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Qanuippitaa?  
HOW ARE WE?

PERCEPTION OF  
CONTAMINANTS,  
PARTICIPATION IN  
HUNTING AND FISHING  
ACTIVITIES, AND  
POTENTIAL IMPACTS  
OF CLIMATE CHANGE



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## **BACKGROUND OF THE NUNAVIK INUIT HEALTH SURVEY**

The monitoring of population health and its determinants is essential for the development of effective health prevention and promotion programs. More specifically, monitoring must provide an overall picture of a population's health, verify health trends and how health indicators vary over distance and time, detect emerging problems, identify priority problems, and develop possible health programs and services that meet the needs of the population studied.

The extensive survey conducted by Santé Québec in Nunavik in 1992 provided information on the health status of the Nunavik population (Santé Québec, 1994). The survey showed that health patterns of the population were in transition and reflected important lifestyle changes. Effectively, the Inuit population has undergone profound sociocultural, economic, and environmental changes over the last few decades. The Inuit have changed their living habits as contact with more southerly regions of Quebec increased. A sedentary lifestyle, the switch to a cash-based domestic economy, the modernization of living conditions and the increasing availability and accessibility of goods and foodstuffs imported from southern regions have contributed to these changes. These observations suggest the need for periodic monitoring of health endpoints of Nunavik Inuit to prevent the negative impact of risk factor emergence and lifestyle changes on subsequent morbidity and mortality from major chronic diseases.

In 2003, the Nunavik Regional Board of Health and Social Services (NRBHSS) decided to organize an extensive health survey in Nunavik in order to verify the evolution of health status and risk factors in the population. The NRBHSS and the Ministère de la Santé et des Services sociaux (MSSS) du Québec entrusted the Institut national de santé publique du Québec (INSPQ) with planning, administering and coordinating the survey. The INSPQ prepared the survey in close collaboration with the Unité de recherche en santé publique (URSP) of the Centre hospitalier universitaire de Québec (CHUQ) for the scientific and logistical component of the survey. The Institut de la statistique du Québec (ISQ) participated in methodology development, in particular the survey design.

The general aim of the survey was to gather social and health information on a set of themes including various

health indicators, physical measurements, and social, environmental and living conditions, thus permitting a thorough update of the health and well-being profile of the Inuit population of Nunavik. The survey was designed to permit a comparison of the 2004 trends with those observed in 1992. Data collected in 2004 also allowed researchers to compare the Inuit to other Quebecers.

### ***Target population***

The health survey was conducted among the Inuit population of Nunavik from August 27 to October 1, 2004. According to the 2001 Canadian census, the fourteen communities of Nunavik have a total of 9632 inhabitants, 91% of whom identified themselves as Inuit. The target population of the survey was permanent residents of Nunavik, excluding residents of collective dwellings and households in which there were no Inuit aged 18 years old or older.

### ***Data collection***

Data collection was performed on the Canadian Coast Guard Ship Amundsen, thanks to a grant obtained from the Canadian Foundation for Innovation (CFI) and the Network of Centres of Excellence of Canada (ArcticNet). The ship visited the fourteen villages of Nunavik, which are coastal villages. The study was based on self-administered and interviewer-completed questionnaires. The study also involved physical and biological measurements including clinical tests. The survey was approved by the Comité d'éthique de la recherche de l'Université Laval (CERUL) and the Comité d'éthique de santé publique du Québec (CESP). Participation was voluntary and participants were asked to give their written consent before completing interviews and clinical tests. A total of 677 private Inuit households were visited by interviewers who met the household respondents to complete the identification chart and the household questionnaire. A respondent was defined as an Inuit adult able to provide information regarding every member of the household. The identification chart allowed demographic information to be collected on every member of the household. The household questionnaire served to collect information on housing, environment, nutrition and certain health indicators especially regarding young children.

All individuals aged 15 or older belonging to the same household were invited to meet survey staff a few days later, on a Canadian Coast Guard ship, to respond to an interviewer-completed questionnaire (individual

questionnaire) as well as a self-administered confidential questionnaire. Participants from 18 to 74 years of age were also asked to complete a food frequency questionnaire and a 24-hour dietary recall, and to participate in a clinical session. The individual questionnaire aimed to collect general health information on subjects such as health perceptions, women's health, living habits and social support. The confidential questionnaire dealt with more sensitive issues such as suicide, drugs, violence and sexuality. During the clinical session, participants were invited to answer a nurse-completed questionnaire regarding their health status. Then, participants had a blood sample taken and physical measurements were performed including a hearing test, anthropometric measurements, an oral glucose tolerance test (excluding diabetics) and toenail sampling. Women from 35 to 74 years of age were invited to have a bone densitometry test. Finally, participants aged 40 to 74 could have, after consenting, an arteriosclerosis screening test as well as a continuous measure of cardiac rhythm for a two-hour period.

### ***Survey sampling and participation***

The survey used a stratified random sampling of private Inuit households. The community was the only stratification variable used. This stratification allowed a standard representation of the target population. Among the 677 households visited by the interviewers, 521 agreed to participate in the survey. The household response rate is thus 77.8%. The individual response rates are obtained by multiplying the household participating rate by the individual collaboration rate since the household and individual instruments were administered in sequence. The collaboration rate corresponds to the proportion of eligible individuals who agreed to participate among the 521 participating households. In this survey, about two thirds of individuals accepted to participate for a response rate in the area of 50% for most of the collection instruments used in the survey. A total of 1056 individuals signed a consent form and had at least one test or completed one questionnaire. Among them, 1006 individuals answered the individual questionnaire, 969 answered the confidential questionnaire, 925 participated in the clinical session, 821 had a hearing test, 778 answered the food frequency questionnaire, 664 answered the 24-hour dietary recall, 282 had an arteriosclerosis test, 211 had a continuous measure of their cardiac rhythm for a two-hour period and 207 had a bone densitometry test. More details on the data processing are given in the Methodological Report.

