
4001	R. SEAL MEAT, RAW	1,184
4013	NARWHAL MEAT, DRIED	864
4074	CARIBOU MEAT, BOILED	673
4027	CARIBOU MEAT, RAW	664
4067	WALRUS MEAT, AGED	383
4080	BEARDED SEAL MEAT, DRIED	326
4056	R. SEAL BROTH, BOILED	303
4092	BABY R.SEAL MEAT, BOILED	268
4003	R. SEAL LIVER, RAW	190

Code	Description	Zinc, mg
4027	CARIBOU MEAT, RAW	653
4054	R. SEAL MEAT, BOILED	522
4074	CARIBOU MEAT, BOILED	501
4016	NARWHAL MATTAK, RAW	434
370	BEEF, HAMBURGER	180
4001	R. SEAL MEAT, RAW	168
4067	WALRUS MEAT, AGED	100
4092	BABY R.SEAL MEAT, BOILED	93
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	86
4013	NARWHAL MEAT, DRIED	86

Table 20 (cont'd)

Code	Description	Calcium, mg
416	BANNOCK/BISCUITS	15,444
1304	MACARONI & CHEESE	5,553
1324	MILK EVAP CND	5,371
646	CHEESE CHEDDAR	5,227
4045	KELP , RAW	3,934
461	BREAD WHITE ENRCHD,	3,501
1633	PIZZA W/ CHEESE	3,184
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	3,089
653	CHEESE PROCESSED	2,134
587	CHOCOLATE MILK	1,939

Code	Description	Vitamin A, RE
4003	R. SEAL LIVER, RAW	59,922
1304	MACARONI & CHEESE	12,447
4016	NARWHAL MATTAK, RAW	10,464
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	7,412
619	CARROTS RAW	5,626
4014	NARWHAL BLUBBER, RAW	5,097
371	BEEF&VEG STEW	5,089
974	EGGS	4,276
4055	R. SEAL BLUBBER, BOILED	3,899
4002	R. SEAL BLUBBER, RAW	3,741

Code	Description	Energy/kcal
416	BANNOCK/BISCUITS	24,131
4054	R. SEAL MEAT, BOILED	23,860
4074	CARIBOU MEAT, BOILED	20,976
4027	CARIBOU MEAT, RAW	17,656
370	BEEF, HAMBURGER REG	11,952
916	CRACKERS	10,293
747	CHICKEN CND BONED	9,175
1789	POTATOES FRENCH FRIED	8,640
4055	R. SEAL BLUBBER, BOILED	8,622
4056	R. SEAL BROTH, BOILED	8,616

Table 20 (cont'd)

Code	Description	Fat, g
4055	R. SEAL BLUBBER, BOILED	936
4056	R. SEAL BROTH, BOILED	900
370	BEEF, HAMBURGER	848
416	BANNOCK/BISCUITS	691
4023	WALRUS BLUBBER, AGED	560
4028	CARIBOU FAT, RAW	559
999	FAT VEGETABLE COOKING	546
4027	CARIBOU MEAT, RAW	529
4002	R. SEAL BLUBBER, RAW	505
4074	CARIBOU MEAT, BOILED	502

Code	Description	Copper, mg
4074	CARIBOU MEAT, BOILED	73
4027	CARIBOU MEAT, RAW	38
4054	R. SEAL MEAT, BOILED	25
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	11
4056	R. SEAL BROTH, BOILED	10
587	CHOCOLATE PLAIN MILK	9
4001	R. SEAL MEAT, RAW	9
416	BANNOCK/BISCUITS	8
4073	CARIBOU MEAT, DRIED	7
4003	R. SEAL LIVER, RAW	6

Code	Description	Magnesium, mg
4054	R. SEAL MEAT, BOILED	4,075
4027	CARIBOU MEAT, RAW	4,061
4045	KELP , RAW	3,399
4074	CARIBOU MEAT, BOILED	3,106
4056	R. SEAL BROTH, BOILED	2,625
416	BANNOCK/BISCUITS	1,782
4001	R. SEAL MEAT, RAW	1,380
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	1,050
371	BEEF&VEG STEW	1,049
1789	POTATOES FRENCH FRIED	933

TABLE 21

10 Most Important Food Contributors to Nutrients in Diets of Men 20-40 Years of Age, July 87 to May 88

In Descending Order of Total Nutrient Values Reported from All Records

Code	Description	Protein, g
4074	CARIBOU MEAT, BOILED	3,517
4027	CARIBOU MEAT, RAW	3,402
4054	R. SEAL MEAT, BOILED	3,144
4016	NARWHAL MATTAK, RAW	2,550
4001	R. SEAL MEAT, RAW	1,806
747	CHICKEN CND BONED	954
370	BEEF, HAMBURGER	785
689	CHICKEN FRYERS FRIED	776
416	BANNOCK/BISCUITS	745
4032	ARCTIC CHAR MEAT, RAW	745

Code	Description	Iron, mg
4054	R. SEAL MEAT, BOILED	2,512
4001	R. SEAL MEAT, RAW	1,496
4027	CARIBOU MEAT, RAW	747
4074	CARIBOU MEAT, BOILED	616
4067	WALRUS MEAT, AGED	521
416	BANNOCK/BISCUITS	262
4068	WALRUS MEAT, BOILED	205
4056	R. SEAL BROTH, BOILED	185
4061	B. SEAL MEAT, BOILED	185
4089	DUCK, BOILED	183

Code	Description	Zinc, mg
4016	NARWHAL MATTAK, RAW	834
4027	CARIBOU MEAT, RAW	734
4074	CARIBOU MEAT, BOILED	458
4054	R. SEAL MEAT, BOILED	360
4001	R. SEAL MEAT, RAW	213
370	BEEF, HAMBURGER	140
4067	WALRUS MEAT, AGED	136
4073	CARIBOU MEAT, DRIED	83
416	BANNOCK/BISCUITS	63
747	CHICKEN CND BONED	61

Table 21 (cont'd)

Code	Description	Calcium, mg
416	BANNOCK/BISCUITS	21,837
461	BREAD WHITE ENRCH,	4,649
1633	PIZZA W/ CHEESE	4,126
1324	MILK EVAP CND	3,524
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	2,113
1304	MACARONI & CHEESE	2,050
4045	KELP , RAW	1,976
916	CRACKERS	1,610
653	CHEESE PROCESSED	1,531
4044	CLAMS	1,474

Code	Description	Vitamin A, RE
4016	NARWHAL MATTAK, RAW	20,103
4014	NARWHAL BLUBBER, RAW	10,510
4002	R. SEAL BLUBBER, RAW	6,111
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	5,071
4023	WALRUS BLUBBER, AGED	4,880
1304	MACARONI & CHEESE	4,595
4055	R. SEAL BLUBBER, BOILED	3,525
974	EGGS HARD	3,455
1633	PIZZA W/ CHEESE	2,849
1317	MARGARINE	2,656

Code	Description	Energy/kcal
416	BANNOCK/BISCUITS	34,121
4027	CARIBOU MEAT, RAW	19,857
4074	CARIBOU MEAT, BOILED	19,198
4054	R. SEAL MEAT, BOILED	16,474
4016	NARWHAL MATTAK, RAW	14,479
916	CRACKERS	11,813
461	BREAD WHITE ENRCH,	9,962
370	BEEF, HAMBURGER	9,281
4001	R. SEAL MEAT, RAW	8,815
4055	R. SEAL BLUBBER, BOILED	7,794

Table 21 (cont'd)

Code	Description	Fat, g
416	BANNOCK/BISCUITS	976
4055	R. SEAL BLUBBER, BOILED	846
4002	R. SEAL BLUBBER, RAW	825
4023	WALRUS BLUBBER, AGED	780
370	BEEF, HAMBURGER	659
4014	NARWHAL BLUBBER, RAW	606
4027	CARIBOU MEAT, RAW	595
999	FAT VEGETABLE COOKING	579
4056	R. SEAL BROTH, BOILED	551
4074	CARIBOU MEAT, BOILED	460

Code	Description	Copper, mg
4074	CARIBOU MEAT, BOILED	67
4027	CARIBOU MEAT, RAW	43
4089	DUCK, BOILED	29
4054	R. SEAL MEAT, BOILED	17
416	BANNOCK/BISCUITS	12
4073	CARIBOU MEAT, DRIED	11
4001	R. SEAL MEAT, RAW	11
4016	NARWHAL MATTAK, RAW	9
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	7
1633	PIZZA W/ CHEESE	6

Code	Description	Magnesium, mg
4027	CARIBOU MEAT, RAW	4,567
4074	CARIBOU MEAT, BOILED	2,843
4054	R. SEAL MEAT, BOILED	2,814
416	BANNOCK/BISCUITS	2,520
4001	R. SEAL MEAT, RAW	1,743
4045	KELP , RAW	1,708
4016	NARWHAL MATTAK, RAW	1,608
4056	R. SEAL BROTH, BOILED	1,607
4032	ARCTIC CHAR MEAT, RAW	1,038
4044	CLAMS	918

The important food contributors for men in the same age range is given in Table 21. Again, it is seen that seal, caribou, char and narwhal mattak are providing important amounts of many nutrients in men's diets.

Table 22. demonstrates that the diets of children 0-12 years of age are meeting the recommended nutrient intakes in about the same proportions as are the diets of women. That is to say, that most individuals are meeting their needs for protein, iron, zinc, phosphorus and magnesium. However the needs for vitamin A and calcium are less often met. More boys than girls are not meeting their daily need for energy.

Tables 23. and 24. show the important foods that children are eating to contribute to their nutrient needs. Again, for most nutrients studied, the important Inuit foods are seal, caribou, narwhal mattak and char. Processed and preprepared chicken, and hamburger are the important marketed meat foods contributing similar nutrients as do Inuit meats.

Omega-fatty acids are important nutrients in Inuit foods that are not regularly found in the marketed foods used in Inuit communities. Although guidelines exist for intake of omega-fatty acids, at this time there are no precise standards for individual intake, so their % RNI cannot be computed. Similarly, complete information does not exist on the amount of omega-fatty acids in

many marketed foods, so dietary records cannot be treated for omega-fatty acids as they were for kilocalories, protein, iron, etc. In spite of these limitation, it was possible to use our laboratory values for omega-fatty acids in Inuit foods to find out how much of these important fats are being consumed. It was found that individuals who consume blubber of sea mammals and the skin and meat of arctic char in regular size portions are meeting the general guideline needs for omega-fatty acids from these foods.

TABLE 22

Number of Boys and Girls 0-12 Years* of Age Who Meet Canadian Recommended Nutrient Intake (RNI)

Selected Nutrients - Females 0-12 Years

	<1/2 RNI	>=1/2 &** <2/3 RNI	>=2/3 & < RNI	>=RNI
KCAL	5	3	40	20
PRO,g	1	0	3	64
FE, mg	3	1	3	61
ZN, mg	2	1	11	54
CA, mg	23	11	15	19
P, mg	1	4	10	53
MG, mg	1	5	8	54
A, RE	27	11	19	11

* n = 68 girls, 415 recall interviews

Selected Nutrients - Males 0-12 Years

	<1/2 RNI	>=1/2 &** <2/3 RNI	>=2/3 & < RNI	>=RNI
KCAL	7	18	30	12
PRO,g	1	1	14	61
FE, mg	4	3	6	54
ZN, mg	5	1	12	49
CA, mg	15	16	14	22
P, mg	5	0	6	56
MG, mg	4	2	4	57
A, RE	37	5	14	11

* n = 67 boys, 365 recall interviews
** Equal to or greater than 1/2, but less than 2/3 of the RNI

TABLE 23

10 Most Important Food Contributors to Nutrients in Diets of Boys 0-12 Years of Age, July 87 to May 88

In Descending Order of Total Nutrient Values Reported from All Records

Code	Description	Protein, g
4054	R. SEAL MEAT, BOILED	2,434
4074	CARIBOU MEAT, BOILED	1,522
689	CHICKEN FRYERS FRIED	909
370	BEEF, HAMBURGER	883
4027	CARIBOU MEAT, RAW	634
4075	ARCTIC CHAR MEAT, BOILED	566
4001	R. SEAL MEAT, RAW	542
416	BANNOCK/BISCUITS	534
747	CHICKEN CND BONED	515
1324	MILK EVAP CND	427

Code	Description	Iron, mg.
4054	R. SEAL MEAT, BOILED	1,944
4001	R. SEAL MEAT, RAW	449
4074	CARIBOU MEAT, BOILED	267
866	CORN FLAKES	266
416	BANNOCK/BISCUITS	188
916	CRACKERS	148
4027	CARIBOU MEAT, RAW	139
4056	R. SEAL BROTH, BOILED	124
370	BEEF, HAMBURGER REG	117
4013	NARWHAL MEAT, DRIED	90

Code	Description	Zinc, mg
4054	R. SEAL MEAT, BOILED	279
4074	CARIBOU MEAT, BOILED	198
370	BEEF, HAMBURGER	157
4027	CARIBOU MEAT, RAW	137
4016	NARWHAL MATTAK, RAW	112
4001	R. SEAL MEAT, RAW	64
689	CHICKEN FRYERS FRIED	64
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	55
1324	MILK EVAP CND	50
416	BANNOCK/BISCUITS	45

Table 23 (cont'd)

Code	Description	Calcium, mg
1324	MILK EVAP CND	16,379
416	BANNOCK/BISCUITS	15,652
1320	MILK WHOLE	10,088
1304	MACARONI & CHEESE	4,403
1328	MILK DRY NONFAT SOLIDS INST	3,813
461	BREAD WHITE ENRCH	2,319
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE HOMCKD	1,947
1140	ICE CREAM	1,922
916	CRACKERS	1,816
1323	MILK PART SKIM	1,513

Code	Description	Vitamin A, RE
1304	MACARONI & CHEESE	9,869
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	4,673
1324	MILK EVAP CND	3,389
974	EGGS	3,135
2404	VEG MIXED: FRZN, BOILED	2,711
4016	NARWHAL MATTAK, RAW	2,698
1320	MILK WHOLE	2,628
505	BUTTER	2,475
371	BEEF&VEG STEW	2,332
1328	MILK DRY NONFAT SOLIDS INST	2,199

Code	Description	Energy/kcal
416	BANNOCK/BISCUITS	24,457
916	CRACKERS	13,330
4054	R. SEAL MEAT, BOILED	12,751
1252	POWDERED DRINKS	10,725
370	BEEF, HAMBURGER	10,432
689	CHICKEN FRYERS FRIED	8,554
1324	MILK EVAP CND	8,409
4074	CARIBOU MEAT, BOILED	8,308
866	CORN FLAKES	7,780
999	FAT VEGETABLE COOKING	6,595

Table 23 (cont'd)

Code	Description	Fat, g
999	FAT VEGETABLE COOKING	746
370	BEEF, HAMBURGER REG GND CKD	740
416	BANNOCK/BISCUITS	700
1324	MILK EVAP CND	477
689	CHICKEN FRYERS FRIED	474
1999	FRANKFURTERS CKD	425
1809	POTATO CHIPS	384
916	CRACKERS	369
4056	R. SEAL BROTH, BOILED	368
1789	POTATOES FRENCH FRIED	327

Code	Description	Copper, mg
4074	CARIBOU MEAT, BOILED	29
4054	R. SEAL MEAT, BOILED	13
416	BANNOCK/BISCUITS	8
4027	CARIBOU MEAT, RAW	8
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	7
587	CHOCOLATE PLAIN MILK	6
1324	MILK EVAP CND	6
916	CRACKERS	5
2079	SOUP CHIC NOODLE W	5
1320	MILK WHOLE	4

