Prevalence of food insecurity in a Greenlandic community and the importance of social, economic and environmental stressors

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ABSTRACT

Objectives. Characterize and examine the prevalence of food insecurity in Qeqertarsuaq, Greenland, and identify stressors affecting the food system.

Study design. A mixed-methods study using quantitative food security surveys and semi-structured interviews.

Methods. Food security surveys (n=61) were conducted with a random sample of 6% of Qeqertarsuaq’s population. Semi-structured interviews (n=75) allowed participants to describe in their own words their experience of food insecurity and permitted in-depth examination of determinants. Key informant interviews were used to provide context to local perspectives.

Results. Prevalence of food insecurity (8%) is low. However, interviews reveal a more nuanced picture, with women, adults aged 55+, and non-hunters reporting constrained access to Greenlandic foods. Barriers restricting traditional food access include changing sea ice conditions, reduced availability of some species, high costs of hunting and purchasing food, tightening food sharing networks, and hunting and fishing regulations.

Conclusions. While the Qeqertarsuaq food system is relatively secure, the research highlights susceptibility to social, economic and environmental stressors which may become more prevalent in the future.

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INTRODUCTION

Food security is commonly defined as the ability to acquire safe, nutritionally adequate, and culturally acceptable foods in a manner that maintains human dignity (1,2). Food insecurity exists when food systems are stressed, compromising the ability to attain foods in appropriate quantities or of sufficient quality (3). In the circumpolar region, food security research has primarily focused on the impacts of contaminants, the role of traditional foods within Inuit society and changes in dietary preference known as the “nutritional transition” (i.e., food quality) (4–9). More recently, studies have begun considering the nutritional, sociocultural and economic needs of communities, expanding previous definitions of food security to encompass not only the availability of food but also elements of food quality and access (10–13). Food quality and access are of particular relevance for Arctic communities where traditional foods have strong cultural and dietary significance (14,15). Some studies have also quantitatively examined prevalence of food insecurity among communities, although the published literature is largely limited to a Canadian context (16–18).

The literature highlights multiple social, cultural, economic, and environmental stresses constraining the food security of many Arctic communities (3,10–13,17,19). Many of these stresses are predicted to accelerate in the future given the ongoing pace of resource development, globalization and climate change. In this context, developing a baseline understanding of the prevalence and experience of food insecurity and its determinants has been identified as a research priority (16,19–21). This is particularly pertinent in Greenland where limited research on food security has been conducted. A search of the database Web-of-Knowledge, for example, using the search terms “food (in)security” and “Greenland/Greenlandic” reveals no publications.

This study identifies and characterizes the prevalence of food insecurity in the Inuit settlement of Qeqertarsuaq in western Greenland, and describes the processes and conditions limiting the access, availability and quality of food.

MATERIAL AND METHODS

The town of Qeqertarsuaq was selected for this project during a scoping visit to the community in 2007 where residents and community stakeholders expressed strong interest in a study examining food security. Research objectives were reviewed with residents during a subsequent trip to more accurately address local research needs. The study was conducted with the help of two local researchers and followed ethical protocols, including ethics approval for working with human subjects from McGill University.

A mixed-methods approach was employed drawing upon the observations and knowledge of community members. This allowed the documentation of multiple insights on food security and facilitated respondent validation, where responses to questions were checked to see if they were congruent with the views of others. The methodology followed an iterative sequence beginning with 61 food surveys and semi-structured interviews carried out during March/April 2008. The surveys and interviews were conducted with the same participants at the same time, with interview questions following each food survey. Surveys and interviews were pre-tested...
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and translated through the help of a local interpreter and researcher into the West Greenlandic language, Kalaallisut. A simple random sample of 100 participants was chosen. First, a list of all community members was obtained from the municipality and checked to exclude those who had left the community, were deceased, or were under 18 years of age. Each individual was then assigned a number and a random generator was used to sample 100 individuals, approximately 10% of the community’s population. Each respondent was contacted 3 times either by phone or in person before being classified as a non-response, with 61 of those selected taking part in the survey and interviews (i.e., 61% response rate). A further 14 semi-structured interviews were conducted in August 2008 with randomly selected women and adults aged 55+ who had previously participated in the March/April study and who had been identified as a vulnerable subpopulation. Participation in the study was voluntary and confidential, with no monetary compensation.

**Food survey**
The food survey consisted of 35 closed-ended forced choice questions divided into 4 sections and sought to develop a rapid standardized characterization of the prevalence and experience of food insecurity among the sample population. The first section documented respondent characteristics concerning age, gender, occupation and hunting status. The second section consisted of 8 questions and sought to describe the Qeqertarsuaq food system, identifying the mechanisms of production and exchange, in addition to the role of Greenlandic (or traditional) foods and store-bought foods within the diet of community members. The third section comprised 4 questions and aimed to develop a baseline understanding of access and availability of both Greenlandic and store-bought foods during 2006–2007, compared with previous years. The final section consisted of a further 8 questions (Appendix 1) evaluating the severity and prevalence of food insecurity in Qeqertarsuaq between April 2007 and April 2008. Section 4 was built upon the U.S. Department of Agriculture’s (USDA) Food Security Module (FSSM), adapted and tested to ensure relevance within the community of Qeqertarsuaq (22,23). The FSSM is a widely used measure of food security, utilized by the U.S. Census Bureau’s monthly Current Population Survey, in addition to having other multiple broader applications (24). Locally adapted versions of the FSSM have been used within Arctic indigenous contexts and with indigenous peoples in non-Arctic regions, including Canada (16,17). The authors are not aware of the previous use of food security surveys in Greenland.