## **INTRODUCTION<sup>1</sup>**

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The issues of hunting, fishing and collection of resources from the land and sea are of central importance to the health of Inuit in Nunavik. For approximately twenty years now, confidence in these resources and Inuit access to them have been threatened by reports of environmental contaminants in wildlife, social and economic trends including processes influencing the time available to hunt and fish, and more recently, reports of climate change and variability and their influences on wildlife resource accessibility. This paper focuses on these three issues. The first section of the paper presents the 2004 Nunavik Inuit Health Survey findings on the perception of contaminants and country foods and use of these traditional medicines. The second section describes the current (2004) levels of participation in hunting and fishing activities throughout the region. Finally, the third section focuses on the potential implications of climate change and environmental variability on hunting and fishing activities and sun burns and blisters as perceived by Inuit participants in the Nunavik Health Survey.

## **METHODOLOGICAL ASPECTS**

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Questions were included in the "Nutrition and Contaminants" and "Hunting and Fishing" sections of the Nunavik Inuit Health Survey 2004 individual questionnaire to study the perception of contaminants, the use of traditional medicines, and the level of participation in hunting, fishing and berry collecting activities as well as individuals' perception of the relationship between hunting activities and environmental change. As well, questions from the household questionnaire were included on the prevalence of sunburns and blistering in the region.

### ***Accuracy of estimates***

The data used in this module comes from a sample and is thus subject to a certain degree of error. The coefficient of variation (CV) has been used to quantify the accuracy of estimates and the Statistics Canada scale was used to qualify the accuracy of estimates. The presence of a footnote "E" next to an estimate indicates a marginal estimate (CV between 16.6% and 33.3%) and results

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<sup>1</sup> For ease of readability, the expression "Inuit" is used throughout the theme paper to define the population under study even though a small percentage of individuals surveyed identified themselves as non-Inuit. Refer to "Background of the Health Survey" for further details regarding the definition of the target population.

should be interpreted with caution. Estimates with unreliable levels of accuracy ( $CV > 33.3\%$ ) are not presented and have been replaced by the letter “F” where applicable.

### **Statistical analysis**

Statistical analyses of the data from these questions involved comparisons of proportions of responses with socio-demographic characteristics to look at the association between various socio-demographic factors that may influence risk perception and the participation to various traditional land based activities or use of traditional medicines. The comparisons were done with a chi-square test corrected for design effect. The threshold used for statistical significance was  $\alpha = 0.05$ .

Association with place of residence was studied according to two different groupings of communities in the region. Place of residence was investigated because it is thought to be a determining factor influencing lifestyle and personal behaviours related to health and well-being. The Nunavik territory was divided, for analyses, into two regions based on the coast on which communities were situated. The ‘Hudson coast’ grouping included the villages of Kuujjuarapik, Umiujaq, Inukjuak, Puvirnituk, Akulivik, Ivujivik and Salluit while the ‘Ungava coast’ grouping included Kangiqsujuaq, Quaqtaq, Kangirsuk, Aupaluk, Tasiujaq, Kuujuaq and Kangiqsualujuaq. Also, analyses were done with communities grouped as ‘larger communities’ (Kuujuaq, Puvirnituk and Inukjuak) and ‘smaller villages’ (all others).

In terms of the variable representing education level of participants, it is important to note that the choices of answers for post-secondary training were not well adapted to the context of the survey’s target population. The answers given for this category reveal that there was likely confusion during data collection between training that requires a post-secondary diploma and training that does not (e.g. driver’s license, fishing license, etc). Therefore, the number of people with post-secondary education was likely overestimated.

### **Scope and limitations of data**

The data presented below represents an update of the understanding on perceptions of contaminants among the population in Nunavik as compared to the Santé Québec survey of 1992. It represents new data in terms of the use of traditional medicines and difficulties in locating

animals when hunting and the potential influence that environmental change may be playing in this situation. The questions are valuable in identifying potential factors influencing the phenomena studied (perception of contaminants, participation to land-based activities, use of traditional medicines) but are not indicative of cause-effect relationships. Additionally, some questions (e.g. rejection of catches and reasons for rejection) were posed in too complex of a manner (providing too many detailed potential options for responses) such that the results are not presented as so few individuals responded in any one category. Finally, questions related to the incidence of sunburns and blisters were included in the household survey, meaning that characteristics of the individual to which the responses may be attributed (e.g. individual receiving sunburn) were not gathered in the collection protocol. Therefore, few analyses of the potential associations with various socio-demographic characteristics and the incidence of these reports (e.g. sunburns or blisters) were possible.

## **I. PERCEPTION OF CONTAMINANTS**

Country foods, and the activities (hunting and fishing) to collect, distribute and prepare them for consumption, are still important aspects of everyday life in Nunavik communities today. They are important because of their social and cultural value, formal and informal economic worth, and what they represent in terms of their contributions to physical, social and mental well-being (Van Oostdam et al., 2005; Dewailly et al., 2000). Their importance is further emphasized by the challenges that exist in the region with regards to access to safe, healthy and affordable market food alternatives in many communities. As a result, the contamination of the Arctic country food chain is a complex community health issue that cannot easily be resolved by simply considering the risks associated with exposure to contaminants through consumption of country foods. The many benefits of these foods and the perceptions of Nunavimmiut with regards to their safety must also be understood. Individual factors such as age, gender, education, occupation, language, world view, and culture are shown to influence individuals’ perceptions and concerns about environmental risks such as exposure to contaminants (e.g. Flynn et al., 1994; Furgal et al., 2005). Also, work in other regions of the world has identified aspects of the hazard itself which influence individuals’ perception. They include: the voluntary or involuntary nature of exposure, uncertainty about consequences of exposure,

lack of personal experience with the risk, concern with regards to the delayed nature of some impacts, possible effects on the next generation, accidents related to anthropogenic activity as compared to naturally caused risks, unequal distribution of risks and benefits within a population, and the ease of perception and understanding of the benefits associated with exposure (Slovic, 1987; Douglas, 1986; Pidgeon et al., 1992).

Perception is influenced by a combination of personal and collective (i.e., social) factors that affect the way in which one understands and reacts to issues (i.e., personal behaviours). It is recognized that an individuals' basic understandings of risk are often much more complex than that of an experts' who is not personally exposed and that personal perceptions reflect legitimate concerns that are often forgotten when making environmental and public health decisions and developing strategies to minimize exposure and the potential for harm (Slovic, 1987). It is for these reasons that the perceptions of those involved and affected by exposure to a hazard must be considered in health risk management. They directly influence the effectiveness of any decision and action (including communication) taken to minimize risks and maximize the benefits of, in this case, consuming country foods in Nunavik.