Code	Description	Magnesium, mg
4054	R. SEAL MEAT, BOILED	2,178
416	BANNOCK/BISCUITS	1,806
1324	MILK EVAP CND	1,506
4074	CARIBOU MEAT, BOILED	1,230
1320	MILK WHOLE	1,102
4056	R. SEAL BROTH, BOILED	1,073
916	CRACKERS	862
4027	CARIBOU MEAT, RAW	851
689	CHICKEN FRYERS FRIED	795
370	BEEF, HAMBURGER REG	766

TABLE 24

10 Most Important Food Contributors to Nutrients in Diets of Girls 0-12 Years of Age, July 87 to May 88

In Descending Order of Total Nutrient Value Reported from All Records

Code	Description	Protein, g
4054	R. SEAL MEAT, BOILED	2,808
4074	CARIBOU MEAT, BOILED	2,111
370	BEEF, HAMBURGER	1,148
4027	CARIBOU MEAT, RAW	1,068
689	CHICKEN FRYERS FRIED	894
4001	R. SEAL MEAT, RAW	793
747	CHICKEN CND BONED	785
4016	NARWHAL MATTAK, RAW	703
2165	SPAGHETTI W MEAT BALLS&TOM SAUCE	590
416	BANNOCK/BISCUITS	548

Code	Description	Iron, mg
4054	R. SEAL MEAT, BOILED	2,243
4001	R. SEAL MEAT, RAW	657
4013	NARWHAL MEAT, DRIED	448
4074	CARIBOU MEAT, BOILED	370
4080	BEARDED SEAL MEAT, DRIED	312
866	CORN FLAKES	298
4027	CARIBOU MEAT, RAW	235
4056	R. SEAL BROTH, BOILED	219
416	BANNOCK/BISCUITS	193
370	BEEF, HAMBURGER	152

Code	Description	Zinc, mg
4054	R. SEAL MEAT, BOILED	322
4074	CARIBOU MEAT, BOILED	275
4027	CARIBOU MEAT, RAW	231
4016	NARWHAL MATTAK, RAW	230
370	BEEF, HAMBURGER	204
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	110
4001	R. SEAL MEAT, RAW	93
689	CHICKEN FRYERS FRIED	62
747	CHICKEN CND BONED	50
1683	PORK LEAN CUTS	50

Table 24 (cont'd)

Code	Description	Calcium, mg
416	BANNOCK/BISCUITS	16,040
1324	MILK EVAP CND	14,591
1320	MILK WHOLE	11,170
1304	MACARONI & CHEESE	5,236
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	3,933
1140	ICE CREAM	3,658
1633	PIZZA W/ CHEESE FRZN BAKED	3,260
1328	MILK DRY NONFAT SOLIDS INST	2,698
461	BREAD WHITE ENRCH	2,676
1323	MILK PART SKIM	2,518

Code	Description	Vitamin A, RE
1304	MACARONI & CHEESE	11,736
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	9,439
4016	NARWHAL MATTAK, RAW	5,544
619	CARROTS	5,345
4002	R. SEAL BLUBBER, RAW	3,730
371	BEEF&VEG STEW	3,385
1324	MILK EVAP CND	3,019
974	EGGS	2,996
1320	MILK WHOLE	2,910
1140	ICE CREAM	2,771

Code	Description	Energy/kcal
416	BANNOCK/BISCUITS	25,063
4054	R. SEAL MEAT, BOILED	14,713
370	BEEF, HAMBURGER	13,566
916	CRACKERS	13,481
1252	POWDERED DRINKS	12,734
4074	CARIBOU MEAT, BOILED	11,521
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	10,540
866	CORN FLAKES	8,708
689	CHICKEN FRYERS FRIED	8,404
1789	POTATOES FRENCH FRIED	7,596

Table 24 (cont'd)

Code	Description	Fat, g
370	BEEF, HAMBURGER	963
416	BANNOCK/BISCUITS	717
4056	R. SEAL BROTH, BOILED	653
1999	FRANKFURTERS CKD	537
999	FAT VEGETABLE COOKING	530
4002	R. SEAL BLUBBER, RAW	503
689	CHICKEN FRYERS FRIED	466
1324	MILK EVAP CND	425
1809	POTATO CHIPS	410
1789	POTATOES FRENCH FRIED	400

Code	Description	Copper, mg
4074	CARIBOU MEAT, BOILED	40
4054	R. SEAL MEAT, BOILED	16
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	13
4027	CARIBOU MEAT, RAW	13
416	BANNOCK/BISCUITS	8
587	CHOCOLATE PLAIN MILK	8
4056	R. SEAL BROTH, BOILED	7
2079	SOUP CHIC NOODLE	6
916	CRACKERS	5
1324	MILK EVAP CND	5

Code	Description	Magnesium, mg
4054	R. SEAL MEAT, BOILED	2,513
4056	R. SEAL BROTH, BOILED	1,903
416	BANNOCK/BISCUITS	1,851
4074	CARIBOU MEAT, BOILED	1,706
4045	KELP , RAW	1,650
4027	CARIBOU MEAT, RAW	1,434
1324	MILK EVAP CND	1,342
2165	SPAGHETTI W/MEAT BALLS&TOM SAUCE	1,337
1320	MILK WHOLE	1,220
370	BEEF, HAMBURGER	996

PCB Intakes

A major objective of this research was to determine the seasonal intake of PCB's as well as a yearly average for various age and gender groups of the population.The results of these inquiries are given in Table 25. and in Figures 6. to 14. In Table 25. is shown the average daily PCB intake for each age and gender category. It can be seen that, in general, intake increases with age.

In Figure 6. the total adjusted population daily intake of PCB's over the calendar year (July 87 to May 88) is shown. This was derived from the 24-hour intake interviews which were treated by computer with the food PCB values from Dr. Muir's laboratory. The value for each individual was computed from the yearly average of all available dietary records.

This figure can be interpreted to say, for example, that on each day (on the average) in June and July, the entire community consumes a total of about 9 milligrams of PCB; in August and September the entire community consumes about 18 milligrams ... etc. The yearly average intake per day is about 10 milligrams of PCB's. The lowest intake is in March when about 6 milligrams are consumed, and the highest intake is in September.

The primary PCB contributors are the fat foods from seal, narwhal, walrus and caribou, with varying amounts from each of these depending on how much is used by the community in season.

TABLE 25

Average Daily PCB Intake (ug) from Inuit Foods
Using All 8 Time Periods

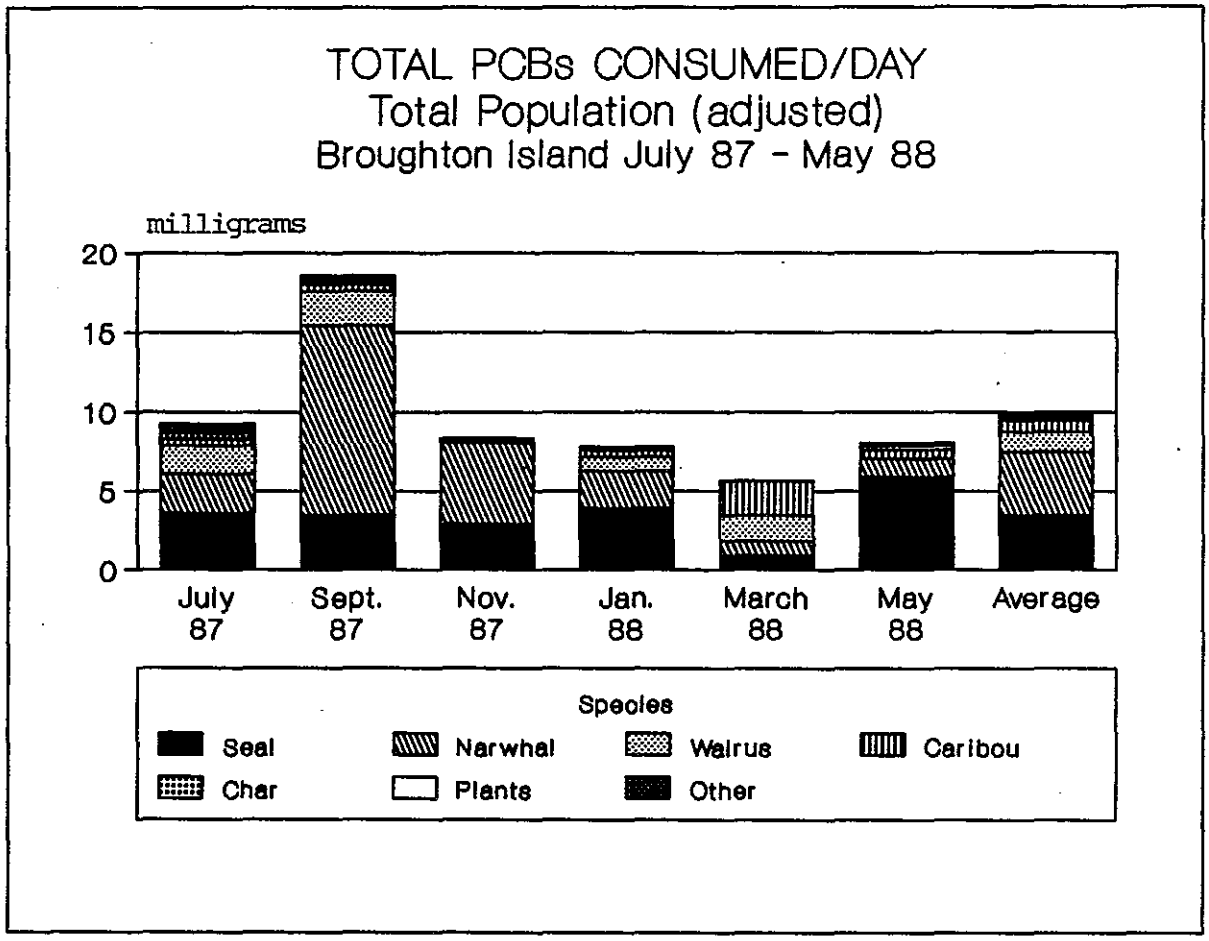
Micrograms

Mean ± Standard Deviation

Female 0-12	Female 13-19	Female 20-40	Female 41-60	Female >60
8±9	10±13	25±31	35±31	42±31

Male 0-12	Male 13-19	Male 20-40	Male 41-60	Male >60
6±8	13±17	43±40	68±53	32±19

Figure 6



1 milligram = 1,000 micrograms

As shown earlier, we know that people of different ages and genders eat differently, and that more Inuit food is eaten by males than by females, and by older than by younger people. Similarly the PCB intake varies with age and gender. With the rough "tolerable" guideline of 1 microgram per 1 kilogram (1 ug/kg) of a person's body weight, it was possible to compute the general percentage of people who ate PCB's within this guideline. In Figure 7. it is shown that more than 90% of children 15 years of age and women 15 to 45 years of age are within this guideline. Men 15-45 years of age and older men and women are consuming more of the PCB containing foods, with men 45 to 65 years of age consuming the most. It can be seen that about 60% of men in this age range are within the guideline and 40% are exceeding the guideline.

Figures 8., 9., 10., 11. and 12. show the patterns of intake. Figure 8. shows how the whole population is distributed over the various ranges of intakes of PCB's. There were few individuals with intakes exceeding 1 microgram of PCB's per kilogram of body weight, and those that did exceed it rarely (1 person)ate more than 3 micrograms per day on the average over the year. Body weights for the various age and gender groups were assumed to be those reported in the Eskimo data of the Nutrition Canada Anthropometry Report (Health and Welfare Canada, 1980).

Figure 9. shows this same distribution for children less than 15 years of age, and Figure 10. gives the same distribution for

individuals 15 to 45 years of age. In Figure 10. it is clear that in the higher levels of intake there are more men than women exceeding the "tolerable" guideline of 1 microgram PCB per each kilogram of body weight. Figures 11. and 12. show how the picture changes with older people. It must be remembered,however, that the majority (80%) of the population are less than 40 years of age, and that fewer individuals are represented in the percentages of Figures 10. and 11.

Figures 13. and 14. show how the different species of Inuit foods contribute differently in different seasons to the PCB's consumed by women and men 20 to 40 years of age. The average woman and man each consumed a yearly daily amount of about 5 micrograms of PCB from seal. Men consumed about 10 micrograms from narwhal, but women only consumed an average of 5 micrograms from this source. Women ate a total of about 4 micrograms from walrus and caribou; men ate about the same amount from these two species. Char, plant foods and all other Inuit foods contributed negligible PCB's to these diets. These figures are confirmed with the average micrograms of PCB's consumed from the different species by the different age and gender groups in Table 25.

Analysis of 4 breast milk samples showed that PCB's were present within the range reported for Southern Canadian women (Mes, 1987). However, the small number of samples, and the lack of infant food/ milk intake data prevent conclusions on PCB intake of nursing infants.