**Semi-structured interviews**
Semi-structured interviews are a standard method for gathering information in an open-ended format and have been used in various northern research contexts. A fixed list of questions was avoided in favour of an interview guide identifying key themes. Key themes sought to elaborate on food security trends identified in the survey to develop more comprehensive insights on the nature of food insecurity in the participants own words. The semi-structured nature of the interview allowed for flexibility: participants were guided by the interviewer’s questions, but the direction and scope of the discussion followed the associations they identified. Interviews lasted between 15 minutes and 2 hours, the majority of which were conducted in participants’ homes.
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**Key informant interviews**
Semi-structured interviews were also conducted with key informants, including the manager of the fish factory in Qeqertarsuaq, municipal administrators, and a representative working in the Greenland Home Rule Government (HRG) Ministry of Fisheries, Hunting and Agriculture. These interviews were conducted to provide context to observations and insights offered by local residents.

**Data analysis**
Responses to questions in section 4 of the food survey were categorized according to severity of food insecurity following procedures outlined by the USDA and illustrated in Table I (22,23,25).

Survey results were entered into SPSS version 16.0 for analysis. Due to a low prevalence of food insecurity in the sample, cell counts in cross tabulations were not sufficient to conduct inferential analysis of statistical significance for the food security module. Basic descriptive statistics were therefore used to describe responses to the food security questions. Responses in section 2 concerning the food system had acceptable cell counts to conduct chi-squared analysis (using a significance level of 95%) to assess variation in question response by respondent characteristics.

Voice recordings from the semi-structured interviews were transcribed, coded and analyzed through a content analysis process inspired by “constructivist grounded theory” (26, p. 319). Text was initially categorized through “open coding” (27,28) in which transcripts and field notes were reviewed and content was described in the margins. Descriptive analysis began in the field during data collection where data interpretation was discussed with local research partners and researcher reflections on the data collection process informed future interviews.

**Table 1.** Qeqertarsuaq food security results and categorization (adapted from USDA [23]).

| Category          | Description                                                                 | Total (%) n=61 | Male (%) n=28 | Female (%) n=33 | Age 18-34 (%) n=14 | Age 35-54 (%) n=27 | Age 55+ (%) n=20 |
|-------------------|-----------------------------------------------------------------------------|----------------|---------------|------------------|---------------------|-------------------|-----------------|
| Food secure       | No reported indications of food access problems or limitations.             | 50 (82)        | 23 (82.1)     | 27 (81.8)        | 11 (78.6)           | 23 (85.2)         | 16 (80)         |
| Marginal          | One or two reported indications. Little or no indication of changes in diet or food intake. | 5 (8.2)        | 3 (10.7)      | 2 (6.1)          | 3 (21.4)            | 1 (3.7)           | 1 (5)           |
| Food insecure     | Anxiety over food sufficiency and shortages, indication of reduced food intake. | 5 (8.2)        | 2 (7.1)       | 3 (9.1)          | 0 (0)               | 3 (11.1)          | 2 (10)          |
| Very low          | Reports of multiple indications of disrupted eating patterns, reduced food intake and loss of weight. | 0 (0)          | 0 (0)         | 0 (0)            | 0 (0)               | 0 (0)             | 0 (0)           |
After this initial stage of descriptive analysis text was coded a second time identifying emerging themes and patterns within interview responses and allowing theoretical analysis (29). Results of the March/April survey and semi-structured interviews were verified to account for possible misinterpretation through dialogue with the majority of respondents during door-to-door follow-up visits in August. These visits allowed the research team to discuss study results and interpretation with 52 participants in person, providing an opportunity to explore additional questions that emerged from analysis and offering a forum for respondent feedback regarding study results and the research process. All respondents received a translated pamphlet delivered to their home detailing study results and encouraging them to contact the research team with any comments, feedback or questions concerning the study. It is noteworthy that in this paper we use extensive quotes from the interviews to illustrate the experience of food insecurity and highlight problems surrounding the food system through the words of respondents.

The studied community

The community of Qeqertarsuaq is located on Disko Island off the west coast of Greenland (Fig. 1), accessible by private boat or ferry during the summer months and by helicopter during the winter. Qeqertarsuaq is one of the larger communities within Disko Bay, whose population was 1,055 in 2007 (30). The community is 90% Kalaallit (Greenlandic Inuit) with the dominant languages comprising the West Greenlandic language of Kalaallisut, followed by Danish and English (14,31). The local climate is characterized by long cold winters and short cool summers, average monthly temperatures ranged from -16.8°C in February to 7.8°C in August 2007 (32). Mean annual precipitation averages

Figure 1. Qeqertarsuaq, Greenland. (Illustration by Adam Bonnycastle, 2008.)
roughly 400mm, 60–70% is snow, typically present from September to late May (33).