Nunavimmiut have heard of the issue of environmental contaminants in their country foods for more than two decades. The 1992 Santé Québec survey (Santé Québec, 1994) assessed perceptions of Nunavik residents towards contaminants in country foods and revealed a high level of awareness (62%) and desire to know more (87%) about this issue. Overall, 55% of Nunavik residents considered country foods to be more healthful and nutritious than commercial foods, and 21% believed that commercial foods were of higher quality either because they were better, more modern, or because country foods were contaminated. These perceptions varied with age, with the most favourable attitudes towards country foods being among individuals in the 25- to 45-year-old age group, and the least favourable attitudes being among younger participants. The survey also indicated that 14% of people reported having changed their habits upon becoming aware of food-chain contamination in Nunavik. About 11% had reduced country food consumption, while 3% discontinued consumption altogether (Dewailly et al., 1994).

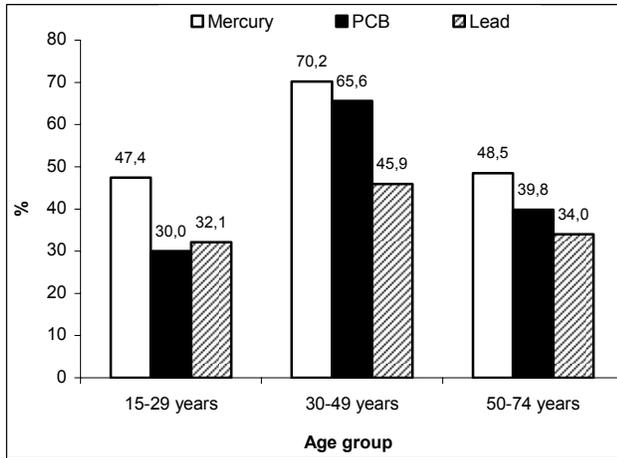
## RESULTS

At the time of the 2004 Nunavik Inuit Health Survey, most (62%) people reported that they had heard about contaminants in the environment. This knowledge varied with a number of socio-demographic factors (Table A1, Appendix). Proportionately, more people above the age of 50 (80%) were aware of this information than younger ages. A larger percentage of individuals that had completed elementary school or less, or had completed secondary school or more reported having heard about contaminants (such as PCBs and mercury (Hg)) than those that had started but not completed secondary school. Further, proportionately more individuals that were either married or divorced, had a higher personal income (earning over 40 000\$/ year), were employed at the time of the survey, and who hunted, fished or collected berries more often reported being aware of this information than others. Finally, significantly more residents of Ungava coast communities than Hudson coast communities reported having heard about contaminants such as PCBs and Hg in country foods.

The Nunavik region has dealt with issues related to three principle contaminants in recent decades. These include mercury (Hg), PCBs and lead (Pb). When asked if people had specifically heard about mercury (Hg) in Nunavik, 57% of residents said that they had. This proportion varied with age where the highest number (70%,  $p < 0.0001$ ) of residents between the ages of 30-49 responded positively to this question (Figure 1). In fact, in all age groups, Hg was the most recognized contaminant among the three listed above (Figure 1). Proportionately more residents that were married or in a couple (63%,  $p = 0.0003$ ), had completed secondary school (76%,  $p < 0.0001$ ), were residents of large communities (62%,  $p = 0.007$ ), had a higher personal income (84% for people earning over 40 000\$/ year,  $p < 0.0001$ ) and were employed at the time of the survey (64%,  $p < 0.0001$ ) reported having heard about Hg in the Nunavik environment than other residents.

**Figure 1**

Percentage of individuals in each age group reporting awareness of specific contaminants (%), population aged 15 and over, Nunavik, 2004



Source: Nunavik Inuit Health Survey 2004.

Similarly, familiarity with PCBs was reported by 47% of survey participants and varied with age where those individuals between the ages of 30 and 49 were more likely to have heard of PCBs than other residents (66%,  $p < 0.0001$ ) (Figure 1). The proportion of participants that said they had heard of PCBs also varied with marital status, education, personal income and employment status at the time of the survey. Proportionately more participants that were married or in couple (54%,  $p < 0.0001$ ), had completed secondary school (63%,  $p < 0.0001$ ), had a higher personal income (73% for people earning over 40 000\$ / year,  $p < 0.0001$ ), and were employed (53%,  $p = 0.0003$ ), respectively, reported having knowledge of PCBs in the region.

Awareness of lead (Pb) in the Nunavik environment was acknowledged by 38% of participants. Recognition of Pb followed a similar demographic pattern to that of Hg and PCBs (Figure 1). More men than women (48% vs. 28%,  $p < 0.0001$ ), residents of larger communities than smaller remote villages (45% vs. 32%,  $p = 0.0005$ ), participants that were married or in couple (43%,  $p = 0.005$ ), residents with secondary school completed (59%,  $p < 0.0001$ ), individuals with a higher personal income (63% for people earning greater than 40 000\$ / year,  $p < 0.0001$ ), employed people (42%,  $p = 0.004$ ) and those more actively involved in hunting activities throughout the year (45%,  $p = 0.002$ ) reported having heard of Pb in the Nunavik environment than others.

Despite the reports of recognition of the terms and names of common contaminants, there was some confusion in the understanding of the concept between contaminants as chemical substances and contaminants as other visible abnormalities in wildlife such as parasites and worms. When participants were asked to describe what a “contaminant” was, 49% identified that contaminants included things such as worms and parasites and 15% of Nunavimmiut stated that “contaminants” were exclusively worms or parasites that can be seen in animals (Table A2, Appendix). As mentioned, 62% of Nunavimmiut report having heard of contaminants previously. However, nearly 14% of those individuals also said they did not know what contaminants were when asked directly. This was the case (had heard of “contaminants” but did not know what a contaminant was when asked) with proportionately more young residents under 30 years old (23%,  $p < 0.0001$ ), females (18%,  $p = 0.001$ ), residents of smaller villages (17%,  $p = 0.014$ ), residents that were not married or in a couple (18%,  $p = 0.027$ ), had a lower personal income (17% for people under 20 000\$,  $p < 0.0001$ ), and who were less active in land based activities (hunting 19%,  $p = 0.0049$ ; fishing 21%,  $p < 0.0001$ ; berry collecting 17%,  $p = 0.049$ ).

