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Challenges and complexities in Northern food systems: Mapping food access and decision-making in Nunavik

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Abstract

The Canadian Arctic and sub-Arctic are undergoing rapid ecological, social, and political transformations that profoundly affect local food systems. This study examines how households in Nunavik, Canada, navigate their complex, mixed subsistence and market-based food systems and identifies the

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factors shaping decision-making when selecting food sources. Specifically, this study asks: (1) What are the primary food acquisition sources for households, how are they accessed, and what challenges are faced? and (2) What key factors influence household decision-making in selecting food acquisition sources? Using a co-production of knowledge approach, participatory workshops were conducted with 17 community members from five Nunavik communities. Data included co-created conceptual food system maps, participant-placed preference cards, and facilitator notes from scenario-based discussions. Findings were subsequently validated in a follow-up community engagement session. Thematic qualitative analysis revealed that Nunavimmiut households draw on over 13 distinct food acquisition sources, ranging from direct harvesting and community freezers to grocery stores, family and friends, and increasingly, social media platforms that facilitate both sharing and informal markets. High costs of food and fuel, transportation barriers, time constraints, and other social factors emerged as persistent challenges. Income level and the presence of a skilled hunter strongly influenced decision strategies: low-income households without hunters relied heavily on community freezers and kin networks, while higher-income households accessed additional options such as buying country food from Inuit harvesters and southern grocery stores. These results underscore the adaptive capacity of Nunavik's food systems alongside their sensitivity to economic and environmental disruptions. Further, these results point to the importance of addressing both structural barriers and digital access. Policies that enhance community freezers, transportation, food assistance programs, and culturally grounded digital tools can strengthen food security and resilience. This study highlights the value of interdisciplinary, community-based approaches that integrate cultural preferences, economic dimensions, and social networks in supporting Arctic food systems under conditions of rapid change.

Keywords
Nunavik, Arctic food security, co-production of knowledge, participatory methods, food system mapping, Inuit food systems

Introduction
The Canadian Arctic and sub-Arctic are experiencing rapid and complex changes that are profoundly impacting the daily lives of their residents, espe-

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Disclosures
The authors used Grammarly as a writing-support tool during manuscript preparation. Grammarly may use artificial intelligence to provide suggestions related to grammar, clarity, and sentence structure. No AI tools were used to generate original research findings, analyze data, or make substantive scientific interpretations. All AI-assisted suggestions were reviewed and approved by the authors, who take full responsibility for the final content of the manuscript.

cially regarding access to food. Environmental change is altering the region's weather patterns, landscapes, and ecosystems. Socio-economic factors, like population growth, increasing resource development, and intensified interest in energy, tourism, and fisheries, are reshaping the economic fabric of these communities, while cultural values and knowledge remain strong and anchored (Ford et al., 2021; Larsen & Fondahl, 2015; Lovecraft & Eicken, 2011). Indigenous communities, while striving to enhance their sovereignty and self-governance, face unique challenges as these transformations influence their access to primary food sources. These challenges are compounded by the historical and ongoing effects of colonization on Indigenous land rights and food sovereignty. For Arctic residents, who often rely on a combination of traditional and market-based food sources, these changes raise critical questions about food security.

Despite the urgency of these issues, there is limited research that examines how environmental change and development pressures are affecting food systems in Arctic and sub-Arctic regions. This paper defines food systems as the interconnected networks of stakeholders, including communities, institutions, and organizations, that are involved in producing, distributing, and consuming food in these regions (Rastoin & Ghersi, 2010). Indigenous food systems, in particular, represent complex relationships that incorporate traditional practices, knowledge, and cultural significance, encompassing the gathering, harvesting, and preparation of food with a reliance on local biodiversity and traditional ecological knowledge (Kuhnlein et al., 2009). As the landscapes, ecosystems, and social structures of these regions evolve, so too do the challenges to sustaining these food practices and ensuring food security.