The community has a mixed-subsistence/cash-based economy with residents pursuing traditional subsistence livelihoods of hunting and fishing in conjunction with waged employment (Fig. 2). Locally harvested animals known as kalaalimernit or “Greenlandic” foods are widely consumed and are a highly valued component of the local diet. Typical animals consumed include harp seal (Pagophilus groenlandicus), narwhal (Monodon monoceros), minke whale (Balaenoptera aequatorialis), reindeer (Rangifer tarandus), eider duck (Somateria mollissima), Greenlandic cod (Gadus ogac), Arctic char (Salvelinus alpinus) and Greenlandic halibut (Reinhardtius hippoglossoides). The harvesting and consumption of these foods are an integral part of local social customs, culture and identity (14,31).

In addition to traditional foods, store-bought foods (or qallunaamernit, “Danish” foods) are an important component of the Qeqertarsuaq food system. While traditional foods are clearly distinguished from store-bought foods by residents, these foods may be consumed with store-bought ingredients such as spices, chicken or rice. Store-bought foods are brought into the community by helicopter during winter months and by boat during the summer with frequency varying according to weather, visibility and ice conditions. Waiting for periods of up to 1 month before being able to restock are common in the winter because of storms, which leads to frequent shortages of fresh fruits, vegetables, packaged milk and milk products. The importance of store-bought and traditional foods in the Qeqertarsuaq food system is typical of “dual food systems” (3).

**Figure 2.** Qeqertarsuaq livelihoods and the local food system.
A. While snow crabs are seldom eaten locally, harvesting crabs with these nets for export provides important cash income in the community.
B. A variety of Greenlandic foods are commonly hung to dry on racks such as these outside homes. These sharks have likely been harvested to feed sledge dogs as they are not eaten locally.
C. The petrol station provides gas for a few vehicles in town but, more importantly, fuels a number of power boats and snowmobiles. Gas is also purchased to trade with hunters for traditional foods.
D. Residents hunt and fish for subsistence and for cash — selling their catch to community members and to the Royal Greenland fish processing plant in town. The plant additionally provides seasonal waged employment to a number of workers.
E. Dog sleds are commonly used by residents for transportation as well as leisure.
F. The Pilersuisoq grocery store provides waged employment to a number of residents in Qeqertarsuaq and supplies community members with a variety of foods, including frozen traditional foods processed by Royal Greenland. This grocery chain is one of two in Greenland and is a subsidiary of KNI (Kalaallit Niuersit or Greenland Trade) owned by the Greenland’s Home Rule Government. Hunting and fishing supplies can also be purchased here.
RESULTS

Sample population
As highlighted in Table II, the survey sample population is representative of the Qeqertarsuaq community, falling within 5% of the 2007 census distributions of gender and age. The survey population (n=61) was 46% male and 54% female. When asked about occupations, 53% identified as full-time waged workers, 5% as part-time waged workers, 1 person was unemployed, 6% were students and 2 people were occupational hunters. A number of waged workers also identified as being casual or non-occupational licensed hunters. The hunting status of the sample was composed of 19% non-occupational hunters, 22% summer hunters and 9% infrequent hunters. Forty-two percent of respondents reported never hunting or fishing.

The Qeqertarsuaq food system
Foods may be accessed through both monetary and non-monetary means in Qeqertarsuaq. Store-bought foods imported into the community are sold at Pilersuisoq, the main grocery store (Fig. 2F). A smaller store sells bread and non-perishable foods, and a third store, open seasonally, sells confections. Fresh traditional foods may be purchased directly from hunters at the outdoor market (kalaaliaraq) and outside the market from hunters in the community, while frozen traditional foods (typically fish processed by the Royal Greenland fish factory) may be purchased at the grocery store. Traditional foods may also be obtained through intrafamily sharing networks, inter- and intrafamily trade and through one’s own harvesting efforts or the efforts of one’s household. Common goods traded for Greenlandic foods include gas and

| Variable          | Target Population n (%) | Sample Population n (%) |
|-------------------|-------------------------|-------------------------|
| Sex¹              |                         |                         |
| Male              | 375 (51)                | 28 (46)                 |
| Female            | 356 (49)                | 33 (54)                 |
| Age¹              |                         |                         |
| 18-34             | 190 (26)                | 14 (23)                 |
| 35-54             | 333 (45)                | 27 (44)                 |
| 55+               | 208 (28)                | 20 (33)                 |
| Occupation        |                         |                         |
| Full-time waged   | -                       | 34 (53)                 |
| Part-time waged   | -                       | 3 (5)                   |
| Unemployed²       | 28 (4.7)                | 1 (2)                   |
| Retired           | -                       | 16 (25)                 |
| Student           | -                       | 4 (6)                   |
| Occupational hunter³ | 46 (4)               | 2 (3)                   |
| Home-keeper       | -                       | 0                       |
| Other             | -                       | 1 (2)                   |
| Hunting Status²   |                         |                         |
| Occupational      | 46 (4)                  | 2 (3)                   |
| Non-Occupational  | 150 (14)                | 12 (19)                 |
| Casual            | -                       | 20 (31)                 |
| Non-Hunter        | -                       | 27 (42)                 |

¹ (30)
² (40)
³ Target population figures based on hunting licences held in the community in May 2008.
Casual hunters harvest animals not in need of a licence such as some bird and fish species.
the use of boats or other hunting equipment. In addition, 2 female respondents noted that they traded sewing services for traditional foods.