Figure 7

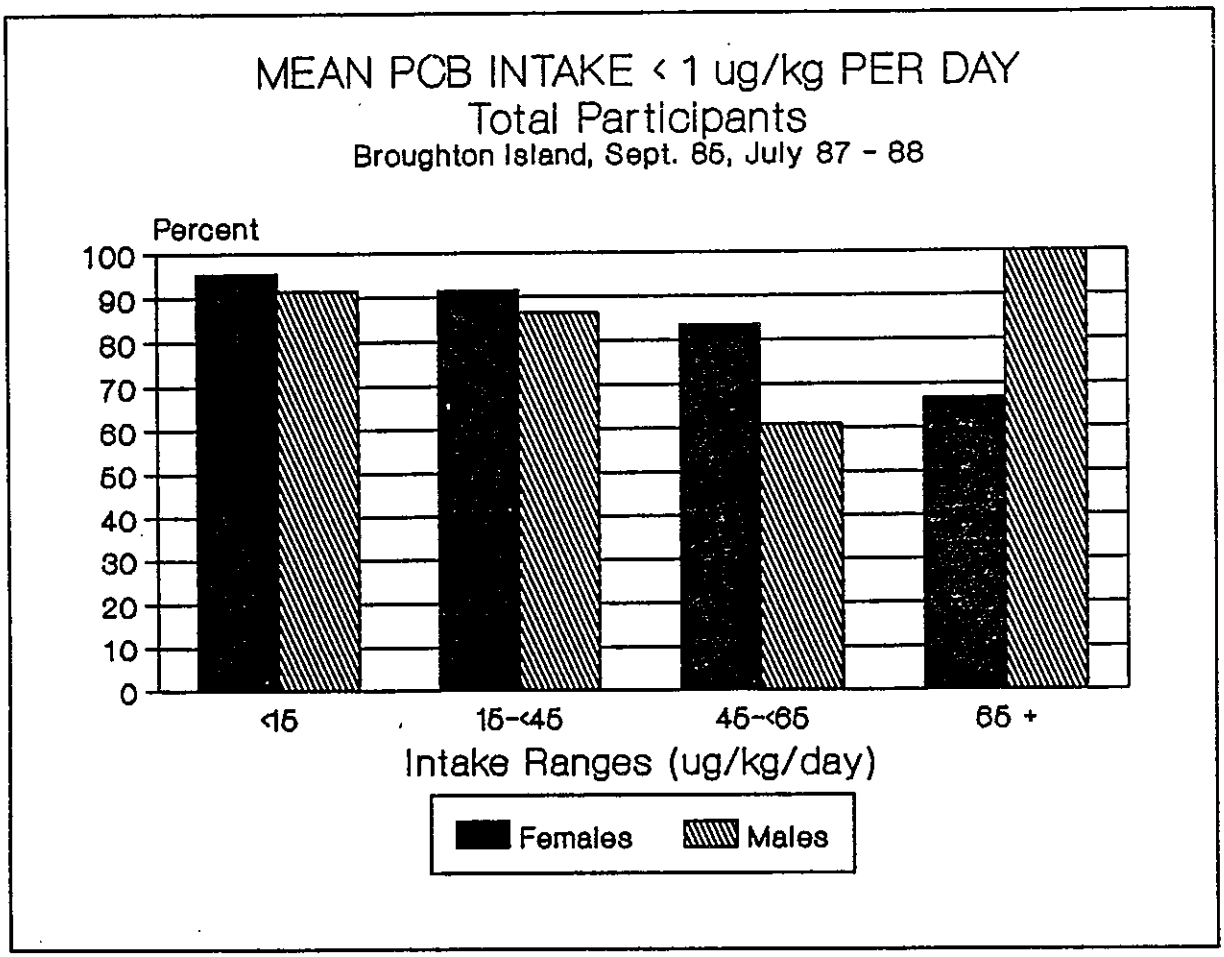
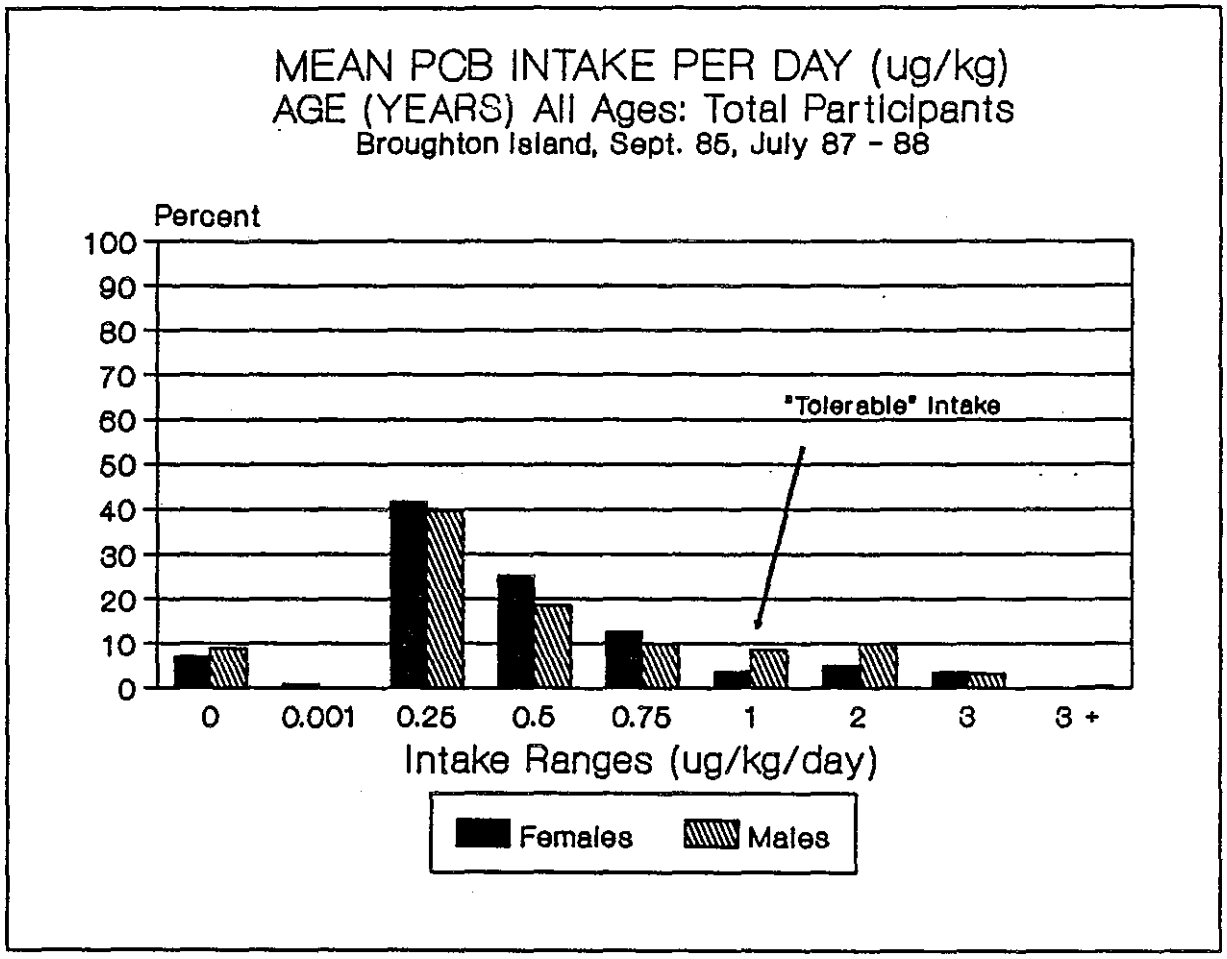
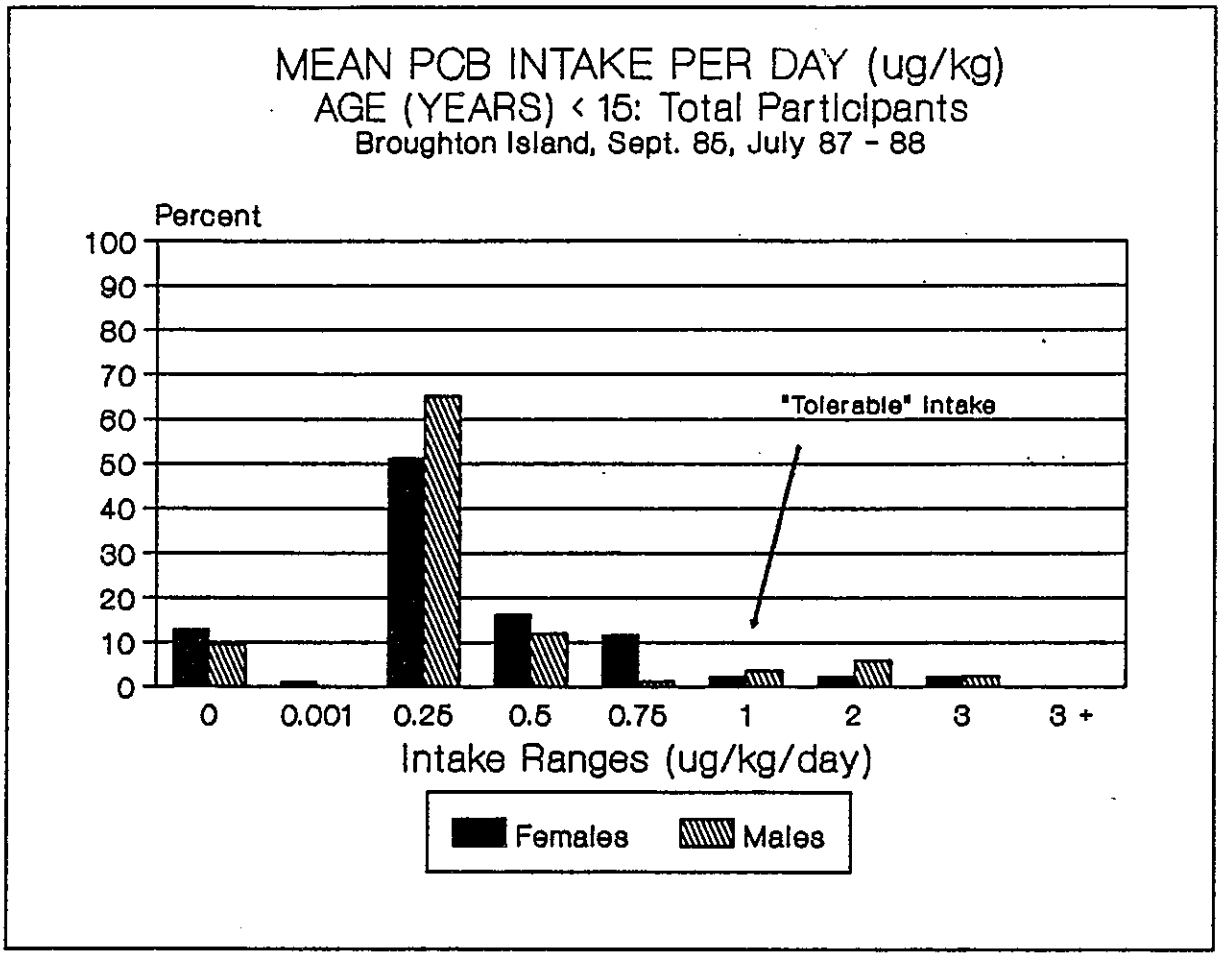

MEAN PCB INTAKE < 1 ug/kg PER DAY
Total Participants
Broughton Island, Sept. 86, July 87 - 88
Percent
100
90
80
70
60
50
40
30
20
10
0
<15
15-<45
45-<65
65 +
Intake Ranges (ug/kg/day)
Females
Males

Figure 8



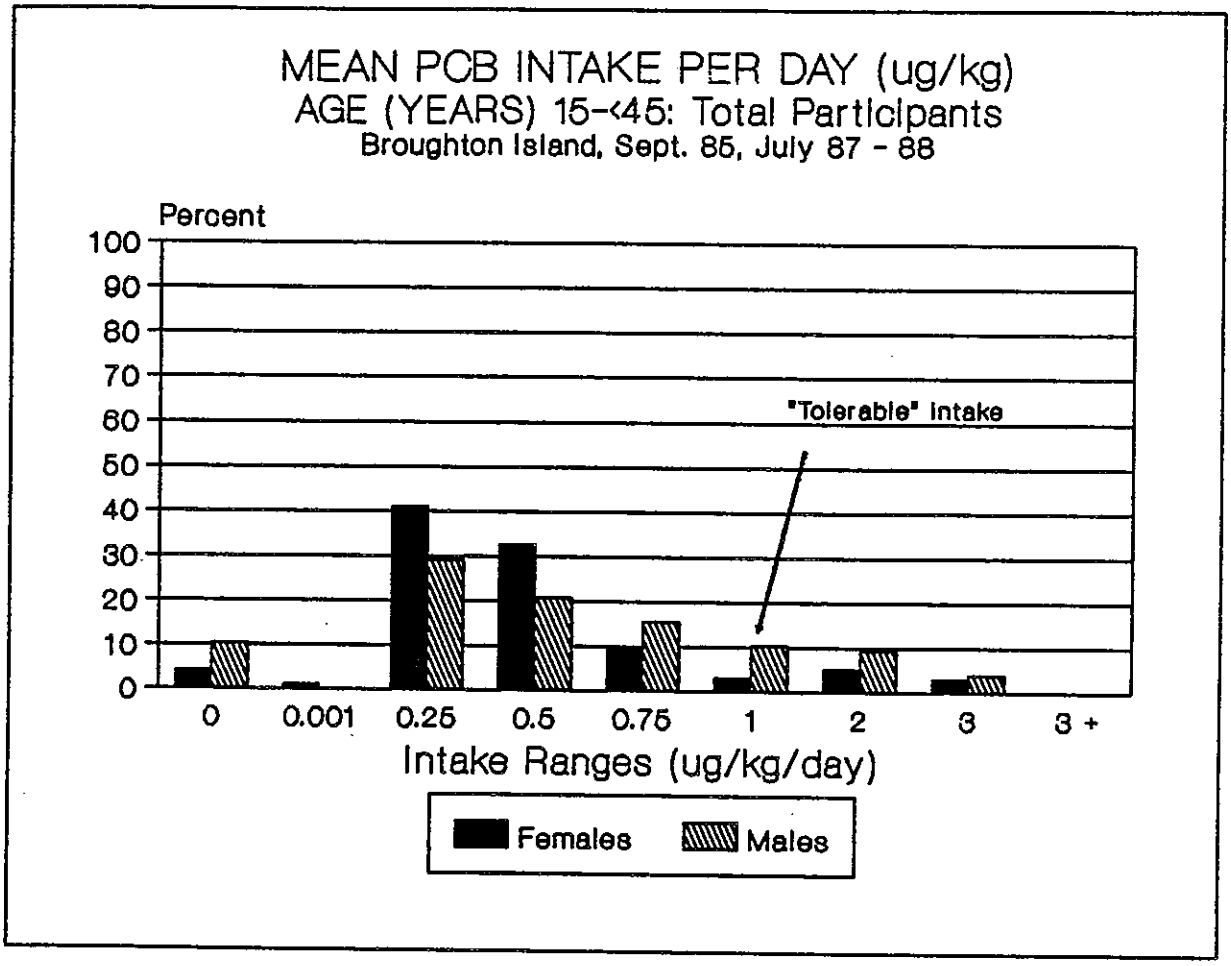
"Tolerable" Intakes are from 0 up to 1 ug/kg/day.

Figure 9



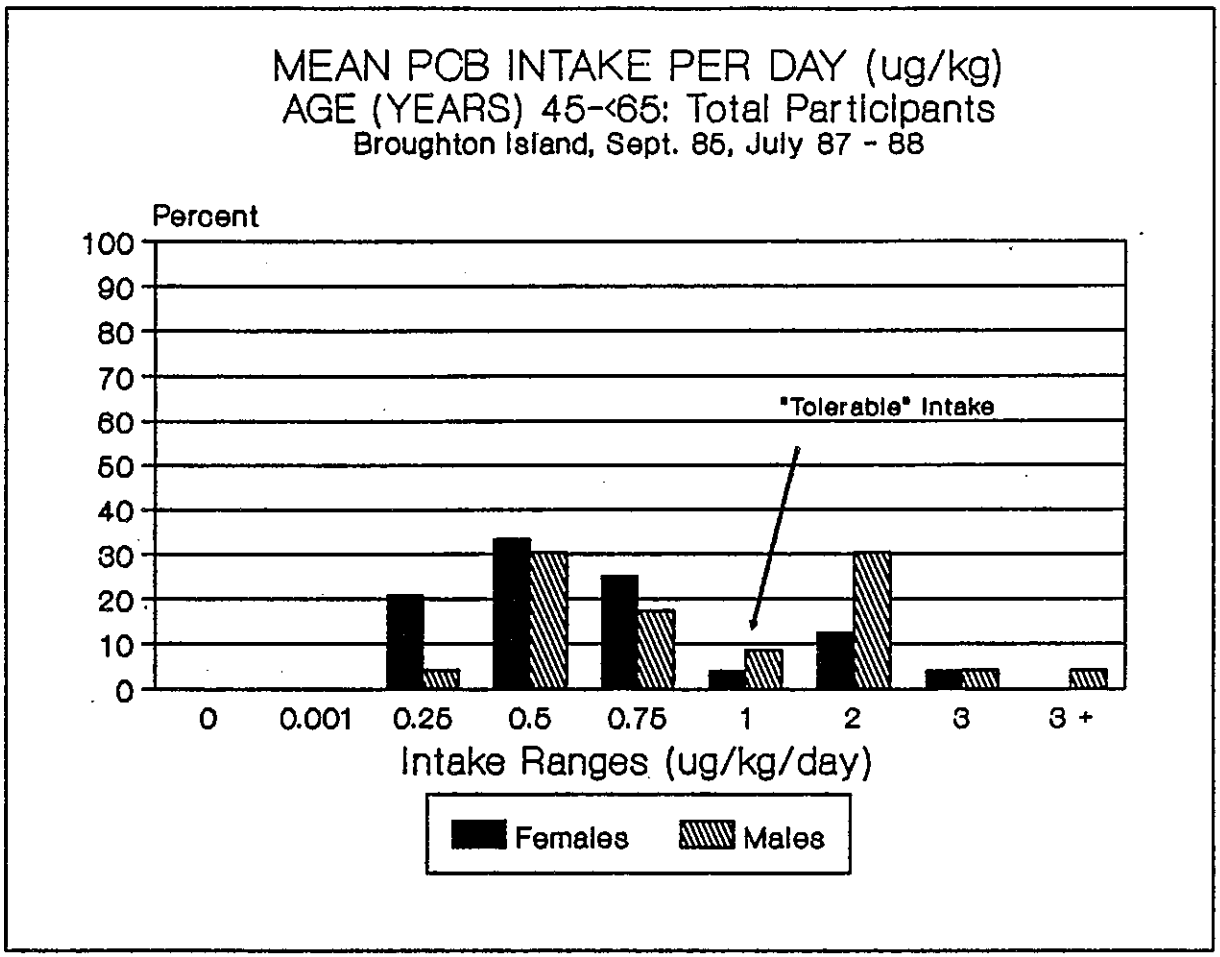
"Tolerable" Intakes are from 0 up to 1 ug/kg/day.