Food systems can be considered a type of social-ecological system (SES) (Allen & Prosperi, 2016). Berkes and Folke (1998) first introduced SES to describe how humans' social systems and the surrounding natural environment interact. An SES lens recognizes that environments are embedded within complex systems that include regional and global influences and multilayered governance structures. Previous researchers have utilized SES approaches to demonstrate the complex interlinkages within food systems and food security outcomes in Northern regions (Fauchald et al., 2017; Hopping et al., 2010; Kenny, 2017; Zimmermann et al., 2023). An SES approach recognizes that the sustainability of food systems—and therefore the food security of communities dependent on them—is influenced by a wide range of social, economic, institutional, and ecological variables (Colonna et al., 2013).

Arctic and sub-Arctic food systems are shaped by unique geographical, environmental, and cultural factors. Inuit food systems rely heavily on traditional foods that are seasonal and influenced by climate and animal migration, requiring traditional knowledge for hunting and gathering (Ford, 2009; Kenny, 2019; Revenko & Soldatenkova, 2022; Wilson et al., 2020; Zimmermann et al., 2023). However, high transportation costs, limited employment opportunities, and limited access to fresh products contribute to food insecurity, with many relying on cheaper, nutrient-poor store-bought foods (Kuhnlein & Receveur, 2007; Little et al., 2021; Naylor et al., 2023). Environmental change further threatens these systems by, for instance, disrupting wildlife and hunting grounds and altering the population size of key species (Brockington et al., 2023; Ford, 2009; Kenny, 2019; Revenko & Soldatenkova, 2022; Wilson et al., 2020; Zimmermann et al., 2023).

The structure and function of food systems directly shape food security outcomes, determining who can access food, how reliably, and in what cultural context. Food security can be defined and quantified in many ways. However, Inuit-based organizations have worked to define food security in their own image. For example, a common definition created by the Inuit Circumpolar Council (ICC) is "the natural right of all Inuit to be part of the ecosystem, to access food, and to care for, protect, and respect all forms of life, land, water, and air" (ICC-Alaska, 2015). This definition emphasizes the ability of Inuit to obtain, process, store, and consume sufficient amounts of healthy and nutritious food that is culturally significant and spiritually needed. It encompasses the responsibility to pass on knowledge to future generations and highlights the connections among food, cultural identity, and environmental health. Furthermore, six

interconnecting dimensions of food security are identified by the ICC: (1) Food Availability, (2) Inuit Culture, (3) Decision-Making Power and Management, (4) Health and Wellness, (5) Stability, and (6) Accessibility. The ICC notes that without food sovereignty, food security cannot exist (ICC-Alaska, 2015). Additionally, complementing this ICC framework, Inuit Tapiriit Kanatami's Inuit Nunangat Food Security Strategy (INFSS) further situates food security within a rights-based and systems-level context. The strategy adopts the Food and Agriculture Organization of the United Nations' (FAO) globally recognized definition of food security, which states that "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Food and Agriculture Organization of the United Nations [FAO], International Fund for Agricultural Development [IFAD], UNICEF, World Food Program [WFP], & World Health Organization [WHO], 2025, p. 177). Unlike narrower definitions that focus solely on food availability, the FAO standard has evolved to incorporate dimensions such as agency, stability, sustainability, access, availability, and utilization, making it one of the most comprehensive and widely applied international frameworks (High Level Panel of Experts on Food Security and Nutrition [HLPE], 2020). The INFSS applies this definition to the unique realities of Inuit Nunangat, where food systems depend on a combination of country foods, commercial fisheries, and store-bought foods. (Country foods refer to traditional foods derived from locally or regionally harvested aquatic and terrestrial wildlife, fish, and plants.) It also identifies the structural drivers of food insecurity such as poverty, high living costs, climate change, and diminished Inuit self-determination. It calls for coordinated, Inuit-led actions to advance food sovereignty across Inuit Nunangat (ITK, 2021).