The data indicate a relationship between household hunting status and means of traditional food access. Non-hunter households are significantly more likely to receive shared traditional foods than hunting households (p=0.028): all casual and infrequent hunter households reported receiving traditional foods from sharing while only 65% of hunting households reported this (Table III). Similarly, non-hunter and casual hunter households were significantly more likely than hunting households to report purchasing traditional foods (p=0.045): 83% of non-hunter and 100% of casual and infrequent hunter households purchased traditional foods in the last year while 65% of hunter households purchased traditional foods. Not surprisingly, those who do not hunt frequently obtain traditional foods from other households via sharing or purchasing.

Illustrating the significance of traditional foods in food sharing practices, 77% of respondents reported receiving shared Greenlandic foods (Table III, IV) while only 1 person received shared store-bought foods from someone outside their household. The individual who received store-bought foods described receiving confections from a basket won at a community bingo night by a friend. Participants noted sharing Greenlandic foods within the community as well as through the mail, some sending food to family as far away as Denmark. Regarding the sale and purchase of Greenlandic foods, 16.4% of respondents reported selling Greenlandic foods in the past year (p=0.045) while 35% reported buying Greenlandic foods (p=0.028).

| Questions and responses                                                                 | Total (%) n=61 | Occupational and non-occupational (%) n=20 | Casual and infrequent (%) n=9 | Non-hunter (%) n=24 | Refuse (%) n=8 | p-value |
|----------------------------------------------------------------------------------------|----------------|------------------------------------------|-------------------------------|---------------------|----------------|---------|
| 1. Think about all the food you ate in the past year (when you were in Qeqertarsuaq). How much of this was Greenlandic food? |                |                                          |                               |                     |                |         |
| Less than half                                                                         | 21 (34.4)      | 5 (25)                                   | 3 (33.3)*                     | 9 (37.5)            | 4 (50)*        | 0.515   |
| Half or more                                                                           | 38 (62.3)      | 15 (75)                                  | 6 (66.7)                      | 13 (54.2)           | 4 (50)         |         |
| Don’t know                                                                             | 2 (3.3)*       | 0*                                       | 0*                            | 2 (8.3)*            | 0*             |         |
| 2. Of the Greenlandic food you ate, how much did you or members of your household hunt or fish? |                |                                          |                               |                     |                |         |
| Less than half                                                                         | 35 (57.4)      | 3 (15)                                   | 8 (88.9)                      | 17 (70.8)           | 7 (87.5)       | 0.0     |
| Half or more                                                                           | 25 (41)        | 17 (85)                                  | 1 (11.1)*                     | 6 (25)              | 1 (12.5)*      |         |
| Don’t know                                                                             | 1 (1.6)*       | 0*                                       | 0*                            | 1 (12.5)*           | 0*             |         |
| 3. Did you or your household ever receive Greenlandic food from people outside your household without having to pay? |                |                                          |                               |                     |                |         |
| Yes                                                                                    | 47 (77)        | 13 (65)                                  | 9 (100)                       | 21 (87.5)           | 4 (50)*        | 0.028   |
| No                                                                                     | 14 (23)        | 7 (35)*                                  | 0*                            | 3 (12.5)            | 4 (50)*        |         |
| 4. Did you or your household purchase Greenlandic food in the past year?                |                |                                          |                               |                     |                |         |
| Yes                                                                                    | 45 (73.8)      | 13 (65)                                  | 9 (100)                       | 20 (83.3)           | 3 (37.5)       | 0.045   |
| No                                                                                     | 14 (23)        | 7 (35)*                                  | 0*                            | 3 (12.5)            | 4 (50)*        |         |
| Don’t know                                                                             | 2 (3.3)*       | 0*                                       | 0*                            | 1 (4.2)*            | 1 (12.5)*      |         |
| 5. Did you or your household ever sell Greenlandic food in the past year?               |                |                                          |                               |                     |                |         |
| Yes                                                                                    | 10 (16.4)      | 5 (25)*                                   | 1 (11.1)*                     | 3 (12.5)*           | 1 (12.5)*      | 0.687   |
| No                                                                                     | 50 (82)        | 14 (70)                                  | 8 (88.9)                      | 21 (87.5)           | 7 (87.5)       |         |
| Don’t know                                                                             | 1 (1.6)*       | 1 (5)*                                   | 0*                            | 0*                  | 0*             |         |

Analysis uses chi-square test.
* These cells have an expected count of <5.
Non-hunter household responses to question 2 as “half or more” suggest the question may have been misinterpreted.
of traditional foods in Qeqertarsuaq, 74% of participants noted purchasing traditional foods in the past year while 16% reported selling foods (Table III, Table IV).

Prevalence of food insecurity: the survey
Eight percent of respondents were characterized as food insecure in the food survey (Table I, 90% CI 2.4–14). More female respondents (9%) were food insecure than males (7%); however, there was insufficient statistical power to detect a significant association by gender. While larger datasets would be required to detect a gender association given low levels of food insecurity, qualitative interview results were consistent with increased food insecurity among women. No food insecurity was documented among young people aged 18–35, while 11.1% of adults aged 35–54 and 10% of adults aged 55+ were found to be food insecure. Cell counts in cross tabulations were not sufficient to test significance of association, with too few people categorized as food insecure.