Figure 10



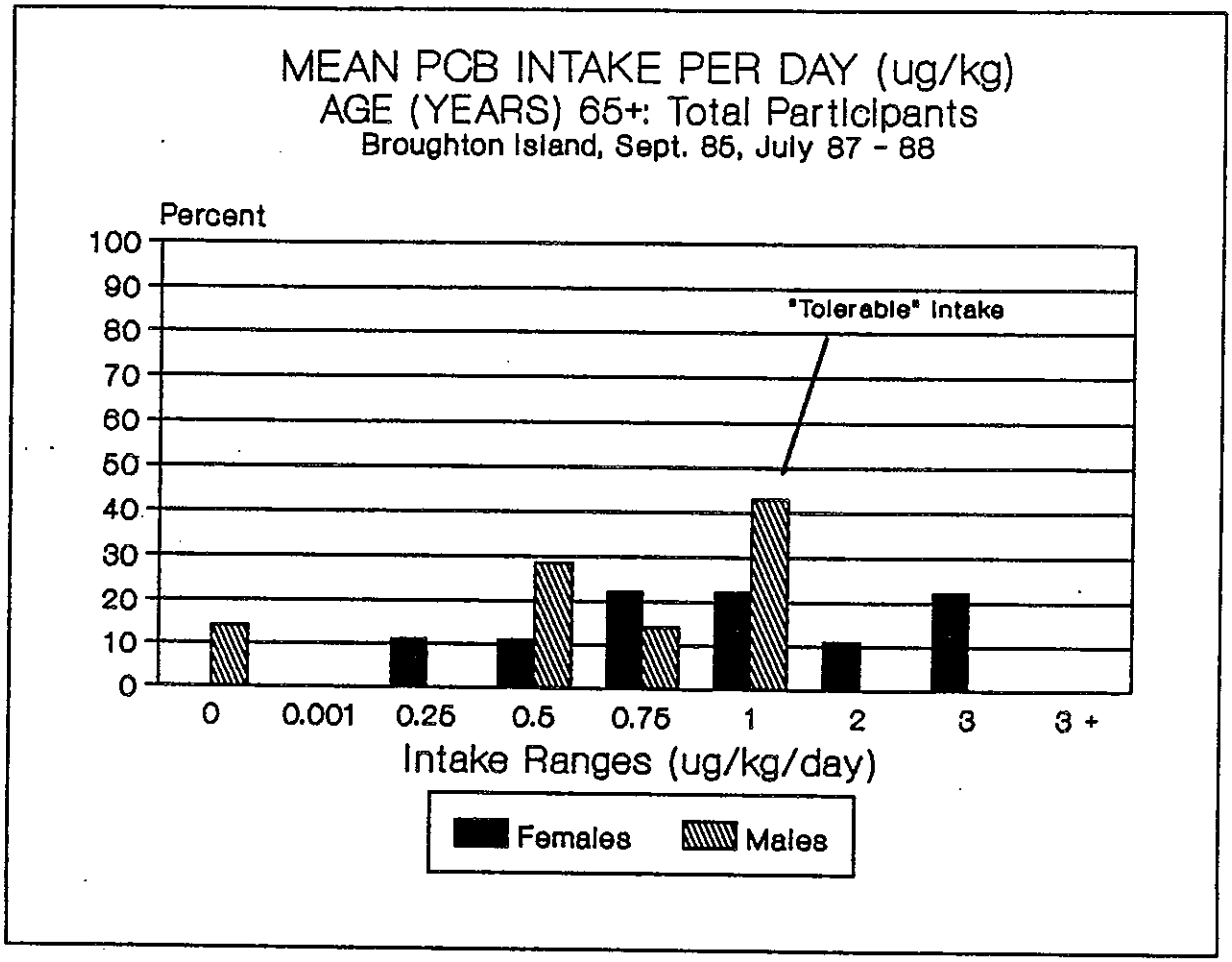
"Tolerable" Intakes are from 0 up to 1 ug/kg/day.

Figure 11



"Tolerable" Intakes are from 0 up to 1 ug/kg/day.

Figure 12



"Tolerable" Intakes are from 0 up to 1 ug/kg/day.

Figure 13

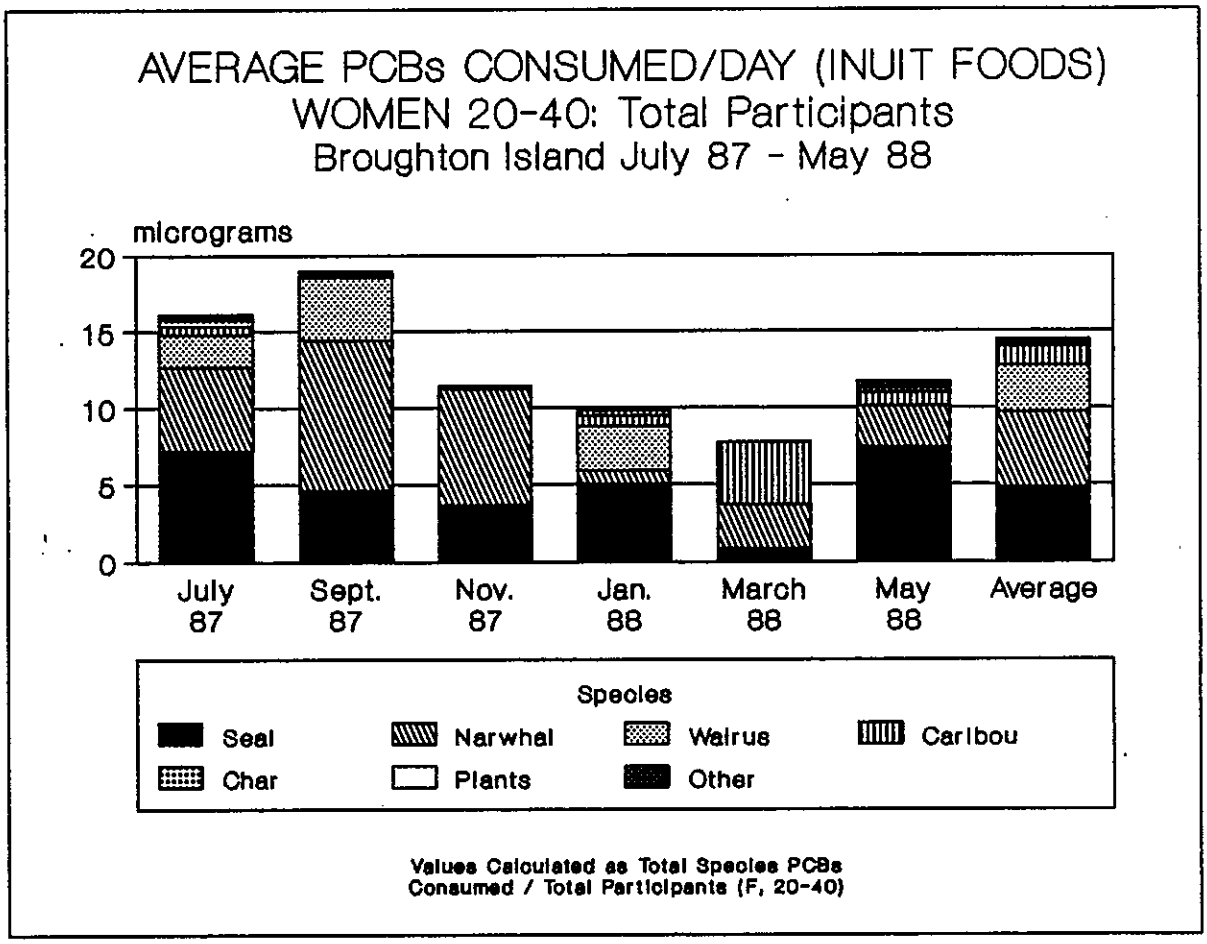
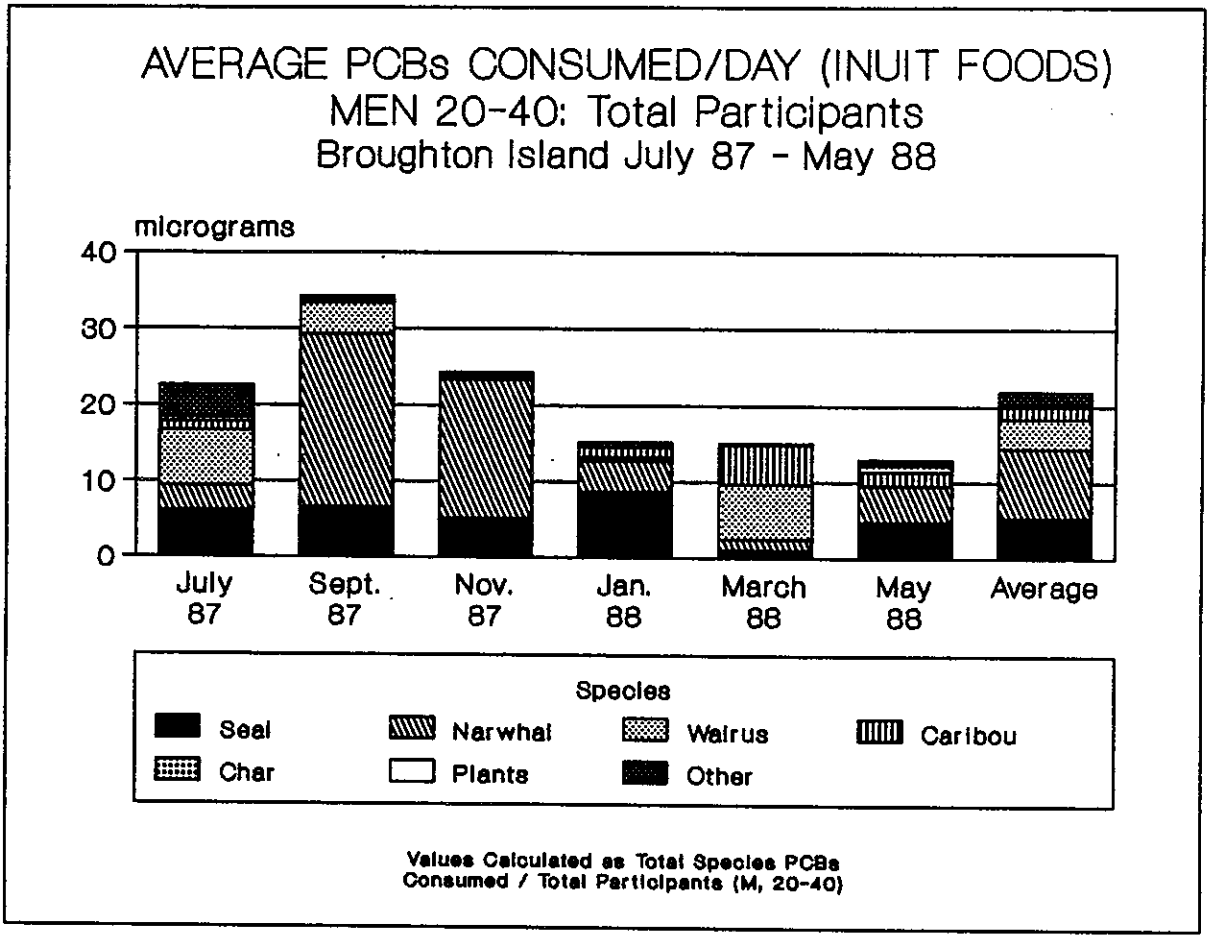

AVERAGE PCBs CONSUMED/DAY (INUIT FOODS)
WOMEN 20-40: Total Participants
Broughton Island July 87 - May 88
micrograms
20
15
10
5
0
July 87
Sept. 87
Nov. 87
Jan. 88
March 88
May 88
Average
Species
Seal
Narwhal
Walrus
Caribou
Char
Plants
Other
Values Calculated as Total Species PCBs Consumed / Total Participants (F, 20-40)

Figure 14


AVERAGE PCBs CONSUMED/DAY (INUIT FOODS)
MEN 20-40: Total Participants
Broughton Island July 87 - May 88
micrograms
40
30
20
10
0
July 87
Sept. 87
Nov. 87
Jan. 88
March 88
May 88
Average
Species
Seal
Char
Narwhal
Plants
Walrus
Other
Caribou
Values Calculated as Total Species PCBs Consumed / Total Participants (M, 20-40)

Correlates with Blood Values

As noted in the first section of this report, blood samples were taken from 207 individuals in 1985 and analyzed for PCB's. Dietary records from many of these same individuals (187) were taken in 1985 and in later interview periods. It was therefore possible to investigate the possibility that dietary records can be used to predict blood levels of PCBs in individuals.

Tables 26. shows a summary of blood PCB standards, and Table 27. shows the number of individuals in the various categories of blood PCB's. Although there are still many difficulties in adequately measuring PCB's in blood in the laboratory, it is possible to group individuals into categories. Table 27. shows that of the 207 samples, a total of 5 individuals had blood PCB's that fell into the "action" guidelines. Generally speaking, "action" means that further evaluation needs to be made.

Each person's analyzed value was treated by computer with the average PCB intake resulting from all available dietary 24-hour food recalls. The only correlation that was significant was for those individuals 20 years of age or older who had been interviewed 3 or more times. The correlations were significant for women 19-45 years and for men over 45 years of age.

It was also found that age correlated with PCB blood levels; that

is, higher PCB's were found in older people, probably due both to (1) accumulation over the years and (2) greater PCB intake on a daily basis. Generally, men had higher PCB blood levels than women. This is probably due to (1) women eat less wildlife foods with PCB's and (2) women excrete PCB's from their bodies in pregnancy and lactation. These results confirm what has already been known from the literature, as reviewed in 1987 by Dr. J. Mes (Mes, 1987).

It is important to re-state in this section that there is no evidence that PCB's as consumed in the forms and amounts contained in the Inuit foods reported here are causing harm to Inuit people.

Table 26

Guidelines for PCB's in Blood*

	---PCB Blood Levels (ppb)---		
Risk Groups	Tolerable	Concern	Action
Children <15**	< 5	5-19	20-
Women 15-44 yr	< 5	5-99	100-
Pregnant and lactating women	< 5	5-	5-
Men and women ≥45 yr	<20	20-99	100-

* With Aroclor 1254 mixture as standard
** Guidelines establish children ≤18 yr.