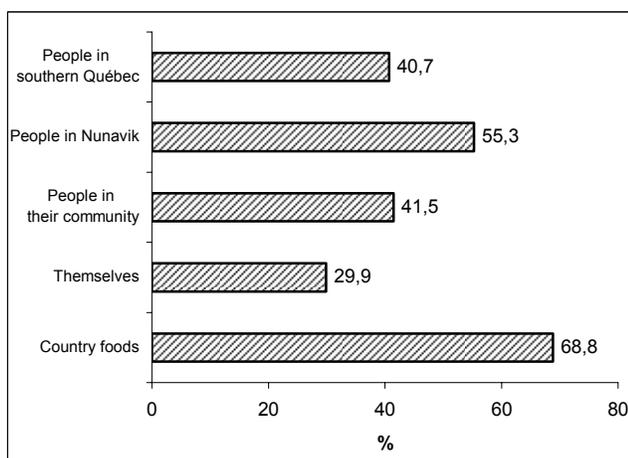
Since hearing about chemical contaminants in country foods (such as PCBs and Hg), one quarter (25%) of the population reports having changed some aspect of their diet. This change in diet does not differ between the sexes in the current survey however it seems more common among students (53%<sup>E</sup>) than other categories of employment status in the population (Table A3, Appendix). Twenty five percent of individuals between the ages of 15-29 said they had changed their diet since hearing about contaminants, the same proportion as among the population as a whole. Among the people that have modified their eating habits (25%): 73% report that they eat less or do not eat anymore meat of beluga, walrus or seal, 62% said they had decreased their consumption of blubber (33% said they eat more), 48% said they eat less fish today (41% said they eat more), and 60% said they eat more caribou than before. Only a very small number, too small to report, said they had stopped eating any country food items since hearing news about contaminants in the environment.

When asked what things in the region had been exposed to contaminants (such as PCBs and Hg) Nunavimmiut were more likely to identify things (people or wildlife) other than themselves despite the fact that 62% of the population report having previously heard about

contaminants in the region. The majority of the population (69%) believes there are contaminants in country foods, while only 30% think they have contaminants in their bodies. Less than half (42%) think people in their community have been exposed to contaminants and 55% think people in Nunavik have been exposed and have some level of contaminants in them. Finally, 41% of Nunavimmiut think that people in the south have been exposed to these contaminants (Figure 2).

**Figure 2**

Percentage of participants reporting perception of where contaminants could be found (%), population aged 15 and over, Nunavik, 2004



Source: Nunavik Inuit Health Survey 2004.

Many of the common factors that are reported elsewhere to influence the perception of environmental health risks such as exposure to contaminants appear to apply in Nunavik. Proportionately more men than women thought there were contaminants in country foods and themselves (Men country foods 77%,  $p < 0.0001$ ; men themselves 38%,  $p < 0.0001$ ). As well, these reports varied with age, as significantly more individuals between the ages of 30 and 49, than other ages, reported these same perceptions (country foods 76%,  $p = 0.006$ ; themselves 37%,  $p = 0.005$ ). Further, positive responses to these questions increased with years of formal education and personal income.

Despite these concerns and knowledge about contaminants in country foods, the environment and people in the region, nearly one third of the population (28%) still reports using some traditional items for medicinal purposes (Table A4, Appendix). Items such as red berries, seal blubber, and teas made from plants are

used to treat a number of common ailments and to improve general health by people in the region today. Proportionately more people over the age of 50, living in smaller communities, who are married or in a couple, have completed fewer years of formal education, or who are more active in hunting, fishing, and berry collecting activities report using traditional medicines than other residents in the region (Table A4, Appendix).

## DISCUSSION

In general, the level of awareness of contaminants and understanding of contaminants as chemical pollutants in country foods does not seem to have changed since the time of the last survey in 1992. Although the question regarding awareness of contaminants in the 1992 Santé Québec survey was not formulated in exactly the same way, it appears that the level of knowledge of contaminants measured in 2004 was similar to that reported in 1992. The lack of increased awareness among the population in Nunavik today is somewhat surprising considering the ongoing efforts made by the Nunavik Nutrition and Health Committee, the Nunavik Regional Board of Health and Social Services (NRBHSS) and individual researchers among others, in educating the public about this issue over the years. As well, the long history of dealing with various contaminant-related issues in the region may lead one to expect an increased awareness and understanding over time, however this does not appear to be the case. Finally, the fact that the question in the 1992 survey specifically only asked whether participants had heard about PCBs, whereas the question in this survey asked, more generally, if people had heard about contaminants such as “the presence of pollutants or chemicals in country food” provided the opportunity for a wider understanding of contaminants and as such, the potential for a higher percentage of positive responses which did not occur. The apparent lack of increase in awareness of the contaminants issue in the region between 1992 and 2004 may be related to a number of factors. Things such as the increasing complexity and subtleties of the messages delivered from research and public health officials today as compared to 15 years ago (see NRBHSS, 2003), the competing importance of this issue in the region with other more basic health priorities (e.g. having enough to eat vs. choice of foods lower in contaminants), and the effects of time on information recall among individuals in the population may all play a role.

A greater percentage of individuals in Ungava Bay communities as compared with those living along the Hudson coast reported having heard of contaminants. The reason for this geographic distribution in awareness is not currently well understood. As much of the work on the health effects of contaminants in the Nunavik population has been focused and based along the Hudson coast (e.g. Fraser et al., 2006; Muckle et al., 2006) a larger physical presence of research on these topics has existed in that area. As a result, one might expect a higher level of awareness among residents in those communities.

The pattern of socio-demographic variables associated with reported levels of awareness of contaminants in the 2004 survey indicates that awareness is greatest among more frequent hunters and fishers in the region and those with more formal education and living in larger communities such as Kuujuaq and Puvirnituk. This association between socio-economic status and risk perception is reflected in the literature elsewhere (e.g. Vaughan, 1995). It is not surprising that in Nunavik, the knowledge of these issues is also higher among those that have more direct and frequent contact with the exposures associated with these substances, i.e. hunters and fishers. This level of experiential knowledge therefore forms an important aspect of 'education status' on the issue in the region.