Food insecurity: the interviews
Food security questions in the FSSM portion of the survey (Appendix A) were designed to assess the ability of respondents to attain adequate quantities of food and to measure related anxieties. The findings reflect levels of hunger and “worry” regarding food access in general and do not fully capture the ability of respondents to attain culturally significant Greenlandic foods, an integral component to food quality and therefore food security. Indeed, while respondents demonstrated food

Table IV. Number and percent of responses by sex and age to 5 questions concerning Greenlandic food access in Qeqertarsuaq.

| Questions and responses                                      | Total (n=61) | Male (n=28) | Female (n=33) | Age 18-34 (n=14) | Age 35-54 (n=27) | Age 55+ (n=20) |
|---------------------------------------------------------------|--------------|-------------|---------------|-----------------|-----------------|---------------|
| 1. Think about all the food you ate in the past year (when you were in Qeqertarsuaq). How much of this was Greenlandic food? |              |             |               |                 |                 |               |
| Less than half                                                | 21 (34.4)    | 6 (21.4)    | 15 (45.5)     | 5 (35.7)        | 10 (37)         | 6 (30)        |
| Half or more                                                  | 38 (62.3)    | 20 (71.4)   | 18 (54.5)     | 9 (64.3)        | 16 (59.3)       | 13 (65)       |
| 2. Of the Greenlandic food you ate, how much did you or members of your household hunt or fish? |              |             |               |                 |                 |               |
| Less than half                                                | 35 (57.4)    | 17 (60.7)   | 18 (54.5)     | 6 (42.9)        | 15 (55.6)       | 14 (70)       |
| Half or more                                                  | 25 (41)      | 10 (35.7)   | 15 (45.5)     | 8 (57.1)        | 12 (44.4)       | 5 (25)        |
| 3. Did you or your household ever receive Greenlandic food from people outside your household without having to pay? |              |             |               |                 |                 |               |
| Yes                                                           | 47 (77)      | 23 (82.1)   | 24 (72.7)     | 12 (85.7)       | 19 (70.4)       | 16 (80)       |
| No                                                            | 14 (23)      | 5 (17.9)    | 9 (27.3)      | 2 (14.3)        | 8 (29.6)        | 4 (20)        |
| 4. Did you or your household purchase Greenlandic food in the past year? |              |             |               |                 |                 |               |
| Yes                                                           | 45 (73.4)    | 21 (75)     | 24 (72.7)     | 10 (71.4)       | 21 (77.8)       | 14 (70)       |
| No                                                            | 14 (23)      | 6 (21.4)    | 8 (24.2)      | 3 (21.4)        | 6 (22.2)        | 5 (25)        |
| 5. Did you or your household ever sell Greenlandic food in the past year? |              |             |               |                 |                 |               |
| Yes                                                           | 10 (16.4)    | 5 (17.9)    | 5 (15.2)      | 3 (21.4)        | 5 (18.5)        | 2 (10)        |
| No                                                            | 50 (82)      | 23 (82.1)   | 27 (81.8)     | 10 (71.4)       | 22 (81.5)       | 18 (90)       |

Percentages may not add up to 100% due to alternative responses.
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security in the surveys, the majority of participants noted difficulty accessing Greenlandic foods in the interviews, particularly over the last year.

“From 2004 to this year, [seal hunting] has been very difficult.” –Jensugen

“It’s not like in the old days ... now the animals are more far away so it’s more difficult to catch them.” –Johannes

“It’s harder to get regulated animals.” –Gerda

“Compared to the last few years, it’s very hard to get seal meat.” –Elias

All respondents claimed they were consuming less Greenlandic food than they would like and 34% of respondents identified that their diet consisted mainly (i.e. >50%) of non-Greenlandic foods in the last year (Table IV). A preference for Greenlandic food was articulated by many respondents.

“Greenlandic foods are very strong. I don’t know how to explain it. Without Greenlandic food, I am nothing. A freezer box without Greenlandic food is nothing.” –Kristian

“I really appreciate getting Greenlandic food at the elder home. My favourite is dried cod and capelin. I eat less when I’m served Danish food at the elder home.” –Birgathe

Breaking down consumption of Greenlandic foods by respondent characteristic, 45% of women reported that their diet consisted mostly of store-bought foods compared with 21% of men. Sixty five percent of respondents aged 55+, however, obtained most of their food from traditional sources, although the majority (70%) obtained such foods primarily from sharing networks and from trading rather than their own harvesting activities. Sixty four percent of respondents aged 18–34 and 59% of respondents aged 35–54 obtained most of their foods from traditional sources (Table IV).

Stressors influencing food security

Environmental conditions and change

Animal availability and the ability to hunt and fish successfully and safely are closely linked with environmental conditions. In Qeqertarsuq, sea ice forms an important platform used for hunting and functions as a transportation route to hunting areas while also restricting subsistence and commercial fishing. In the early 1990s, the duration of the ice season lasted roughly 5 months, from early January to mid-to-late May (34), but respondents widely noted changing ice regimes with considerably less ice cover in recent years. Local observations are consistent with instrumental measurements by Hansen et al. (34) which documented a 50% decrease in sea ice coverage in Disko Bay between 1991 and 2004. In particular, interviewees noted that in the last decade there were numerous occasions when there was no ice. These changes have been to the benefit of those equipped for open water harvesting while disadvantaging winter harvesters. Consequently, many hunters equipped for winter harvesting described giving up their dog teams and replacing their winter hunting equipment with summer equipment. Dog teams are difficult to care for without sea ice and equipment is expensive to maintain when not being used.
“It’s difficult to hunt now because of the ice, it’s too thin.” –Steen

“Back in time, all hunters had dogs and they didn’t face the same problems as nowadays. I have noticed that they have been losing the dogs because of ice.” –Marline

However, in 2008, full winter sea ice coverage (100%) was observed in Disko Bay for the first time in a decade. With fewer people having access to winter hunting equipment (including dogs), there was a decrease in access to traditional foods. This may have consequently influenced the accessibility of Greenlandic foods for some respondents relative to previous years. One-fifth of respondents (20.3%) stated that their households were unable to obtain Greenlandic foods most of the time in the last year, while 44% of respondents stated it was more difficult to obtain traditional foods in 2008 than in previous years, compared with 21% who said it was easier and 33% who noted no change (Table V).