Table 27

Summary of PCB Blood Levels (ppb) by Groups

Risk Group	Below Detection	1-4	5-19	20-	Total
			Numbers		
Children <15	4	13	27	2*	46
Women 15-44	10	19	23	0	52
Pregnant	3	1	2*	0	6
Lactating	6	2	1*	0	9
Men 15-	3	6	57	4	70
Women 45-	0	0	17	7	24
ALL	26	41	127	13	207

* Above action guideline

TABLE 28.1

Factors Correlating with PCB Blood Values

A. Dietary PCB's, where 3 or More Dietary Records are Available per Individual >= 19 Years of Age

	n	Correlation	Significance
Whole group	122	+.20	.029*
All Females	74	+.20	.089
All Males	48	+.16	.283
All 19-45	81	+.22	.046*
All > 45	41	+.05	.745
Females 19-45	46	+.30	.045*
Females > 45	28	-.06	.759
Males 19-45	35	-.01	.939
Males > 45	13	+.61	.026*

* Significance <= .05

TABLE 28.2

Factors Correlating with PCB Blood Values

B. Age, Weight, PCB Intake as Correlates with Blood PCBs.

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0

	AGE (years)	Weight (kg)	PCB Intake Mean (ug/kg)	PCB in Blood (ng)
Age (years)	1.00000 0.0	0.63891 0.0001*	0.33013 0.0001*	0.46164 0.0001*
Weight (kg)	0.63891 0.0001*	1.00000 0.0	0.17792 0.0002*	0.06697 0.3624
PCB intake mean (ug/kg)	0.33013 0.0001*	0.17792 0.0002*	1.00000 0.0	0.12478 0.0888
PCB in Blood (ng)	0.46164 0.0001*	0.06697 0.3624	0.12478 0.0888	1.00000 0.0

* Significant

DISCUSSION AND CONCLUSIONS

Although this research was extended over 4 years in the community of Broughton Island, there was a continuing spirit of cooperation to get the best possible end results. The intensive interviewing periods in September, 1985, and from July, 1987, through August, 1988, were agreed upon by the Hamlet Council and supported by the council administration, elders and other leaders in the community. This is not to say the interviewers and their research supervisors had an easy task, because the interviews did take peoples' time and thought to get the quantitative data needed. The response rates, as given in Tables 5., 6. and 7. clearly show that people were willing to participate. It was also shown that participation represented the community as a whole so that the results gained could be extrapolated to the entire community when participation was from 60 to 70%.

A continuing worry was that the fear and concern about PCB's would already change peoples' food patterns before the data collection that was intended to describe their current food patterns was complete. However, the meetings with council members and the Hamlet administrators, as well as conversations with the interviewing teams, assured the supervisors that in their perception, people were not changing their eating patterns during the course of data collection.

Figures 2.-5. also demonstrate that the use of Inuit foods during the different periods changed with seasonal availability, but that portion sizes were reasonably consistent. The July 87 and July 88 data represented in Figure 5. show that total per capita use was lower in July, 1988, than in July, 1987, but it is not known if this was due to differing availability of the species because of climate and hunting conditions, or changes in food preferences/health beliefs related to worry about PCBs. The September 1985 and 1987 data indicate that food use increased in the later interview period. In any event, the September 1985 and July 1988 data were not included in the yearly average calculations. Thus we have no evidence that bias was introduced into any of the interviews.

It is clear from the food use data reported here that traditional Inuit foods are a major portion of the foods eaten in the community. They are clearly important nutritionally for all the nutrients reviewed in this report. It is also understood that the harvest, preparation and actual consumption in family meals of these foods contribute substantially to the Inuit cultural experience. The use of these foods also help in economic stability of families.

Nevertheless, as anticipated from research reports from other native groups (Kuhnlein, 1984a; Kuhnlein, 1984b; Kuhnlein, 1989; Wein, 1986) and from informal comments from Broughton Island

elders, the younger age groups are already eating more marketed foods and less Inuit foods than their parents and grandparents.

The nutrients provided by the Inuit food components of all age groups are still vitally important. Even in the diet records of young people, the Inuit meats are consumed in sufficient quantity to ensure that the large majority are meeting their recommended nutrient intakes for most nutrients evaluated. Vitamin A (retinol) and calcium are problem nutrients for all age groups. It is ironic that these nutrients are found in Inuit foods and needs for them could be met if people would eat more of the richer sources: blubbers (retinol), kelp (calcium) and fish skin (calcium). Alternatively the marketed foods important for these nutrients are carrots and other green and yellow vegetables (vitamin A) and dairy products (calcium). These foods are expensive in Broughton Island markets and are not regularly used. Another alternative is to use vitamin/mineral pills to supplement the diet. This choice would be a lesser alternative because pills are expensive. More important, pills never can provide the full nutrient spectrum that foods do.

Unfortunately, it is clear that PCB's are present in Inuit diets. This was expected because of the earlier reports (Wagemann and Muir, 1984 and Wong, 1985) which showed the presence of PCB's in these foods. The dietary pattern derived from the culture and environment of Inuit is one which is highest in sea mammal foods

(which are high on the food chain) of any of the world's cultural groups. Even though the use of traditional cultural foods has been declining during this century for Inuit, there is still considerable use of these foods by Inuit people living in remote communities.

Using the dietary records available in this research, several people were shown to exceed the provisional "tolerance" for dietary PCB of 1 microgram per kilogram body weight. Most of the individuals exceeding this level were past the period of growth and development (adults) when PCB risk is presumed to be greatest. Also, there were few women in the child-bearing age range that exceeded the provisional "tolerance", and no one who exceeded it consistently in all dietary records. Furthermore, personal body weights (kg) were not used in these calculations, so these results are only approximate for any one individual.

It must also be kept in mind that the human "tolerance" was set with a 200x safety factor from the lowest level which was proven to cause defects in rats and mice. If an individual occasionally consumes 2x or 3x the "tolerance" amount of PCB's, this is not to say they will become ill from PCB's. It is also important to note that there have been no health data from any region of the Northwest Territories that demonstrate illness caused by PCB's.

Thus, it is reasonable to conclude that because:

(1) Children and women in their child-bearing years are mostly all within the PCB "tolerable" intake

(2) The downward trend in the extent of use of traditional Inuit foods from historical times to the present will probably prevail and continue downward

(3) PCB's will probably not be increasing in Inuit food species since use in industrial countries will (hopefully) be even further reduced than they have been to date

(4) The nutrition components of Inuit food are supurb and are important enough for Inuit diets that they should, if anything, be increased,

therefore the Inuit people of Broughton Island, and presumably in other Arctic areas, should continue use of their traditional food resources.

It is understandable, though unfortunate, that people exposed to media reports about PCB's in Inuit foods will voluntarily wish to reduce their use of Inuit foods to avoid PCB's. If this is the case it could be considered that blubbers from older male animals highest on the food chain (polar bear, narwhal, beluga, walrus) might be appropriate tissues to partially avoid. Because of the essential contributions of sea mammal and char fats to levels of omega-fatty acids and vitamin A for all age groups, it is desirable

to have some of these foods regularly in the diet all year-round. These nutrients are not readily found in marketed foods that people are using. Furthermore, these foods are a central part of Inuit culture. Because all meats, mattak, and plant foods are very low in PCB's and very rich in nutrients, they should continue to be a regular part of the diet of all ages of Inuit people.

It is unsettling for all that this message (yes, there are PCB's; but continue to eat Inuit foods) is a complex one. The situation is not black and white. It is also very worrisome that the concern for PCB's as promoted by the media will further accelerate the transition to a lifestyle containing fewer Inuit foods than are reported here, and that in all likelihood this will promote poorer nutrition and health status of Inuit people than has been documented to date.

RECOMMENDATIONS

The Department of Health of the Northwest Territories requested that recommendations on Inuit food use be part if this contract report. The conclusions and discussion of the previous section make it clear that the conclusions and recommendations presented to the Hamlet Council of Broughton Island and the Legislative Assembly of the Northwest Territories in March-April, 1989, are unchanged. This being the case, they are given here, again, for completeness:

Nutritional Value of Inuit Foods

1. Inuit foods are nutritionally superior to the marketed foods used in the community.
2. Blubber, which has the highest levels of PCB's, is rich in at least one essential vitamin (retinol), and may be its major source in the diet. Blubber also contains high levels of omega-3 fatty acids, which are believed to provide protection against heart disease and other diseases, and to support other metabolic processes, such as the development of nerve tissue (particularly important <u>in utero</u> and during infancy).
3. Inuit food meats - from marine mammals, caribou and char - provide large quantities of high quality protein, and the essential minerals iron and zinc, among other nutrients.
4. The use of Inuit foods provides a uniquely healthful, nutritionally sound diet; breast feeding and breast milk convey enormous benefits to developing infants.

PCB's in Inuit Foods

1. Inuit foods are used by nearly all Broughton Island residents, and are a major part of the diet for the community. Only about 12% of participants reported no consumption of Inuit foods during any of the survey periods.
2. All Inuit foods tested contain some PCB's; the smallest amounts are in plants and fish, higher amounts are in animals which feed on them; the largest amounts are found in sea mammal blubber (other than seals) and in polar bear fat.
3. More, and different proportions of Inuit foods, and more PCB's are consumed by older than by younger persons, and by males than by females. Marketed foods are used more by younger persons.
4. Over all surveys periods, about 10% of female participants and 15% of male participants consumed more than the "tolerable" amounts of PCBs - 1 microgram per kilo of body weight per day (1ug/kg); the highest intake was about 4 ug/kg. This intake represents an erosion of the safety factor for a PCB intake, but does not warrant advising a change in diet.

Conclusions

1. The nutritional value of Inuit foods is high.
2. Substitution of Inuit foods with marketed foods currently available and consumed in the community will result in a

poorer diet, with the risk of damage to health.

3. The benefits of Inuit foods, and of breast feeding to Broughton Island residents are greater than the risk from the PCB's in Inuit food or in breast milk.
4. The use of Inuit foods, and breast feeding should be encouraged.

Another group of recommendations on further research is also put forward for consideration:

a. Continued monitoring of PCB's and other contaminants in food species of the Arctic.
b. The age, sex and body part differences in contaminant levels of food species be defined, so people can make intelligent selections in their food choices after hunting.
c. The food use of various Arctic peoples be monitored for nutritional quality as well as the presence of contaminants.
d. The cultural impact of contaminant concerns should be defined to try to prevent undue loss of valuable foods and cultural practices.
e. Ways to assure the Inuit people through research, education, and the media must be found to show that Inuit foods make positive and healthful contributions to them.

f. Ways must be found to ensure the participation of Inuit people in these endeavors.

Finally, it is undoubtedly the universal wish of all who are aware of this project and its findings that all possible effort - be it research, educational or political - be put forward to stop the release of industrial contaminants into the world's environments.

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APPENDICES

TABLE 29.1

Changing Household Residence by Individuals Across All Interview Periods

A. ID by Date of Birth and Gender

ID	Date of Birth	Sex	ID	Date of Birth	Sex
11	1955	M	175	1985	M
12	1957	F	181	1958	M
13	1979	M	182	1959	F
14	1981	F	183	1977	F
15	1984	M	184	1980	F
21	1933	F	185	1982	M
22	1938	M	191	1960	M
23	1964	F	192	1966	F
24	1969	M	193	1981	M
25	1969	M	201	1953	M
26	1980	M	202	1966	F
31	1963	F	203	1981	M
32	1964	M	204	1986	F
33	1983	F	211	1955	M
34	1984	F	212	1960	F
35	1986	M	213	1978	F
41	1960	M	214	1980	M
42	1962	F	215	1982	F
43	1979	F	216	1988	F
44	1984	M	221	1926	M
61	1954	M	222	1931	F
62	1952	F	225	1969	M
63	1972	F	226	1970	F
64	1977	M	227	1980	F
65	1980	F	371	1942	F
81	1953	M	372	1947	M
84	1988	F	373	1962	F
121	1908	F	374	1966	F
122	1964	F	375	1968	M
123	1970	F	376	1970	F
131	1935	F	377	1971	M
133	1988	F	378	1978	F
151	1950	M	379	1981	M
152	1982	M	431	1953	M
153	1987	F	432	1963	F
161	1954	M	433	1986	M
162	1962	F	441	1952	M
163	1978	F	442	1958	F
164	1983	F	443	1974	M
171	1962	M	444	1984	M
172	1962	F	451	1959	M
173	1981	M	452	1963	F
174	1984	F	453	1981	F

454	1986	F
462	1964	M
471	1911	M
472	1968	M
473	1972	F
481	1951	M
482	1955	F
483	1972	M
484	1974	F
485	1978	F
486	1980	F
491	1961	M
492	1961	F
493	1981	F
501	1942	M
502	1946	F
503	1963	M
505	1969	M
506	1972	M
507	1973	F
508	1978	F
511	1938	M
512	1939	F
513	1962	F
514	1964	F
521	1964	M
522	1967	F
523	1985	F
524	1987	M
531	1935	M
532	1935	F
534	1965	M
535	1968	M
536	1970	F
537	1982	F
541	1944	M
542	1944	F
543	1967	M
544	1968	F
545	1969	M
546	1975	F
547	1976	F
548	1979	M
549	1980	M
551	1948	M
552	1953	F
553	1973	M
554	1985	M
555	1988	M
561	1933	F
562	1942	M
563	1968	F
564	1971	M
565	1984	M
566	1987	F
571	1921	F
572	1968	M
573	1969	F
575	1988	M
581	1954	M
582	1957	F
583	1977	F
584	1979	M
585	1981	M
586	1984	F
611	1935	M
612	1937	F
613	1972	M
621	1937	M
622	1938	F
623	1961	F
624	1966	M
625	1968	M
626	1970	F
627	1972	M
628	1974	F
629	1975	F
671	1929	M
672	1936	F
673	1964	F
674	1964	F
675	1966	M
676	1968	M
677	1975	F
678	1982	M
679	1985	M
681	1945	F
682	1948	M
683	1970	F
684	1973	M
685	1976	F
686	1978	F
687	1981	F
688	1983	M
691	1915	F
692	1952	M
693	1956	F
694	1964	F
695	1970	M
696	1977	F
697	1978	M
741	1941	F
742	1948	M
743	1959	M
744	1967	F
745	1968	F
746	1969	M
747	1977	F

748	1987	M
761	1935	F
762	1940	M
763	1966	F
764	1970	F
765	1975	M
766	1978	M
767	1986	M
781	1958	M
782	1962	F
783	1979	F
784	1981	M
785	1984	M
791	1911	M
792	1950	M
793	1963	F
794	1965	F
795	1983	M
801	1950	F
802	1951	M
803	1971	F
804	1977	F
805	1980	M
806	1985	M
821	1961	M
822	1962	F
824	1981	M
825	1982	F
832	1950	F
833	1967	F
835	1970	F
836	1978	M
841	1953	F
842	1954	M
843	1975	F
844	1979	M
851	1919	F
852	1925	M
853	1959	F
854	1969	M
871	1931	F
872	1936	M
873	1974	F
874	1984	F
902	1954	F
903	1971	M
921	1933	M
922	1937	F
923	1960	M
924	1960	F
925	1967	M
926	1973	M
927	1977	M
928	1986	M
941	1937	M
942	1940	F
944	1976	M
961	1942	M
1031	1956	M
1032	1961	F
1033	1984	F
1081	1952	M
1082	1958	F
1083	1972	F
1084	1975	M
1085	1983	F
1101	1916	M
1102	1916	F
1103	1964	M
1104	1967	M
1105	1970	M
1106	1974	M
1107	1980	F
1111	1933	M
1112	1942	F
1113	1963	F
1114	1966	M
1115	1973	M
1116	1975	M
1117	1979	M
1118	1987	F
1121	1921	F
1122	1927	M
1123	1968	F
1124	1970	M
1125	1979	M
1131	1903	M
1132	1965	M
1141	1946	F
1142	1947	M
1143	1970	M
1144	1974	F
1145	1976	M
1146	1979	F
1201	1906	F
1202	1909	M
1203	1939	M
1204	1970	M
1211	1937	M
1212	1943	F
1213	1963	M
1214	1966	F
1215	1969	M
1216	1971	F
1217	1974	F
1218	1986	M
1219	1986	M
1331	1949	M