The awareness of specific contaminants in the region (Hg, Pb and PCBs) was similarly associated with socio-economic variables in that those with a higher level of formal education and greater annual personal income reported more awareness of the specific substances. The exception to this pattern was the awareness of lead. The higher awareness of lead in the region predominantly among more frequent hunters is likely related to the attention this contaminant has received in the past in terms of public education about the health risks of lead exposure. Researchers and the Nunavik Regional Board of Health and Social Services, Public Health Department, has investigated the risks associated with lead exposure via the use of lead shot for hunting wild fowl and ingestion of lead pellets or contaminated tissue (Dallaire et al., 2003). As a result, the Public Health Department requested a ban on the sale and use of lead shot in the region in the late 1990s. It is likely, that hunters are more aware of this contaminant because of their purchase of shot and other hunting supplies on a more frequent basis and therefore their more direct and often contact with this information.

It appears as though some confusion around contaminants as chemical substances exists in the region and this lack of understanding may influence some of the patterns of recall and awareness discussed above. The confusion appears to be highest among the youngest age groups surveyed, and is more prevalent among females than males. Confusion of contaminants as 'worms or parasites' has been documented in the region before where residents have referred to the parasite associated with trichinosis as a contaminant in discussions on chemicals in wildlife (Bruneau et al., 2001). This issue requires further attention as it is central to use of terminology in communicating on this public health risk. As well, it is this population, young females, that is increasingly the target audience of health and dietary advice regarding the potential reduction of exposure to contaminants in order to protect the developing fetus.

A small, but significant number of individuals report having made some behavioural change since becoming aware of contaminants in the region. The details of these shifts in dietary habits and rationale for them are the subject of great study today (e.g. Duhaime et al., 2002), including some sections of this survey, as they appear to be influencing the potential loss of some benefits attributed to a traditional Inuit diet and the potential increase in some forms of "western diseases" among northern populations. Regardless of the knowledge of pollution or contaminants, many northerners report that they would continue to eat country foods despite any advice by health officials to reduce their consumption, because they are an important part of Inuit culture, lifestyle and health (O'Neil et al., 1997). Nunavik residents participating in recent work investigating the factors influencing individuals' intent to eat country foods (Furgal et al., 2001) reported various advantages to consumption in addition to their importance to Inuit culture and social well-being. They included their health and nutritional benefits, economic / cost advantages, as well as their value in terms of personal aspects of taste and freshness. It is interesting to note here as well, that the importance of some traditional resources is not only associated with their consumption, but also, with their use in traditional medicines for nearly one quarter of the regional population today.

Based on these results, it would be prudent to continue study in the area of risk perception and understanding of contaminants among Inuit in Nunavik to better understand the role that this information plays in dietary practices which may be influencing Inuit health status in the future.

Ongoing research in Nunavik, including initiatives under the Northern Contaminants Program, ArcticNet and the International Polar Year will continue to add to our understanding of the factors influencing perception and comprehension of contaminant issues and help to further inform public health education and communication programs around health and diet.

## II. PARTICIPATION IN HUNTING, FISHING, AND COLLECTING ACTIVITIES

Hunting, fishing and gathering of wild resources and the subsequent sharing of those items with others in the community are social activities bringing together individuals, families and generations, and are often the focus of celebrations and festivities (Searles, 2002). They form and maintain an important social fabric among individuals which supports community health and well-being. For example, not only is muktuk nutritionally and psychologically beneficial, but its widespread sharing among relatives and between communities creates and sustains the bonds that remain the basis of Inuit social, cultural and economic relationships today (Freeman et al., 1998). Further, such activities are opportunities for the transfer of knowledge between generations and the maintenance of language, as they necessitate and use traditional knowledge and components of local language, and therefore support the exchange of information about hunting techniques, places and local history while on the land. Despite all of the social, cultural, economic and political changes that Nunavik has undergone over the past decades, hunting, fishing and gathering resources from the land and sea continue to be important activities for many Nunavimmiut. Previous surveys in the region did not conduct a detailed assessment of the level of hunting and fishing activity, however as communities and lifestyles continue to change it is important to understand how participation in such practices also changes as they continue to be a source of health and well-being for many Nunavimmiut.

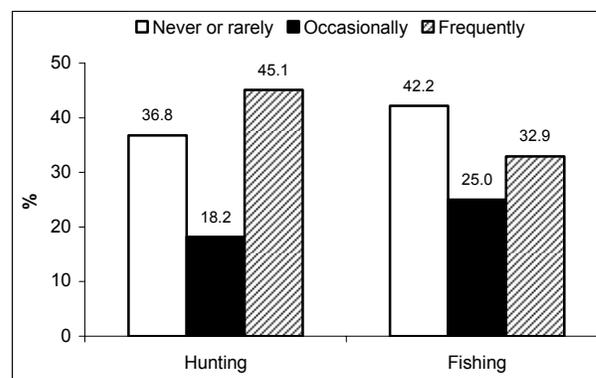
### RESULTS

Nearly half (45%) of the Nunavik population classify themselves as “frequent” hunters throughout the year, hunting regularly once a week or more in at least two seasons (Figure 3). Nearly half of the population goes hunting more than once a week in the spring and summer seasons, which are the most active times of year. The level of hunting activity reported by residents varies with

age. Fifty-four percent of individuals 50 years or older reported being “frequent” hunters throughout the year as compared with 45% of individuals 30-49 years of age, or 41% of individuals between the ages of 15 and 29 ( $p = 0.036$ ). More men (61%,  $p < 0.0001$ ), married individuals or those living in a couple (52%,  $p < 0.0001$ ), and those with a higher individual income (61% for people earning more than 40 000\$/year,  $p = 0.001$ ) reported being more actively involved in hunting throughout the year.

**Figure 3**

Percentage of participants reporting frequency of hunting and fishing activities (%), population aged 15 and over, Nunavik, 2004



Source: Nunavik Inuit Health Survey 2004.

Sharing of the catch is still very much alive in communities today. More than half of all Nunavimmiut (57%) reported sharing their catch “often” with other members of their community. Sharing “often” was more common among men, individuals aged 50 years and over, those having completed secondary school or more, those who are married or living with a partner, employed at the time of the survey, and those with a higher personal income (greater than 40 000\$/year) (Table A5, Appendix). Not surprisingly, sharing a catch more often was more regularly reported among those that hunted and fished more frequently as well (Table A5, Appendix).