“We purchased a bigger boat but now need a smaller boat because there is more ice.” –Saalamit

“Now it’s difficult to get Greenlandic foods but if it [sea ice changes] continue, it could be more difficult.” –Ane

“Narwhal hunting has been better in years without ice. It is a lot more difficult to catch narwhals now because they hide beneath the ice.” –Jon

Variability in sea ice has direct implications on local food security by affecting the availability of some animal populations and reducing the accessibility of harvesting for some hunters. Changes in sea ice conditions impose an economic burden on hunters because they reduce harvest sales and require greater capital investment in order to equip hunters for unpredictable ice conditions, which further limit food security.

### Table V. Number and percent of responses by sex and age to 3 questions concerning Greenlandic food access in Qeqertarsuaq.

| Questions and responses | Total (%) n=61 | Male (%) n=28 | Female (%) n=33 | Age 18-34 (%) n=14 | Age 35-54 (%) n=27 | Age 55+ (%) n=20 |
|-------------------------|---------------|---------------|-----------------|-------------------|-------------------|-----------------|
| 1. In the last year, were you or your household able to get Greenlandic food most of the time? |               |               |                 |                   |                   |                 |
| Yes                     | 47 (73.4)     | 23 (82.1)     | 24 (72.7)       | 9 (64.3)          | 20 (74.1)         | 18 (90)         |
| No                      | 13 (20.3)     | 5 (17.9)      | 8 (24.2)        | 5 (35.7)          | 6 (22.2)          | 2 (10)          |
| 2. If NO, can you briefly tell me the main reasons why you or your household were unable to get Greenlandic food most of the time? |               |               |                 |                   |                   |                 |
| Lack of resources (income, equipment etc.) | 3 (23.1) | 0             | 3 (37.5)        | 1 (20)            | 1 (16.7)          | 1 (50)          |
| Hunting/fishing regulations | 1 (7.7) | 1 (20)        | 0               | 1 (20)            | 0                 | 0               |
| Environmental conditions (sea ice, weather, animals, etc.) | 3 (23.1) | 1 (20)        | 2 (25)          | 0                 | 3 (50)           | 0               |
| Personal (illness, old age, lack of training etc.) | 5 (38.5) | 3 (60)        | 2 (25)          | 2 (40)            | 2 (33.3)         | 1 (50)          |
| 3. How would you say your ability to get Greenlandic food was this year compared with previous years? |               |               |                 |                   |                   |                 |
| Easier                  | 13 (21.3)     | 6 (21.4)      | 7 (21.2)        | 2 (14.3)          | 5 (18.5)         | 6 (30)          |
| Harder                  | 27 (44.3)     | 15 (53.6)     | 12 (36.4)       | 8 (57.1)          | 10 (37)          | 9 (45)          |
| Same                    | 20 (32.8)     | 7 (25)        | 13 (39.4)       | 4 (28.6)          | 11 (40.7)        | 5 (25)          |

Percentages may not add up to 100% due to alternative responses.
Institutional barriers

Hunting and fishing in Qeqertarsuaq — like the rest of Greenland — is closely controlled, with regulations determining what species can be hunted, where and when. The flexibility of regulations are important in determining adaptive capacity to changing environmental conditions and hunting behaviour (35,36). In recent years, some hunters have noticed a change in the migration of eider ducks, describing their arrival and departure up to 2 weeks in advance of previous years, outdating the hunting season that commences June 15th in all of Greenland. The hunting season dates set by the Ministry of Fisheries, Hunting and Agriculture of Greenland’s Home Rule Government were thereby limiting the harvest of these birds and restricting traditional food consumption at the time of this study.

“The season begins 15 of June even though [eider ducks] arrive earlier now. The rules are the same for whole Greenland. They should be separated, like south Greenland with [its] own rules and north Greenland with [its] own rules because the climate is changing.” –Karl

“It’s mostly because of the changes in weather that the regulations that are set are too old.” –Mariane

“The regulation is bad because [you] can hunt for the birds when [they] are not around here in Qeqertarsuaq. ... It is getting harder to get the birds due to the regulation.” –Emilie

Interview participants expressed interest in having a greater involvement in the regulation of hunting, some highlighting this need in the context of recent environmental changes. Reflecting on the disparity between the pace of observed environmental changes in the community and government response, one respondent noted:

“Everything is changing. The only thing that is not changing is us, people.” –Kristian

Economic

Economic constraints were frequently noted as limiting access and availability of traditional foods. Both wage earners and non-wage earners described traditional foods as expensive relative to local incomes and the cost of “Danish” food alternatives. A common response when asked what the main reasons were that make it difficult to eat more Greenlandic food was expressed by one respondent:

“The price. If you want to eat the cheapest ones, it’s the Danish food.” –Ane

“Buying Greenlandic food is very expensive even though we both have paying jobs. It’s very rare that hunters sell meat for less than board prices off the market. Board prices are too high.” –Ane

Traditional food prices are negotiated by an organization representing Greenlandic hunters and fishers called Kalaallit Nunaami Aalisartut Piniartullu Katuffiat (KNAPK, or the Organization of Hunters and Fishers in Greenland). These “board prices” represent the cost paid by Royal Greenland (the Home Rule-owned fisheries company) when

...
purchasing from hunters and fishers while functioning as a minimum selling price for hunting and fishing products in the communities. Board prices ensure hunters receive adequate income to sustain subsistence livelihoods and therefore reflect the rising cost of fuel and other hunting expenses. Increasing hunting costs translate into increasing Greenlandic food prices rendering them unaffordable for many community members.

“Some people say to decrease the price of Greenlandic food so that they can get it. But conversely you have to think about hunters because they have to get money from their catches to cover gas expenses and like that, so it’s very hard to decrease the price.”

–Kristian

“All kind of Greenlandic food is expensive and the price is increasing every year.” –Karl

In addition to rising fuel and commodity prices, the cost of Greenlandic food is influenced by supply, as determined by quota restrictions, environmental conditions and animal accessibility. Residents believe reduced availability of seal and narwhal catch restrictions implemented by the HRG in 2004 have influenced board prices for these species.

“Now it’s more difficult to get seal and mattak from narwhal, especially the seal. In recent years you could buy whole seals just for 100 Dkr. But now it’s difficult.” –Ane

Sociocultural

Hunting frequency is an important determinant of Greenlandic food access despite various additional means of acquiring traditional foods. Illness, old age or a lack of training was described as the primary barrier restricting Greenlandic food consumption by 38.5% of survey respondents who were unable to obtain traditional foods “most of the time” in the last year (Table V). As trained hunters are typically men, many widows experience greater difficulty accessing Greenlandic foods with the loss of their husbands.

“It has been more difficult since my husband passed away. He was a hunter.” –Maren

“It’s difficult to access Greenlandic food when you have almost no money and [are] alone.”

–Ane

Food sharing and trading were highlighted as invaluable practices strengthening the local food system in times of stress and providing regular support for elders and non-hunters.

“Seal is harder to obtain than it was before, but if you have community and friends you will never go hungry.” –Louise

“It’s easier for us because we now give gas to hunters and get food in return.” –Ane

While 77% of survey respondents lived in households that received shared Greenlandic foods in the last year (Table III, Table IV), 98% of these respondents received food from family members. Many participants described a reduction in the breadth of food sharing networks over time, evolving from a system including neighbours, elders and other community members known to be in need to one internalized within extended family units.
"Many years ago they were sharing together ... like my grandparents. But now it's gone I think. Now you have to pay. You have to need money." – Marie

When asked about the prevalence of food sharing by the younger generation, one respondent noted:

"Compared to when I was a child, it's nothing today." – Ane

DISCUSSION

The numerous barriers restricting traditional food access described by respondents within the interview results contrast the relatively low level of 8% food insecurity found through the survey methods. The food security module (Appendix A) used to quantitatively document levels of food insecurity in Qeqertarsuaq focused primarily on characterizing levels of “hunger” or “worry” associated with not attaining adequate food resources. This measurement highlighted food access and availability while including one question addressing food quality asking respondents whether they were able to “afford to eat healthy meals” (question 3).

A food insecurity level of 8% found in Qeqertarsuaq does not represent the ability of residents to attain culturally acceptable foods. Questions did not capture food preferences or the cultural relevance of foods attained, both of which are integral components of food quality and therefore food security. By not differentiating between traditional and store-bought foods, the food security module failed to recognize the numerous environmental, socio-cultural and institutional barriers restricting traditional food access in Qeqertarsuaq. The quantitative value of 8% food insecurity in Qeqertarsuaq must therefore be interpreted in conjunction with qualitative results illustrating compromised traditional food access for some community members.

Canadian studies using similar methodology document significantly higher levels of food insecurity among Inuit communities. Using the same food security module as this study (Appendix A), Ford and Berrang-Ford (17) document a prevalence of food insecurity of 64% in the community of Igloolik, Nunavut, while Lawn and Harvey (16) report 83% of Inuit living in Kugaruuk, Nunavut, are food insecure. Even the high end of the confidence interval around the 8% estimate in this study (14%, 90% upper confidence bound) is well below these comparative estimates and lower than the national level of food insecurity in Canada and the United States (37,38).

Socio-economic indicators describe very different living conditions in Inuit communities of Arctic Canada relative to Greenland. The community of Igloolik, Nunavut, referred to above, is one example, with an unemployment rate of 16.1% (39), a value 13.7% higher than that of Qeqertarsuaq with a rate of 2.4% (40). As the relationship between social and economic stresses and food insecurity is well developed in the literature (3,5,10,41–43), it follows that these diverging characteristics may contribute to the varying levels of food insecurity experienced in these communities. Despite this possible connection, the variety of complicating factors influencing food security reach far beyond those that may be captured through social or economic health statistics, particularly within Inuit communities where
these measures often lack cultural relevance and poorly represent Inuit livelihoods. Further research exploring the characteristics of food insecurity and food security determinants in both Arctic Canada and Greenland is needed for a more comprehensive understanding of the differences between these localized experiences.