1332	1949	F
1333	1969	F
1334	1977	F
1335	1987	M
1341	1927	M
1342	1927	F
1343	1965	F
1344	1968	F
1345	1970	F
1411	1931	F
1412	1964	M
1415	1969	F
1416	1971	M
1417	1978	F
1421	1921	M
1422	1928	F
1423	1975	M
1424	1975	M
1431	1923	F
1432	1965	M
1433	1970	M
1434	1973	F
1435	1974	M
1441	1928	F
1442	1962	M
1443	1962	F
1444	1966	M
1447	1977	F
1448	1983	F
1449	1987	M
3710	1987	M
3811	1927	F
3812	1929	M
3813	1952	F
3814	1963	F
3815	1969	F
3816	1977	F
3817	1980	M
3818	1987	M
3821	1961	M
3822	1966	F
3823	1985	F
4100	1937	M
4200	1945	F
4320	1961	F
4500	1972	F
4600	1976	M
4700	1982	F
4711	1988	F
4800	1987	M
5010	1987	M
5100	1938	F
5200	1946	M
5300	1965	F
5400	1968	F
5410	1984	F
5500	1969	M
5600	1976	F
6210	1980	M
6211	1984	F
6311	1958	M
6312	1965	F
6313	1984	F
6314	1987	M
6321	1958	M
6322	1964	F
6323	1981	F
6324	1982	F
6325	1986	M
6611	1900	F
6612	1960	M
6621	1947	M
6622	1973	M
6710	1987	M
7512	1951	F
7513	1984	F
7711	1950	M
7712	1956	F
7713	1976	F
7714	1979	M
7715	1982	M
7716	1984	M
7721	1942	M
7722	1945	F
7723	1965	F
7724	1967	F
7725	1971	F
7726	1977	F
7727	1980	F
7728	1982	F
7729	1985	M
8100	1922	M
8200	1958	M
8300	1968	F
8400	1986	F
8500	1988	M
9100	1933	F
9111	1950	M
9112	1963	F
9113	1985	M
9121	1950	M
9122	1950	F
9123	1972	M
9124	1980	M
9125	1985	F
9200	1933	M
9300	1968	M
9311	1956	F

9312	1973	F
9313	1975	F
9314	1985	F
9321	1958	M
9322	1958	F
9323	1981	M
9324	1984	F
9325	1986	F
9400	1970	M
9600	1972	M
9700	1977	F
14410	1988	F
16411	1988	F
85471	1934	F
85474	1968	M
85475	1983	F
85615	1970	F
580001	1950	F
830002	1953	F
830003	1974	F
830004	1976	M
830005	1976	F
851413	1966	F
851431	1923	M
855061	1955	M
855062	1962	F
855063	1979	F
857511	1953	M
857512	1954	F
857513	1974	M
857514	1981	F
857515	1983	M
1110005	1967	M
3810006	1969	M

TABLE 29.2

Changing Household Residence by Individuals Across All Interview Periods

B. Household Residents by Interview Period

HOUSE	Date	ID1	ID2	ID3	ID4	ID5	ID6	ID7	ID8	ID9	ID10	ID11
004	July 87	4100	4200	4600	.	.	.	.	.	.	.	.
	Sept. 87	4100	4200	4600	4700	4800	.	.	.	.	.	.
	Nov. 87	4200	4600	4700	4800	.	.	.	.	.	.	.
	March 88	4200	4700	4800	.	.	.	.	.	.	.	.
	May 88	4100	4200	4500	4700	4800	.	.	.	.	.	.
	July 88	4100	4200	4500	4600	4700	4800	.	.	.	.	.
005	Sept. 85	5100	5200	5500	5600	.	.	.	.	.	.	.
	July 87	5100	5200	5300	5400	.	.	.	.	.	.	.
	Sept. 87	572	5100	5300	.	.	.	.	.	.	.	.
	Nov. 87	5100	5500	.	.	.	.	.	.	.	.	.
	Jan. 88	5100	5200	5300	5600	.	.	.	.	.	.	.
	May 88	5100	5600	.	.	.	.	.	.	.	.	.
	July 88	5100	5200	5400	.	.	.	.	.	.	.	.
008	Sept. 85	8300	.	.	.	.	.	.	.	.	.	.
	July 87	8200	8300	.	.	.	.	.	.	.	.	.
	Sept. 87	8100	.	.	.	.	.	.	.	.	.	.
	Nov. 87	8100	8300	8400	.	.	.	.	.	.	.	.
	Jan. 88	8100	8200	8300	8400	.	.	.	.	.	.	.
	March 88	8100	8200	8300	8400	8500	.	.	.	.	.	.
	May 88	8200	.	.	.	.	.	.	.	.	.	.
	July 88	8100	8300	8400	8500	.	.	.	.	.	.	.
009	July 87	9100	9200	9600	9700	.	.	.	.	.	.	.
	Sept. 87	1214	9100	9200	9700	.	.	.	.	.	.	.
	Nov. 87	9100	9400	9600	.	.	.	.	.	.	.	.
	Jan. 88	9100	9200	9600	.	.	.	.	.	.	.	.

	March 88	9100	.	.	.	.	.	.	.	.	.	.
	May 88	9300	.	.	.	.	.	.	.	.	.	.
	July 88	9100	9200	9300	9400	9600	9700	.	.	.	.	.
012	Sept. 85	1081	1082	1084	1085	.	.	.	.	.	.	.
	July 87	123	.	.	.	.	.	.	.	.	.	.
	Sept. 87	122	123	1342	.	.	.	.	.	.	.	.
	Nov. 87	121	122	.	.	.	.	.	.	.	.	.
	Jan. 88	121	123	.	.	.	.	.	.	.	.	.
	March 88	121	804	.	.	.	.	.	.	.	.	.
016	Sept. 85	161	162	163	164	.	.	.	.	.	.	.
	July 87	161	162	163	164	.	.	.	.	.	.	.
	Sept. 87	571	.	.	.	.	.	.	.	.	.	.
017	Sept. 85	171	173	174	.	.	.	.	.	.	.	.
	July 87	171	172	173	174	.	.	.	.	.	.	.
	Sept. 87	171	172	173	174	175	.	.	.	.	.	.
	Nov. 87	172	173	174	175	7715	.	.	.	.	.	.
	Jan. 88	171	172	173	174	175	.	.	.	.	.	.
	March 88	171	172	173	174	175	.	.	.	.	.	.
	July 88	172	173	174	175	.	.	.	.	.	.	.
018	Sept. 85	181	182	183	184	185	.	.	.	.	.	.
	July 87	181	182	183	184	185	.	.	.	.	.	.
	Sept. 87	182	183	184	185	.	.	.	.	.	.	.
	Nov. 87	181	182	183	184	185	.	.	.	.	.	.
	Jan. 88	181	182	183	184	185	.	.	.	.	.	.
	March 88	181	182	183	184	185	.	.	.	.	.	.
	May 88	181	182	183	184	185	.	.	.	.	.	.
	July 88	183	.	.	.	.	.	.	.	.	.	.
019	Sept. 85	192	193	.	.	.	.	.	.	.	.	.
	July 87	192	.	.	.	.	.	.	.	.	.	.
	Sept. 87	192	.	.	.	.	.	.	.	.	.	.
	Nov. 87	191	192	.	.	.	.	.	.	.	.	.
	May 88	192	193	.	.	.	.	.	.	.	.	.
	July 88	192	.	.	.	.	.	.	.	.	.	.

020	Sept. 85	201	202	203	.	.	.	.	.	.	.	.	
	July 87	201	202	203	204	.	.	.	.	.	.	.	
	Sept. 87	202	203	204	.	.	.	.	.	.	.	.	
	Nov. 87	202	203	204	.	.	.	.	.	.	.	.	
	Jan. 88	201	202	203	204	.	.	.	.	.	.	.	
	May 88	202	203	.	.	.	.	.	.	.	.	.	
	July 88	201	202	203	204	.	.	.	.	.	.	.	
021	Sept. 85	151	152	4320	.	.	.	.	.	.	.	.	
	July 87	211	.	.	.	.	.	.	.	.	.	.	
	Sept. 87	212	.	.	.	.	.	.	.	.	.	.	
	Nov. 87	211	212	213	214	215	.	.	.	.	.	.	
	Jan. 88	212	.	.	.	.	.	.	.	.	.	.	
	March 88	212	.	.	.	.	.	.	.	.	.	.	
	May 88	212	213	214	215	216	.	.	.	.	.	.	
	July 88	212	213	214	215	.	.	.	.	.	.	.	
022	Sept. 85	221	222	225	226	227	.	.	.	.	.	.	
	July 87	221	222	226	227	.	.	.	.	.	.	.	
	Nov. 87	222	226	227	.	.	.	.	.	.	.	.	
	Jan. 88	222	226	227	.	.	.	.	.	.	.	.	
	March 88	222	226	227	.	.	.	.	.	.	.	.	
	May 88	222	226	.	.	.	.	.	.	.	.	.	
	July 88	222	225	227	.	.	.	.	.	.	.	.	
034	Sept. 85	1331	1332	1334	.	.	.	.	.	.	.	.	
037	Sept. 85	371	372	373	374	376	377	378	379	.	.	.	
	July 87	371	378	379	.	.	.	.	.	.	.	.	
	Sept. 87	371	372	373	376	378	379	.	.	.	.	.	
	Nov. 87	371	372	373	375	376	378	379	3710	.	.	.	
	Jan. 88	372	374	376	.	.	.	.	.	.	.	.	
	March 88	371	372	373	376	378	379	3710	.	.	.	.	
	May 88	371	373	376	378	379	3710	.	.	.	.	.	
	July 88	371	373	378	379	3710	.	.	.	.	.	.	
041	Sept. 85	1131	.	.	.	.	.	.	.	.	.	.	
043	Sept. 85	791	792	793	794	795	.	.	.	.	.	.	

	July 87	431	432	433	.	.	.	.	.	.	.	.	.
	Sept. 87	431	432	433	.	.	.	.	.	.	.	.	.
	Jan. 88	431	432	433	.	.	.	.	.	.	.	.	.
	March 88	431	432	433	.	.	.	.	.	.	.	.	.
	May 88	431	.	.	.	.	.	.	.	.	.	.	.
	July 88	431	.	.	.	.	.	.	.	.	.	.	.
044	July 87	442	444	.	.	.	.	.	.	.	.	.	.
	Sept. 87	441	442	443	444	.	.	.	.	.	.	.	.
	Nov. 87	441	442	443	444	.	.	.	.	.	.	.	.
	Jan. 88	441	.	.	.	.	.	.	.	.	.	.	.
	March 88	441	442	443	444	.	.	.	.	.	.	.	.
	May 88	441	442	443	444	.	.	.	.	.	.	.	.
	July 88	441	442	443	444	.	.	.	.	.	.	.	.
045	Sept. 85	451	452	453	.	.	.	.	.	.	.	.	.
	July 87	452	.	.	.	.	.	.	.	.	.	.	.
	Sept. 87	451	452	453	454	.	.	.	.	.	.	.	.
	Nov. 87	452	454	.	.	.	.	.	.	.	.	.	.
	Jan. 88	451	452	453	454	.	.	.	.	.	.	.	.
	March 88	451	452	453	454	.	.	.	.	.	.	.	.
046	Sept. 85	462	.	.	.	.	.	.	.	.	.	.	.
047	Sept. 85	85471	85474	85475	.	.	.	.	.	.	.	.	.
	July 87	471	.	.	.	.	.	.	.	.	.	.	.
	Sept. 87	9121	9122	9124	9125	.	.	.	.	.	.	.	.
	Nov. 87	9121	9122	9124	9125	.	.	.	.	.	.	.	.
	Jan. 88	501	502	506	507	508	5010	.	.	.	.	.	.
	March 88	501	502	505	507	508	5010	.	.	.	.	.	.
	May 88	472	502	506	508	4711	5010	.	.	.	.	.	.
	July 88	502	508	4711	5010	.	.	.	.	.	.	.	.
048	Sept. 85	481	482	483	484	485	486	.	.	.	.	.	.
	July 87	481	482	483	484	485	486	.	.	.	.	.	.
	Sept. 87	481	482	484	486	8300	8400	.	.	.	.	.	.
	Nov. 87	482	483	484	485	486	.	.	.	.	.	.	.
	Jan. 88	481	482	483	484	485	486	.	.	.	.	.	.
	March 88	481	482	483	484	485	486	.	.	.	.	.	.

	May 88	482	485	486	.	.	.	.	.	.	.	.	.
	July 88	482	483	485	486	.	.	.	.	.	.	.	.
049	Sept. 85	492	493	.	.	.	.	.	.	.	.	.	.
	July 87	492	.	.	.	.	.	.	.	.	.	.	.
	Sept. 87	492	493	.	.	.	.	.	.	.	.	.	.
	Jan. 88	492	.	.	.	.	.	.	.	.	.	.	.
	March 88	492	.	.	.	.	.	.	.	.	.	.	.
	May 88	491	492	.	.	.	.	.	.	.	.	.	.
	July 88	491	492	.	.	.	.	.	.	.	.	.	.
050	Sept. 85	501	502	506	508	.	.	.	.	.	.	.	.
	July 87	502	507	508	.	.	.	.	.	.	.	.	.
	Sept. 87	472	501	502	506	507	508	5010	.	.	.	.	.
	Nov. 87	472	501	502	503	507	508	5010	.	.	.	.	.
	Jan. 88	9121	9122	9124	9125	.	.	.	.	.	.	.	.
	March 88	9121	9122	9124	9125	.	.	.	.	.	.	.	.
	May 88	9121	9122	9124	9125	.	.	.	.	.	.	.	.
	July 88	9121	9122	9124	9125	.	.	.	.	.	.	.	.
051	Sept. 85	511	512	.	.	.	.	.	.	.	.	.	.
	July 87	511	512	.	.	.	.	.	.	.	.	.	.
	Sept. 87	511	512	.	.	.	.	.	.	.	.	.	.
	Nov. 87	511	512	514	.	.	.	.	.	.	.	.	.
	Jan. 88	511	512	513	.	.	.	.	.	.	.	.	.
	March 88	511	512	.	.	.	.	.	.	.	.	.	.
	May 88	511	512	513	.	.	.	.	.	.	.	.	.
	July 88	512	513	.	.	.	.	.	.	.	.	.	.
052	July 87	522	523	.	.	.	.	.	.	.	.	.	.
	Sept. 87	522	523	.	.	.	.	.	.	.	.	.	.
	Nov. 87	521	522	523	.	.	.	.	.	.	.	.	.
	Jan. 88	522	523	.	.	.	.	.	.	.	.	.	.
	March 88	521	522	523	524	.	.	.	.	.	.	.	.
	May 88	521	522	523	524	.	.	.	.	.	.	.	.
	July 88	522	523	524	.	.	.	.	.	.	.	.	.
053	Sept. 85	531	532	536	537	.	.	.	.	.	.	.	.
	July 87	531	532	535	536	537	.	.	.	.	.	.	.