Fewer Nunavimmiut are regular participants to fishing activities than hunting but the activity is still widely practiced throughout the region today. One-third of residents (33%) fish frequently, or more than once a week during at least two seasons throughout the year (Figure 3). As with hunting, spring and summer months are the most active times for this activity. Fishing activity is greatest among older individuals (50 years and over 51%,

$p < 0.0001$ ), men (38%,  $p < 0.0001$ ), those married or living in a couple (41%,  $p < 0.0001$ ), those having completed elementary school or less (46%,  $p < 0.0001$ ), those working at the time of the survey (36%,  $p = 0.031$ ), and among those earning greater than 40 000\$ / year (45%,  $p < 0.0001$ ).

Approximately half (48%) of the population participates in berry collecting at least once a month at some time during the year. As was the case traditionally, this activity is still practiced much more by women than men (62% vs. 36%,  $p < 0.0001$ ). Participation to berry collecting varies also with age, marital status, education and personal income. More individuals 50 years of age and older (61%,  $p \leq 0.0001$ ), those who are married or living in a couple (58%,  $p < 0.0001$ ), have completed elementary school or less (62%,  $p < 0.0001$ ), and those who earn more than 40 000\$ / year (57%,  $p = 0.004$ ) report berry picking more frequently than others.

Less than one-quarter (23%) of the population said they have rejected or thrown away something they have caught in the 12 months previous to the survey (Table A6, Appendix). Primarily this was done in relation to a concern for a visible anomaly. The number of participants that said they had rejected any part of a catch because of concern related to chemical contaminants in the animal was too few to report. The rejection of any catch varied with individuals' gender, employment status, personal income, region of residence and frequency of participation in hunting activities (Table A6, Appendix). Proportionately more men, individuals that were working at the time of the survey, individuals that earned more than 40 000\$ / year, or those that lived in Hudson coast communities reported having rejected a catch than other participants. Finally, rejecting a catch was reported by proportionately fewer individuals that classified themselves as occasional, as compared to rare or frequent hunters (Table A6, Appendix).

## DISCUSSION

Hunting, fishing and berry collecting still remain important activities for Nunavimmiut today. These activities appear to be practiced more frequently by older, married males and among those with a higher personal annual income. As reported by Duhaime et al. (2002), consumption of country foods in Nunavik was highest among those individuals living in a household with a male and those with a higher total household income. This pattern is representative of two key determinants in the

procurement of country food resources; access to an experienced male hunter as well as financial resources to purchase and maintain equipment and supplies for hunting and fishing. The role of these factors in participation to hunting and fishing activities is evident here as well.

Because of their importance in terms of physical activity, contribution to the preservation of tradition and culture, and their role in the provision of healthy and nutritious foods, hunting, fishing and collecting activities in Nunavik continue to play an important role in the health and well-being of Nunavimmiut. Despite their importance, Nunavimmiut have reported changes in environmental conditions and quality of wildlife which have influenced, at times, consumption of some species (Communities of Nunavik et al., 2005). However, according to participants in the 2004 survey, concern for contaminants in wildlife species was not a factor leading to the rejection of any catch. Rather, rejection of species caught was more closely associated with the presence of visible anomalies such as parasites in wildlife tissue and these events appear to be more common in Hudson coast communities than elsewhere. With current socio-economic trends in the region and shifts taking place in food consumption habits, it will be important to continue to increase our understanding of the factors influencing participation to these land-based activities which are associated with a healthy lifestyle and diet in the future.

## III. POTENTIAL IMPACTS OF CLIMATE CHANGE

The climate appears to be changing in Nunavik and other northern regions, and scientific studies indicate that the North is and will continue to warm over the coming decades (McBean et al., 2005). These changes are reported to have potential implications on various aspects of health and well-being in northern regions. For example, hunters' ability to find and catch animals may be impacted because of changes in environmental conditions which influence hunters' ability to get to hunting grounds and changes in conditions which influence animal migrations and distribution (Arctic Climate Impact Assessment (ACIA), 2005; Berner & Furgal, 2005; Furgal et al., 2002; Communities of Nunavik et al., 2005). Currently little is known with regards to the potential influence of climate change on aspects of health such as country food security in Nunavik and other northern regions. However, because of the importance of these resources for public health, the sensitive nature of the

health in Nunavik and other Inuit regions, and the climate and environmental changes projected to occur in the future throughout the North, it is important to begin to document and understand the relationships between climate and health and the local observations of changes and their impacts today. Developing this local scale baseline will help establish a foundation for more comprehensive environmental and public health monitoring and surveillance on these issues in the future. To this end, some questions were asked in the household survey regarding the potential impacts of current changes and variability in regional climate and environmental conditions.

## RESULTS

Half of the participants (51%) asked in the survey reported that some animals have become harder to find and hunt during the same season over the past 4 years. The reporting of these difficulties varied with gender, as proportionately more men reported these challenges than women (Table A7, Appendix). As well, a larger proportion of older hunters 50 years old and over, responded positively to this question as did more individuals with elementary school level education. More individuals with an individual income under 20 000\$ reported these challenges as did those that participated to hunting activities more frequently throughout the year (Table A7, Appendix). The majority of people who reported that some species were harder to find and catch, specifically identified that caribou (60%) and beluga (53%) were more difficult to find and hunt today. The main reason mentioned for changes in caribou accessibility was related to the fact that they were seen to be further away from the community than they used to be (47%). A small number (14%) said the increased difficulties were related to changes in the land, sea or weather conditions. The main reason mentioned for difficulties in locating beluga was because that there were fewer of them today (22%) and because they have moved away from where they are usually found (18%).

A question as to the presence of sunburn, redness or blistering from the sun among any household resident was included in the survey to document current UVB exposure and skin problems. It is estimated that 4% of the population experienced sunburn in the year prior to the survey, with 33%<sup>E</sup> experiencing blistering and 92% experiencing some redness/peeling. The prevalence of sunburns varied with age (30 years and over: 7.4%) however, no variations were seen for reports of blistering

or redness/peeling according to gender, age group and place of residence.