Common to this study and food security studies in Arctic Canada are findings of increased prevalence of food insecurity among women and connections between traditional food access and food security (3,10,11,17,43–45). Ford and Berrang-Ford (17) and Beaumier and Ford (13) found females of Igloolik, Nunavut, and those relying more heavily on market foods to have a higher risk of food insecurity, while Lambden et al. (42) describe Arctic food security as “contingent upon access to (traditional) foods” (p. 318). Regarding the indigenous communities of Canada more broadly, Lambden et al. (11) state, “Indigenous Canadians experience food insecurity … due to under-employment, unemployment, low incomes and high living costs” (p. 332).

Economic factors such as the price of market foods and the rising fuel and hunting costs are common barriers described as limiting food security in Arctic Canada (10,11). While economic factors play a similar limiting role restricting food security in Qeqertarsuaq, market foods were described as affordable relative to the purchase of Greenlandic foods with some respondents consuming greater quantities of market foods in times of economic stress. As the sale of traditional foods is uncommon within Inuit communities in Canada and generally incompatible with local cultural norms (46), traditional food access is negotiated through food sharing, trading and harvesting practices (3). Although expensive, the option of purchasing traditional foods in Greenland increases access for waged workers and others with cash income and limited harvesting ability while providing necessary cash resources for hunters. The traditional food market may simultaneously reduce the quantity of Greenlandic foods entering food sharing networks, thereby reducing access for vulnerable populations such as women and elders with limited alternative means of access.

“It’s very, very hard for elders. The sharing isn’t as common as back in time.” – Gerda

Although a greater portion of adults aged 35–54 were found to be food insecure than adults aged 55+ (Table I), qualitative interviews suggest that limited financial resources and diminished harvesting ability leave older generations vulnerable to food insecurity. Low cell counts and poor statistical power may account for the contradiction in results between quantitative (Table V) and qualitative results based on age.

“It’s very difficult when you only have a pension and it’s very difficult to get Greenlandic foods unless you hunt yourself.” – Kristian

Interview respondents noted that elders, women and non-hunters rely more heavily on food sharing than other sectors of the population, and that sharing and trading are of increased importance in times of food system stress. While food sharing strengthens community capacity to adapt to food system stressors, increasing food accessibility and food security, participants described sharing quantities of traditional food relative to the
success of their hunt, thereby sharing less when food resources were scarce.

“It depends on the season. We share more during spring and autumn because there is more.” –Kirstine

Sectors of the population relying heavily on food sharing are therefore more vulnerable to the effects of social, economic and environmental barriers restricting hunting frequency and harvest success at the community scale. The role of changing ice regimes, shifting animal migration patterns, reduced availability of seal populations in recent years and projected climatic changes could therefore have a disproportionate effect on the food security of women, elders and others relying on food sharing networks.

Many respondents observed warming temperatures in recent years and some described these changes in relation to reductions in extent of sea ice, seal availability and shifting animal migration patterns. According to studies by Hansen et al. (34), the mean annual temperature in Qeqertarsuaq rose 0.4°C per year between 1991 and 2004, with warming of comparable magnitude experienced from 1920 to 1930. Past experience with similar climate-induced environmental changes may have increased the ability of some community members to adapt and respond to changes incurred by the local food system. Many residents expressed an understanding that climatic variability and change may influence the accessibility of Greenlandic foods, necessitating adaptation.

“If the climate gets warmer, like in recent years, some animals might disappear. We might have to adapt that they are not allowed anymore. You cannot control the nature.” –Laila

“We adapt to the climate changes, so do the animals.” –Karl

Others expressed concern regarding the future viability of subsistence livelihoods given recent climate warming and difficulties acquiring Greenlandic foods.

“Being a full-time hunter has no future. I would rather say to my children, don’t like Greenlandic food because in future it will be more difficult to get. In future where are the seals? Where are the whales? Don’t eat too much Greenlandic food because Greenlandic food will disappear in future. I hope not.” –Kristian

Conclusion

This study examines the multiple stressors affecting the Greenlandic food system of Qeqertarsuaq. While survey respondents experienced high levels of food security in 2008, access to culturally and nutritionally significant Greenlandic food was limited among women, adults aged 55+, and non-hunters, compromising food quality. Social, economic and environmental stressors at various temporal scales were found to play a contributing role determining food security. The dynamic nature of food security and the multiple temporal scales within which changes occur necessitate ongoing research that explores food security in Disko Bay and develops a more comprehensive understanding of the attributes of these changes.
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Appendix I. Section 4 of the Survey Questions.

1. Some people might say, “We worried whether our food would run out before we got money to buy more or were able to go hunting or fishing.” In the last 12 months, did that happen often, sometimes or never for you or your household?

2. Some people might say, “The food that we bought, hunted or fished just didn’t last, and we were not able to get more.” In the last 12 months did that happen often, sometimes or never for your household?

3. Some people might say, “We couldn’t afford to eat healthy meals.” In the last 12 months did this happen often, sometimes or never for your household?

4. Since March last year, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn’t enough food?

5. In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough food?

6. In the last 12 months, were you ever hungry but didn’t eat because you couldn’t afford enough food OR were not able go hunting or fishing?

7. In the last 12 months, did you lose weight because you didn’t eat enough food?

8. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn’t enough food?