	Sept. 87	532	535	536	537	.	.	.	.	.	.	.	
	Nov. 87	531	532	535	536	537	.	.	.	.	.	.	
	Jan. 88	531	532	536	537	.	.	.	.	.	.	.	
	March 88	532	535	537	.	.	.	.	.	.	.	.	
	May 88	532	536	537	.	.	.	.	.	.	.	.	
	July 88	532	535	536	537	.	.	.	.	.	.	.	
054	Sept. 85	821	822	825	9700	.	.	.	.	.	.	.	
	July 87	541	542	544	545	546	547	548	549	5410	.	.	
	Sept. 87	541	542	548	549	5410	.	.	.	.	.	.	
	Nov. 87	541	542	544	546	547	548	549	5410	.	.	.	
	Jan. 88	541	542	544	546	547	548	549	5410	.	.	.	
	March 88	541	542	544	546	547	548	549	5410	.	.	.	
	May 88	541	542	544	546	547	548	549	5410	.	.	.	
	July 88	541	542	544	546	547	548	549	5410	.	.	.	
055	Sept. 85	801	802	803	804	805	.	.	.	.	.	.	
	Sept. 87	551	552	553	554	.	.	.	.	.	.	.	
	Nov. 87	551	.	.	.	.	.	.	.	.	.	.	
	March 88	552	553	554	.	.	.	.	.	.	.	.	
	July 88	551	552	553	554	555	.	.	.	.	.	.	
056	Sept. 85	671	672	673	674	676	677	678	679	.	.	.	
	July 87	561	565	.	.	.	.	.	.	.	.	.	
	Sept. 87	561	562	563	564	565	566	.	.	.	.	.	
	Nov. 87	561	562	563	565	566	.	.	.	.	.	.	
057	Sept. 85	571	572	573	.	.	.	.	.	.	.	.	
	July 87	571	572	.	.	.	.	.	.	.	.	.	
	Nov. 87	571	573	.	.	.	.	.	.	.	.	.	
	Jan. 88	571	572	580001	.	.	.	.	.	.	.	.	
	March 88	571	572	573	580001	.	.	.	.	.	.	.	
	May 88	571	.	.	.	.	.	.	.	.	.	.	
	July 88	573	575	.	.	.	.	.	.	.	.	.	
058	Sept. 85	681	683	685	686	687	688	.	.	.	.	.	
	Sept. 87	581	.	.	.	.	.	.	.	.	.	.	
	Jan. 88	581	.	.	.	.	.	.	.	.	.	.	
	July 88	801	802	804	805	806	.	.	.	.	.	.	

061	Sept. 85	611	612	613	6311	6312	6313	85615	.	.	.	.
	July 87	611	612	613	.	.	.	.	.	.	.	.
	Sept. 87	612	.	.	.	.	.	.	.	.	.	.
	Nov. 87	612	613	6313	.	.	.	.	.	.	.	.
	Jan. 88	611	612	6313	.	.	.	.	.	.	.	.
	May 88	6313	6314	.	.	.	.	.	.	.	.	.
062	Sept. 85	621	622	623	624	625	626	627	628	629	6210	6211
	July 87	622	623	625	626	627	628	629	6210	6211	.	.
	Sept. 87	621	622	623	627	628	629	6210	6211	.	.	.
	Nov. 87	621	622	623	625	626	627	628	629	6210	6211	.
063	Sept. 85	212	214	215	.	.	.	.	.	.	.	.
067	Sept. 85	561	562	563	564	565	.	.	.	.	.	.
	July 87	672	673	674	677	679	.	.	.	.	.	.
	Sept. 87	671	676	.	.	.	.	.	.	.	.	.
	Nov. 87	671	673	678	679	.	.	.	.	.	.	.
	Jan. 88	671	672	673	674	675	677	678	679	6710	.	.
	March 88	673	.	.	.	.	.	.	.	.	.	.
	July 88	671	672	673	678	679	.	.	.	.	.	.
068	July 87	681	682	683	685	686	687	688	.	.	.	.
	Sept. 87	681	682	683	684	685	686	688	.	.	.	.
	Nov. 87	683	.	.	.	.	.	.	.	.	.	.
	Jan. 88	682	683	685	.	.	.	.	.	.	.	.
	March 88	683	684	685	686	687	688	.	.	.	.	.
	May 88	683	.	.	.	.	.	.	.	.	.	.
	July 88	681	683	685	686	688	.	.	.	.	.	.
069	Sept. 85	691	693	694	697	.	.	.	.	.	.	.
	July 87	691	696	.	.	.	.	.	.	.	.	.
	Sept. 87	691	693	696	697	.	.	.	.	.	.	.
	Nov. 87	691	693	695	696	697	.	.	.	.	.	.
	Jan. 88	691	692	693	697	.	.	.	.	.	.	.
	March 88	692	.	.	.	.	.	.	.	.	.	.
	May 88	691	693	696	697	.	.	.	.	.	.	.
	July 88	691	693	697	.	.	.	.	.	.	.	.

074	Sept. 85	741	742	746	747	.	.	.	.	.	.	.
	July 87	741	742	743	744	747	.	.	.	.	.	.
	Sept. 87	741	743	744	747	.	.	.	.	.	.	.
	Nov. 87	741	742	743	744	745	747	.	.	.	.	.
	Jan. 88	741	743	745	747	748	.	.	.	.	.	.
	March 88	741	742	743	744	745	747	748	.	.	.	.
	May 88	741	743	745	747	748	.	.	.	.	.	.
	July 88	741	743	747	748	.	.	.	.	.	.	.
076	Sept. 85	761	762	763	764	765	766	.	.	.	.	.
	July 87	761	762	763	764	766	767	.	.	.	.	.
	Sept. 87	761	762	763	764	765	766	767	.	.	.	.
	Jan. 88	761	762	763	764	765	766	767	.	.	.	.
	March 88	761	762	763	764	765	766	767	.	.	.	.
	May 88	761	762	763	764	765	766	767	.	.	.	.
	July 88	761	762	763	764	765	766	767	.	.	.	.
078	Sept. 85	782	783	784	785	6322	6323	6324	.	.	.	.
	Sept. 87	782	783	784	785	.	.	.	.	.	.	.
	Nov. 87	781	782	783	784	785	.	.	.	.	.	.
	Jan. 88	781	782	783	784	785	.	.	.	.	.	.
	March 88	781	782	783	784	785	.	.	.	.	.	.
	July 88	781	782	783	784	785	.	.	.	.	.	.
079	Sept. 85	471	472	473	.	.	.	.	.	.	.	.
	July 87	793	795	.	.	.	.	.	.	.	.	.
	Nov. 87	792	794	.	.	.	.	.	.	.	.	.
	Jan. 88	793	795	.	.	.	.	.	.	.	.	.
	March 88	792	793	795	.	.	.	.	.	.	.	.
	July 88	793	795	.	.	.	.	.	.	.	.	.
080	Sept. 85	551	552	553	554	.	.	.	.	.	.	.
	July 87	801	802	803	804	805	806	.	.	.	.	.
	Sept. 87	801	802	803	804	805	806	.	.	.	.	.
	Nov. 87	801	802	803	805	806	.	.	.	.	.	.
	Jan. 88	801	802	804	805	806	.	.	.	.	.	.
	March 88	801	803	805	806	.	.	.	.	.	.	.
	May 88	801	805	806	.	.	.	.	.	.	.	.

081	Sept. 85	581	582	583	584	585	586	.	.	.	.	.	
	March 88	581	.	.	.	.	.	.	.	.	.	.	
	May 88	582	584	585	.	.	.	.	.	.	.	.	
	July 88	583	.	.	.	.	.	.	.	.	.	.	
082	Sept. 85	541	542	543	544	547	548	549	5410	.	.	.	
	July 87	821	822	824	.	.	.	.	.	.	.	.	
	Sept. 87	821	822	824	825	.	.	.	.	.	.	.	
	Jan. 88	821	822	824	825	.	.	.	.	.	.	.	
	March 88	821	822	824	825	.	.	.	.	.	.	.	
	May 88	821	822	824	825	.	.	.	.	.	.	.	
	July 88	821	822	824	825	.	.	.	.	.	.	.	
083	Sept. 85	832	833	835	836	6622	.	.	.	.	.	.	
	July 87	832	833	836	.	.	.	.	.	.	.	.	
	Sept. 87	832	833	.	.	.	.	.	.	.	.	.	
	Jan. 88	830002	830003	830004	830005	.	.	.	.	.	.	.	
	May 88	830002	830003	830004	830005	.	.	.	.	.	.	.	
	July 88	830002	830003	830005	.	.	.	.	.	.	.	.	
084	Sept. 85	1111	1112	1113	.	.	.	.	.	.	.	.	
	July 87	841	843	844	.	.	.	.	.	.	.	.	
	Sept. 87	841	.	.	.	.	.	.	.	.	.	.	
	Nov. 87	841	843	844	.	.	.	.	.	.	.	.	
	Jan. 88	841	843	844	.	.	.	.	.	.	.	.	
	March 88	841	.	.	.	.	.	.	.	.	.	.	
	May 88	841	.	.	.	.	.	.	.	.	.	.	
	July 88	841	.	.	.	.	.	.	.	.	.	.	
085	Sept. 85	851	852	853	854	.	.	.	.	.	.	.	
	July 87	851	.	.	.	.	.	.	.	.	.	.	
	Sept. 87	851	852	.	.	.	.	.	.	.	.	.	
	Nov. 87	851	852	.	.	.	.	.	.	.	.	.	
	Jan. 88	851	852	.	.	.	.	.	.	.	.	.	
	March 88	851	852	854	.	.	.	.	.	.	.	.	
	May 88	851	.	.	.	.	.	.	.	.	.	.	
	July 88	851	852	.	.	.	.	.	.	.	.	.	

087	July	88	871	872	873	874	.	.	.	.	.	.	.
090	July	87	902	903	.	.	.	.	.	.	.	.	.
092	Sept.	85	921	922	925	926	927	.	.	.	.	.	.
	Sept.	87	922	926	927	.	.	.	.	.	.	.	.
	Nov.	87	921	922	925	926	927	.	.	.	.	.	.
	Jan.	88	921	922	925	.	.	.	.	.	.	.	.
	July	88	921	922	927	.	.	.	.	.	.	.	.
094	Sept.	85	841	842	843	844	.	.	.	.	.	.	.
	July	87	942	944	.	.	.	.	.	.	.	.	.
	Sept.	87	941	942	944	.	.	.	.	.	.	.	.
	Nov.	87	941	942	944	.	.	.	.	.	.	.	.
	Jan.	88	941	942	944	.	.	.	.	.	.	.	.
	March	88	941	942	944	.	.	.	.	.	.	.	.
	May	88	941	942	.	.	.	.	.	.	.	.	.
	July	88	941	942	944	.	.	.	.	.	.	.	.
096	July	87	961	.	.	.	.	.	.	.	.	.	.
	Sept.	87	961	.	.	.	.	.	.	.	.	.	.
	Jan.	88	961	.	.	.	.	.	.	.	.	.	.
	March	88	961	.	.	.	.	.	.	.	.	.	.
	May	88	961	.	.	.	.	.	.	.	.	.	.
1	July	87	11	12	13	14	15	.	.	.	.	.	.
10	Nov.	87	7711	7712	7713	7714	7716	.	.	.	.	.	.
	Jan.	88	7712	.	.	.	.	.	.	.	.	.	.
	March	88	7712	7714	7715	7716	.	.	.	.	.	.	.
	May	88	7711	7712	7713	7714	7715	7716	.	.	.	.	.
	July	88	7712	.	.	.	.	.	.	.	.	.	.
103	Sept.	85	1031	1032	1033	.	.	.	.	.	.	.	.
	July	87	1031	1032	1033	.	.	.	.	.	.	.	.
	Nov.	87	1031	1032	1033	.	.	.	.	.	.	.	.
	March	88	1032	1033	.	.	.	.	.	.	.	.	.
	July	88	1031	1032	1033	.	.	.	.	.	.	.	.

108	Sept. 85	121	123	.	.	.	.	.	.	.	.	.	.
	July 87	1081	1082	1085	.	.	.	.	.	.	.	.	.
	Sept. 87	1081	1082	1085	.	.	.	.	.	.	.	.	.
	Nov. 87	1081	1082	1083	1084	1085	.	.	.	.	.	.	.
	Jan. 88	1081	1082	1083	1084	1085	.	.	.	.	.	.	.
	March 88	1082	1083	1084	1085	.	.	.	.	.	.	.	.
	May 88	1081	1082	1084	1085	.	.	.	.	.	.	.	.
	July 88	1081	1082	1083	1085	.	.	.	.	.	.	.	.
11	Nov. 87	853	.	.	.	.	.	.	.	.	.	.	.
	Jan. 88	853	.	.	.	.	.	.	.	.	.	.	.
	March 88	853	.	.	.	.	.	.	.	.	.	.	.
	July 88	853	.	.	.	.	.	.	.	.	.	.	.
110	Sept. 85	1101	1102	1103	1104	1105	1106	1107	.	.	.	.	.
	July 87	1101	1102	1106	1107	.	.	.	.	.	.	.	.
	Sept. 87	1102	.	.	.	.	.	.	.	.	.	.	.
	Nov. 87	1102	1105	1107	.	.	.	.	.	.	.	.	.
	Jan. 88	1102	1105	1106	1107	.	.	.	.	.	.	.	.
	March 88	674	1105	1106	1107	6710	.	.	.	.	.	.	.
	May 88	674	675	1102	1104	1107	6710	.	.	.	.	.	.
	July 88	1106	.	.	.	.	.	.	.	.	.	.	.
111	Sept. 85	941	942	944	.	.	.	.	.	.	.	.	.
	July 87	1112	1114	1115	1116	1117	.	.	.	.	.	.	.
	Sept. 87	1111	1112	1113	1115	1116	1117	1118	1110005	.	.	.	.
	Nov. 87	1111	1112	1113	1114	1115	1116	1117	1118	1110005	.	.	.
	Jan. 88	1112	1113	1117	1110005	.	.	.	.	.	.	.	.
	March 88	1112	1113	1115	1116	1117	1118	.	.	.	.	.	.
	May 88	1111	1112	1115	1116	1117	1118	.	.	.	.	.	.
	July 88	1111	1112	1115	1116	1117	1118	.	.	.	.	.	.
112	Sept. 85	1121	1122	1123	1124	1125	.	.	.	.	.	.	.
	July 87	1121	1122	1123	.	.	.	.	.	.	.	.	.
	Sept. 87	1121	1122	1123	1125	.	.	.	.	.	.	.	.
	Nov. 87	1121	1122	1123	1125	.	.	.	.	.	.	.	.
	Jan. 88	1121	1122	1123	1125	.	.	.	.	.	.	.	.
	March 88	1121	1123	1125	.	.	.	.	.	.	.	.	.
	May 88	1121	1122	1123	1125	.	.	.	.	.	.	.	.