## DISCUSSION

According to Berner and Furgal (2005), and others (e.g. Ford et al., 2006) some hunters in Inuit communities are reporting challenges associated with hunting and fishing and accessing wildlife resources while on the land as a result of increased weather unpredictability and other forms of environmental and climatic change. In general, it does not appear that participants to this study report the same experiences. The most common rationale for difficulties in locating caribou in the year prior to the survey as compared to the past was associated with changes in animal distributions. Traditional Inuit knowledge speaks of cycles of caribou movement, which may explain the changes in distributions reported here. Alternate explanations with regards to climate influences on changes in vegetation productivity that could influence animal distributions may require further attention considering projected climatic changes for this and other regions in the future (Kattsov et al., 2005).

In focus groups and community workshops conducted in the region over the past 4 years, Nunavimmiut have reported more sunburns and rashes than they have experienced previously (Furgal et al., 2002; Communities of Nunavik et al., 2005). In this survey, 4% of individuals were estimated to have received a sunburn in the year prior to the study while 92% experienced some form of redness or peeling. As there are projected increases in UVB exposure for northern populations in the near future (e.g. Weatherhead et al., 2005; Berner & Furgal, 2005) and this may influence these rates and warrant enhanced public education on the topic, it would be prudent to continue to monitor this status in future years. It is important to note however, that the questions related to this topic were asked as part of the household survey (most often answered by the head of the household) and the socio-demographic information collected reflects either the status of the entire household or the individual responding on behalf of the household. They do not always reflect the responses of the individual having experienced the phenomenon being investigated (incidence of sunburn). As a result, the associations with socio-demographic variables should be interpreted with caution. However, due to the potentially important nature of these topics as discussed by Nunavimmiut (Communities of Nunavik et al. 2005), and reported in the

scientific literature it is recommended to gather more data at the individual level in the near future.

## CONCLUSION

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The results presented in this section highlight the continued importance of land and sea based activities for Nunavimmiut today despite the significant changes taking place in the region over recent decades. However, these resources are potentially being threatened by forms of environmental change including the presence of chemical and metal contaminants and climate change. The knowledge and awareness of these issues among Inuit in Nunavik should continue to be monitored, to ensure that residents receive and have access to information that will support their informed decision making on important health related behaviours such as diet and the consumption of country foods.

## KEY ISSUES

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- ↪ At the time of the survey, most (62%) people reported that they had heard about contaminants in the environment. Familiarity with mercury, PCBs and lead was reported by 57%, 47%, and 38% of participants respectively and appears to be lowest among young females.
- ↪ Since hearing about chemical contaminants in country foods, one quarter (25%) of the population reports having changed some aspect of their diet. Only a very small number said they had stopped eating any country food items.
- ↪ Nearly one third of the population (28%) reports using some traditional items for their medicinal properties.
- ↪ Nearly half (45%) of the Nunavik population goes hunting frequently throughout the year and one third (33%) goes fishing regularly once a week or more in at least two seasons. About half (48%) of the population participates in berry collecting at least once a month during berry picking season.
- ↪ Less than one-quarter (23%) of hunters said they have rejected or thrown away something they have caught in the 12 months previous to the survey for safety reasons. Too few of these reports to analyse, were attributed to concerns related to chemical contaminants in wildlife.

- ↪ It is estimated that 4% of population experienced a sunburn in the year before the survey; with 33% experienced blistering and 92% experienced redness / peeling.

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## APPENDIX

**Table A1**

Socio-demographic factors influencing awareness of contaminants (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Awareness of contaminants	
	Yes	P-value
<b>Total</b>	62.2	
<b>Sex</b>		
Men	63.4	
Women	60.9	0.37
<b>Age group</b>		
15-29 years	50.4	
30-49 years	67.3	
50 years and +	79.7	< 0.0001
<b>Education level</b>		
Elementary school completed or less	75.9	
Secondary school not completed	52.3	
Secondary school completed or higher	74.3	< 0.0001
<b>Marital status</b>		
Single	52.1	
Married or common law	69.5	
Separated, divorced or widowed	67.8	< 0.0001
<b>Job status</b>		
Work	64.8	
Other <sup>a</sup>	56.7	< 0.0001
<b>Income</b>		
Less than \$20 000	55.4	
\$20 000-\$39 999	65.9	
\$40 000 and over	80.8	< 0.0001
<b>Coastal region</b>		
Hudson	59.0	
Ungava	66.5	0.006
<b>Frequency of fishing<sup>b</sup></b>		
Never or rarely	54.7	
Occasionally	65.0	
Frequently	68.5	< 0.0001
<b>Frequency of hunting<sup>b</sup></b>		
Never or rarely	55.8	
Occasionally	64.3	
Frequently	66.2	< 0.0001
<b>Frequency of berry picking</b>		
Less than once a month	54.9	
1 to 3 times a month	65.5	
Once a week or more	72.4	< 0.0001

<sup>a</sup> Other: hunter support program, housework, retired or on pension, unemployment insurance, social welfare, student or other.

<sup>b</sup> Never or rarely: Less than once a month for at least three seasons.

Occasionally: Other than "Never or rarely" and "Frequently".

Frequently: More than once a week for at least three seasons.

Source: Nunavik Inuit Health Survey 2004.

**Table A2**

Correct identification of contaminants by socio-demographic characteristics (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Do not know any contaminants	Identification of worms or parasites exclusively	Identification of worms or parasites and of actual contaminants	Identification of actual contaminants exclusively	P-value
<b>Total</b>	13.6	15.2	33.7	37.5	
<b>Sex</b>					
Men	9.7 <sup>E</sup>	14.9	38.4	37.0	
Women	17.8	15.6	28.6	38.1	0.003
<b>Age group</b>					
15-29 years	22.5	18.9	29.7	28.9	
30-49 years	6.9 <sup>E</sup>	7.5 <sup>E</sup>	40.6	44.9	
50 years and +	11.2 <sup>E</sup>	22.5	28.3	38.0	< 0.0001
<b>Income</b>					
Less than \$20 000	16.7	19.9	25.7	37.7	
\$20 000 and over	4.8 <sup>E</sup>	5.9 <sup>E</sup>	49.8	39.6	< 0.0001

<sup>E</sup> Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

**Table A3**

Socio-demographic variables and changes in living habits reported since hearing about contaminants (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Changes in eating habits	
	Yes	P-value
<b>Total</b>	24.8	
<b>Sex</b>		
Men	27.4	
Women	21.9	0.13
<b>Job status</b>		
Work	22.4	
Student	53.1 <sup>E</sup>	
Other <sup>a</sup>	28.5	0.006

<sup>a</sup> Other: hunter support program, housework, retired or on pension, unemployment insurance, social welfare or other.