	July	88	1121	1122	1123	1124	1125	.	.	.	.	.	.	.	.
113	July	87	1131	.	.	.	.	.	.	.	.	.	.	.	.
	Sept.	87	1131	1132	.	.	.	.	.	.	.	.	.	.	.
	Nov.	87	1131	1132	.	.	.	.	.	.	.	.	.	.	.
	Jan.	88	1131	1132	.	.	.	.	.	.	.	.	.	.	.
	March	88	1131	1132	.	.	.	.	.	.	.	.	.	.	.
	May	88	1131	1132	.	.	.	.	.	.	.	.	.	.	.
	July	88	1131	.	.	.	.	.	.	.	.	.	.	.	.
114	Sept.	85	1141	1142	1143	1144	1145	1146	.	.	.	.	.	.	.
	July	87	1141	1142	1144	1145	1146	.	.	.	.	.	.	.	.
	Sept.	87	1141	1142	1144	1145	1146	.	.	.	.	.	.	.	.
	Nov.	87	1141	1142	1144	1145	1146	.	.	.	.	.	.	.	.
	Jan.	88	1141	1142	1144	1145	1146	.	.	.	.	.	.	.	.
	May	88	1141	1146	.	.	.	.	.	.	.	.	.	.	.
	July	88	1141	1144	1145	1146	.	.	.	.	.	.	.	.	.
120	Sept.	85	1202	1204	.	.	.	.	.	.	.	.	.	.	.
	July	87	1203	.	.	.	.	.	.	.	.	.	.	.	.
	Sept.	87	1201	1202	1203	1204	.	.	.	.	.	.	.	.	.
	Nov.	87	1201	1202	1203	1204	.	.	.	.	.	.	.	.	.
	Jan.	88	1202	1203	.	.	.	.	.	.	.	.	.	.	.
	March	88	1201	1202	1203	1204	1110005	.	.	.	.	.	.	.	.
	July	88	1202	.	.	.	.	.	.	.	.	.	.	.	.
121	Sept.	85	1211	1212	1213	1215	1216	1217	.	.	.	.	.	.	.
	July	87	1211	1214	1219	.	.	.	.	.	.	.	.	.	.
	Sept.	87	1211	.	.	.	.	.	.	.	.	.	.	.	.
	Nov.	87	1211	1212	1217	1218	.	.	.	.	.	.	.	.	.
	Jan.	88	1212	1218	.	.	.	.	.	.	.	.	.	.	.
	March	88	1211	1212	1218	.	.	.	.	.	.	.	.	.	.
	May	88	1211	1212	1218	.	.	.	.	.	.	.	.	.	.
	July	88	1211	1212	1218	.	.	.	.	.	.	.	.	.	.
124	Sept.	85	1421	1422	1424	.	.	.	.	.	.	.	.	.	.
13	July	88	131	133	.	.	.	.	.	.	.	.	.	.	.

133	July 87	1331	1332	1334	.	.	.	.	.	.	.	.	.
	Jan. 88	1332	1333	1334	1335	.	.	.	.	.	.	.	.
	March 88	1331	1332	1333	1334	.	.	.	.	.	.	.	.
	May 88	1333	.	.	.	.	.	.	.	.	.	.	.
	July 88	1333	.	.	.	.	.	.	.	.	.	.	.
134	Sept. 85	1343	.	.	.	.	.	.	.	.	.	.	.
	July 87	1341	1342	.	.	.	.	.	.	.	.	.	.
	Sept. 87	1341	1344	1345	.	.	.	.	.	.	.	.	.
	Nov. 87	1341	1342	.	.	.	.	.	.	.	.	.	.
	Jan. 88	1341	1342	.	.	.	.	.	.	.	.	.	.
	March 88	1341	1342	.	.	.	.	.	.	.	.	.	.
	May 88	1342	.	.	.	.	.	.	.	.	.	.	.
	July 88	1341	1342	1344	.	.	.	.	.	.	.	.	.
141	Sept. 85	1411	1412	1415	1417	851413	.	.	.	.	.	.	.
	July 87	1411	1412	1415	1417	.	.	.	.	.	.	.	.
	Sept. 87	1411	1412	.	.	.	.	.	.	.	.	.	.
	Nov. 87	1411	1415	1417	.	.	.	.	.	.	.	.	.
	Jan. 88	1411	1415	1417	.	.	.	.	.	.	.	.	.
	March 88	1411	1412	1415	1416	1417	.	.	.	.	.	.	.
	May 88	1411	.	.	.	.	.	.	.	.	.	.	.
	July 88	1411	.	.	.	.	.	.	.	.	.	.	.
142	July 87	1421	1422	1423	.	.	.	.	.	.	.	.	.
	Sept. 87	1421	1423	1424	.	.	.	.	.	.	.	.	.
	Nov. 87	1421	1423	.	.	.	.	.	.	.	.	.	.
	Jan. 88	1421	.	.	.	.	.	.	.	.	.	.	.
	March 88	1421	.	.	.	.	.	.	.	.	.	.	.
	May 88	1421	1422	1424	.	.	.	.	.	.	.	.	.
	July 88	1422	1424	.	.	.	.	.	.	.	.	.	.
143	Sept. 85	1431	1432	1433	1434	1435	851431	.	.	.	.	.	.
	July 87	1431	1432	1433	1435	.	.	.	.	.	.	.	.
	Sept. 87	152	1431	1434	1435	4320	.	.	.	.	.	.	.
	Nov. 87	152	153	1431	1432	1433	1434	1435	4320	.	.	.	.
	Jan. 88	152	1431	1433	4320	.	.	.	.	.	.	.	.
	March 88	152	153	1431	1432	1433	1434	1435	4320	.	.	.	.
	May 88	152	153	1431	4320	.	.	.	.	.	.	.	.

	July 88	152	153	1431	1433	1435	4320	.	.	.	.	.	
144	Sept. 85	1441	1443	.	.	.	.	.	.	.	.	.	
	July 87	1441	1443	1448	.	.	.	.	.	.	.	.	
	Sept. 87	1441	1443	1447	1448	1449	.	.	.	.	.	.	
	Nov. 87	1441	1443	1444	1447	1448	1449	.	.	.	.	.	
	Jan. 88	1441	1443	1447	1448	1449	.	.	.	.	.	.	
	March 88	1441	1442	1443	1447	1448	1449	.	.	.	.	.	
	May 88	1443	1447	1448	.	.	.	.	.	.	.	.	
	July 88	1441	1443	1444	1447	1448	1449	14410	.	.	.	.	
150	Sept. 85	21	22	23	26	.	.	.	.	.	.	.	
164	Jan. 88	621	622	623	627	629	6210	6211	.	.	.	.	
	March 88	621	623	626	628	6210	6211	.	.	.	.	.	
	May 88	622	623	626	629	6210	6211	16411	.	.	.	.	
	July 88	621	622	626	627	628	.	.	.	.	.	.	
165	Nov. 87	7721	7722	7723	7724	7725	7726	7727	7728	7729	.	.	
	Jan. 88	7722	7724	7726	7727	7728	7729	.	.	.	.	.	
	March 88	7722	7724	7726	7727	7728	7729	.	.	.	.	.	
	May 88	7722	7723	7724	7726	7727	7728	7729	.	.	.	.	
	July 88	7722	7724	7727	7728	7729	.	.	.	.	.	.	
2	July 87	21	22	23	26	.	.	.	.	.	.	.	
	Sept. 87	21	22	23	25	26	.	.	.	.	.	.	
	Nov. 87	21	22	23	25	26	.	.	.	.	.	.	
	Jan. 88	21	22	23	25	26	.	.	.	.	.	.	
	March 88	21	22	23	25	26	.	.	.	.	.	.	
	May 88	21	22	23	25	26	.	.	.	.	.	.	
	July 88	21	22	23	25	26	.	.	.	.	.	.	
3	July 87	31	32	33	34	.	.	.	.	.	.	.	
	Sept. 87	31	32	33	34	35	.	.	.	.	.	.	
	Nov. 87	31	32	33	34	35	.	.	.	.	.	.	
	Jan. 88	31	32	33	34	35	.	.	.	.	.	.	
	March 88	31	32	33	34	35	.	.	.	.	.	.	
381	July 87	3811	3813	3814	3816	3817	.	.	.	.	.	.	

	Sept. 87	3811	3813	3814	3815	3816	3817	3818	.	.	.	.	
	Nov. 87	3811	3812	3813	3814	3815	3816	3817	3818	.	.	.	
	Jan. 88	3811	3812	3813	3814	3815	3816	3817	3810006	.	.	.	
	March 88	3811	3812	3813	3814	3816	3817	3818	.	.	.	.	
	May 88	3811	3815	3810006	.	.	.	.	.	.	.	.	
	July 88	3811	3815	3810006	.	.	.	.	.	.	.	.	
382	July 87	3821	3822	3823	.	.	.	.	.	.	.	.	
	Sept. 87	3821	3822	3823	.	.	.	.	.	.	.	.	
	Nov. 87	923	924	928	.	.	.	.	.	.	.	.	
	Jan. 88	924	928	.	.	.	.	.	.	.	.	.	
4	July 87	41	42	43	44	.	.	.	.	.	.	.	
	Sept. 87	42	43	44	.	.	.	.	.	.	.	.	
	Nov. 87	41	42	43	44	.	.	.	.	.	.	.	
	Jan. 88	24	41	42	43	44	.	.	.	.	.	.	
	March 88	41	42	43	44	.	.	.	.	.	.	.	
	May 88	42	43	44	.	.	.	.	.	.	.	.	
	July 88	41	42	43	44	.	.	.	.	.	.	.	
501	Sept. 85	11	12	13	14	15	.	.	.	.	.	.	
503	Sept. 85	3821	3822	3823	.	.	.	.	.	.	.	.	
506	Sept. 85	855061	855062	855063	.	.	.	.	.	.	.	.	
509	Sept. 85	41	42	43	44	.	.	.	.	.	.	.	
511	Sept. 85	62	63	64	65	.	.	.	.	.	.	.	
515	Sept. 85	9112	.	.	.	.	.	.	.	.	.	.	
518	Sept. 85	81	.	.	.	.	.	.	.	.	.	.	
6	July 87	61	62	64	65	.	.	.	.	.	.	.	
	Nov. 87	62	63	64	65	.	.	.	.	.	.	.	
	Jan. 88	61	62	63	65	.	.	.	.	.	.	.	
	March 88	61	62	63	64	65	.	.	.	.	.	.	
	May 88	61	62	63	64	65	.	.	.	.	.	.	

	July 88	61	62	63	64	65	.	.	.	.	.	.
631	July 87	6311	6312	6313	.	.	.	.	.	.	.	.
	Sept. 87	6311	6312	6313	6314	.	.	.	.	.	.	.
	Jan. 88	6311	6312	6314	.	.	.	.	.	.	.	.
	March 88	6311	6312	6313	6314	.	.	.	.	.	.	.
	July 88	6311	6312	6313	6314	.	.	.	.	.	.	.
632	Sept. 85	6321	.	.	.	.	.	.	.	.	.	.
	July 87	6321	6323	6324	6325	.	.	.	.	.	.	.
	Sept. 87	6321	6323	6324	.	.	.	.	.	.	.	.
	Nov. 87	6321	.	.	.	.	.	.	.	.	.	.
	Jan. 88	6322	6323	6324	6325	.	.	.	.	.	.	.
	March 88	6322	6323	6324	6325	.	.	.	.	.	.	.
	May 88	6322	6323	6324	6325	.	.	.	.	.	.	.
	July 88	6321	6322	6323	6324	6325	.	.	.	.	.	.
661	Sept. 85	6611	6612	.	.	.	.	.	.	.	.	.
	July 87	6612	.	.	.	.	.	.	.	.	.	.
	Sept. 87	6611	6612	.	.	.	.	.	.	.	.	.
	Nov. 87	6612	.	.	.	.	.	.	.	.	.	.
	Jan. 88	6611	6612	.	.	.	.	.	.	.	.	.
	March 88	6611	6612	.	.	.	.	.	.	.	.	.
	May 88	6611	6612	.	.	.	.	.	.	.	.	.
	July 88	6611	6612	.	.	.	.	.	.	.	.	.
662	Sept. 85	6621	.	.	.	.	.	.	.	.	.	.
	July 87	6621	.	.	.	.	.	.	.	.	.	.
	Sept. 87	6621	6622	.	.	.	.	.	.	.	.	.
	Jan. 88	836	6621	.	.	.	.	.	.	.	.	.
	March 88	836	6621	.	.	.	.	.	.	.	.	.
751	Sept. 85	857511	857512	857513	857514	857515	.	.	.	.	.	.
	July 87	7512	7513	.	.	.	.	.	.	.	.	.
	May 88	7512	7513	.	.	.	.	.	.	.	.	.
752	Jan. 88	561	562	563	564	565	566	.	.	.	.	.
	March 88	561	562	563	564	565	566	.	.	.	.	.
	May 88	561	562	563	564	565	566	.	.	.	.	.

	July 88	561	562	563	564	565	566	.	.	.	.	.
771	Sept. 85	7711	7712	7713	7714	7715	7716	.	.	.	.	.
	July 87	7711	7712	7713	7714	7715	7716	.	.	.	.	.
	Sept. 87	161	162	163	164	.	.	.	.	.	.	.
	Nov. 87	162	163	164	534	.	.	.	.	.	.	.
	Jan. 88	161	162	163	164	.	.	.	.	.	.	.
	March 88	162	163	164	.	.	.	.	.	.	.	.
	July 88	161	162	163	.	.	.	.	.	.	.	.
772	Sept. 85	7721	7722	7723	7725	7726	7727	7728	.	.	.	.
	July 87	7722	7723	7724	7725	7726	7727	7728	7729	.	.	.
	Sept. 87	7721	7722	7723	7725	7726	7727	7728	7729	.	.	.
	Nov. 87	3821	3822	3823	.	.	.	.	.	.	.	.
	Jan. 88	3821	3822	3823	.	.	.	.	.	.	.	.
	March 88	3821	3822	3823	.	.	.	.	.	.	.	.
	May 88	3821	3822	3823	.	.	.	.	.	.	.	.
	July 88	3821	3822	3823	.	.	.	.	.	.	.	.
8	Sept. 87	7711	7712	7713	7714	7715	7716	.	.	.	.	.
	July 88	84	1113	.	.	.	.	.	.	.	.	.
911	Sept. 85	9111	9113	.	.	.	.	.	.	.	.	.
	July 87	9113	.	.	.	.	.	.	.	.	.	.
	Nov. 87	9111	.	.	.	.	.	.	.	.	.	.
	Jan. 88	9111	9112	9113	.	.	.	.	.	.	.	.
	March 88	9112	9113	.	.	.	.	.	.	.	.	.
	July 88	9112	9113	.	.	.	.	.	.	.	.	.
912	Sept. 85	9122	9123	9124	.	.	.	.	.	.	.	.
	July 87	9121	9122	9124	9125	.	.	.	.	.	.	.
	Sept. 87	222	226	227	.	.	.	.	.	.	.	.
	Jan. 88	1213	1214	1219	.	.	.	.	.	.	.	.
	March 88	1213	1214	1219	.	.	.	.	.	.	.	.
	May 88	1213	1214	1219	.	.	.	.	.	.	.	.
	July 88	1213	1214	1219	.	.	.	.	.	.	.	.
931	Sept. 85	9311	9312	9313	.	.	.	.	.	.	.	.
	July 87	9311	9312	9313	9314	.	.	.	.	.	.	.

	Sept.	87	9311	9314														
	Nov.	87	9311	9312	9313	9314												
	Jan.	88	9311	9314														
	March	88	9311	9313	9314													
	May	88	9311	9313	9314													
	July	88	9311	9313	9314													
932	Sept.	85	9321	9322	9323	9324												
	July	87	9322	9323	9324	9325												
	Sept.	87	9321	9322	9323	9324	9325											
	Nov.	87	9321	9322	9323	9324	9325											
	Jan.	88	9321	9322	9323	9324	9325											
	March	88	9321	9322	9323	9324	9325											
	May	88	9322	9323	9324	9325												
	July	88	9322	9324	9325													
971	Sept.	85	961															

TABLE 30. Common Units

1 kilogram (kg) =	1000 grams (g)
1 gram (g) =	1000 milligrams (mg)
1 milligram (mg) =	1000 micrograms (μg)
1 gram (g) =	1,000,000 micrograms (μg)
1 kilogram (kg)=	2.2 pounds (lb)
1 ounce (oz) =	28.4 grams (g)

The "tolerable" intake for PCB's for all age and gender groups is 1 microgram of PCB's for each kilogram of a person's body weight (1 μg/kg body weight). This means that anything from 0 μg/kg up to 1 μg/kg is within the "tolerable" intake.