<sup>E</sup> Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

**Table A4**

Socio-demographic variables influencing the use of traditional items for medicinal properties (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Use of traditional items for medicinal properties	
	Yes	P-value
<b>Total</b>	28.2	
<b>Age group</b>		
15-29 years	22.1	
30-49 years	28.3	
50 years and +	41.9	< 0.0001
<b>Education level</b>		
Elementary school completed or less	40.9	
Secondary school not completed	24.8	
Secondary school completed or higher	24.9	< 0.0001
<b>Marital status</b>		
Single	22.7	
Married or common law	32.4	
Separated, divorced or widowed	26.2 <sup>E</sup>	0.004
<b>Community size</b>		
Large communities	24.7	
Small communities	31.2	0.023
<b>Frequency of fishing<sup>a</sup></b>		
Never or rarely	17.2	
Occasionally	29.3	
Frequently	36.3	< 0.0001
<b>Frequency of hunting<sup>a</sup></b>		
Never or rarely	21.0	
Occasionally	26.8	
Frequently	38.7	< 0.0001
<b>Frequency of berry picking</b>		
Less than once a month	22.4	
1 to 3 times a month	34.3	
Once a week or more	34.1	0.0001

<sup>a</sup> Never or rarely: Less than once a month for at least three seasons.

Occasionally: Other than "Never or rarely" and "Frequently".

Frequently: More than once a week for at least three seasons.

<sup>E</sup> Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

**Table A5**

Socio-demographic factors influencing sharing of catch (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Reports of sharing catch			P-value
	Often	Sometimes	Never / Do not Hunt	
<b>Total</b>	56.8	22.1	21.1	
<b>Sex</b>				
Men	68.8	22.6	8.6	
Women	44.0	21.6	34.4	< 0.0001
<b>Age group</b>				
15-29 years	51.2	28.1	20.6	
30-49 years	59.5	18.8	21.6	
50 years and +	64.6	14.6	20.8	0.0001
<b>Education level</b>				
Elementary school completed or less	58.5	17.8	23.6	
Secondary school not completed	52.2	25.7	22.2	
Secondary school or higher completed	65.8	17.5	16.7	0.001
<b>Marital status</b>				
Single	48.3	26.4	25.3	< 0.0001
Married or common law	63.4	20.0	16.6	
Separated, divorced or widowed	55.1	12.1 <sup>E</sup>	32.8 <sup>E</sup>	
<b>Job status</b>				
Work	61.0	21.2	17.8	
Other <sup>a</sup>	48.4	24.1	27.5	0.0001
<b>Income</b>				
Less than \$20 000	52.2	26.2	21.6	
\$20 000-\$39 999	62.5	16.7	20.8	
\$40 000 and over	74.0	14.2 <sup>E</sup>	11.9 <sup>E</sup>	< 0.0001
<b>Frequency of hunting<sup>b</sup></b>				
Never or rarely	27.8	18.8	53.4	
Occasionally	63.3	32.6	4.1 <sup>E</sup>	
Frequently	77.5	20.7	1.8 <sup>E</sup>	< 0.0001
<b>Frequency of fishing<sup>b</sup></b>				
Never or rarely	40.1	22.6	37.3	
Occasionally	62.7	26.4	10.9 <sup>E</sup>	
Frequently	75.5	18.9	5.6 <sup>E</sup>	< 0.0001

<sup>a</sup> Other: hunter support program, housework, retired or on pension, unemployment insurance, social welfare, student or other.

<sup>b</sup> Never or rarely: Less than once a month for at least three seasons.

Occasionally: Other than "Never or rarely" and "Frequently".

Frequently: More than once a week for at least three seasons.

<sup>E</sup> Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

**Table A6**

Socio-demographic variables influencing rejection of catch (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Reports of rejecting catches	
	Yes	P-value
<b>Total</b>	22.9	
<b>Sex</b>		
Men	27.7	
Women	16.0	< 0.0001
<b>Job status</b>		
Work	25.2	
Other <sup>a</sup>	17.4	0.025
<b>Income</b>		
Less than \$20 000	20.1	
\$20 000-\$39 999	27.7	
\$40 000 and over	30.7	0.015
<b>Coastal region</b>		
Hudson	25.6	
Ungava	19.5	0.042
<b>Frequency of hunting<sup>b</sup></b>		
Never or rarely	22.6	
Occasionally	15.7	
Frequently	25.9	0.016

<sup>a</sup> Other: hunter support program, housework, retired or on pension, unemployment insurance, social welfare, student or other.

<sup>b</sup> Never or rarely: Less than once a month for at least three seasons.

Occasionally: Other than “Never or rarely” and “Frequently”.

Frequently: More than once a week for at least three seasons.

Source: Nunavik Inuit Health Survey 2004.

**Table A7**

Socio-demographic variables influencing reports of animals “being harder to find or catch” (%), population aged 15 and over, Nunavik, 2004

Socio-demographic variable	Reports of animals being harder to catch or find	
	Yes	P-value
<b>Total</b>	50.5	
<b>Sex</b>		
Men	54.1	
Women	44.9	0.007
<b>Age group</b>		
15-29 years	49.1	
30-49 years	46.7	
50 years and +	60.9	0.008
<b>Education level</b>		
Elementary school completed or less	61.9	
Secondary school not completed	48.7	
Secondary school completed or higher	44.8	0.002
<b>Income</b>		
Less than \$20 000	54.3	
\$20 000-\$39 999	43.2	
\$40 000 and over	49.5	0.035
<b>Frequency of hunting<sup>a</sup></b>		
Never or rarely	42.8	
Occasionally	46.3	
Frequently	54.5	0.010

<sup>a</sup> Never or rarely: Less than once a month for at least three seasons.

Occasionally: Other than “Never or rarely” and “Frequently”.

Frequently: More than once a week for at least three seasons.

Source: Nunavik Inuit Health Survey 2004.





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Qanuippitaa?

HOW ARE WE?