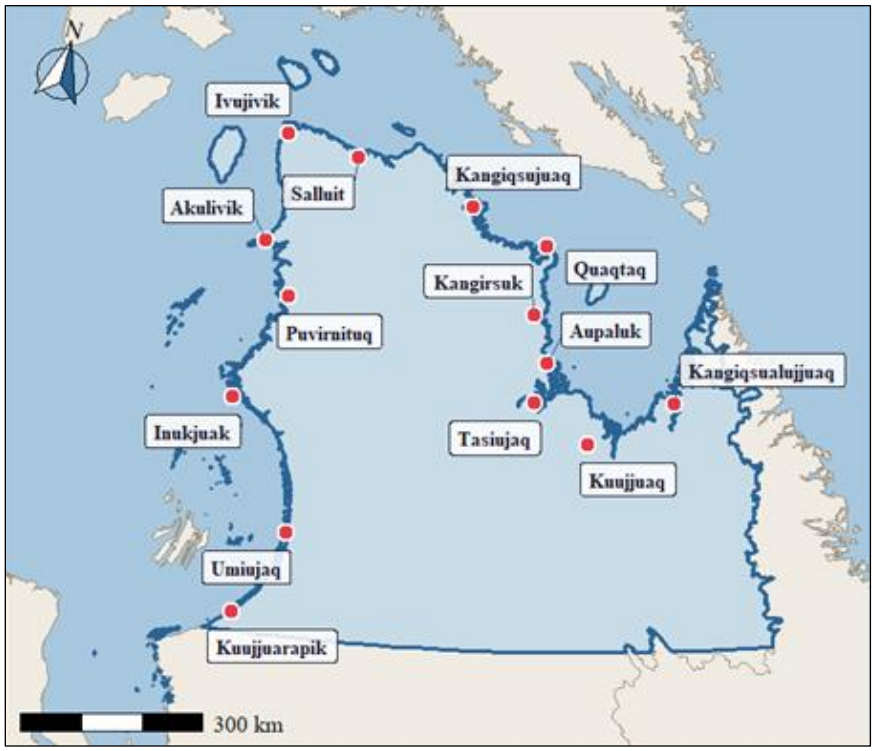
Despite a growing awareness of food insecurity issues in Arctic and sub-Arctic regions, research has yet to fully explore the intricacies of household-level decision-making in navigating Northern food systems, particularly under the combined pressures of environmental change and socio-economic development. While previous studies have utilized an SES approach to examine food security in these regions, there remains a critical gap in describing how individual households in Indigenous communities, such as those in Nunavik, Canada, access and choose their food sources, as well as the specific barriers they encounter in the process (Brockington et al., 2023; Kenny, 2017; Zimmermann et al., 2023). This research addresses this gap by employing a co-production of knowledge approach to examine two key questions: (1) What are the primary food acquisition sources for households in Nunavik, how are they accessed, and what challenges arise in doing so? and (2) What factors influence household decision-making when selecting food acquisition sources?

Methods

Study Context: Food Systems in Nunavik, Québec

Nunavik is an Inuit land claim settlement area in Northern Québec and contains 15 communities. These communities are all fly-in fly-out, meaning that there is no road or rail connection to each other or to communities in the south (Figure 1). Nunavik was politically and legally recognized after many years of negotiations between the Government of Québec, the federal Canadian government, a Canadian crown corporation (Hydro-Québec), and the Inuit and Cree. This resulted in the James Bay and Northern Québec Agreement (JBNQA) of 1975, the first modern land claims treaty in Canada. The JBNQA applies to mainland Nunavik, which is still considered part of the province of Québec, but it operates through nested sovereignty and nested federalism, a governance structure in which multiple overlapping levels of jurisdiction, including federal, provincial, and Indigenous authorities, operate simultaneously in the same territory (Wilson et al., 2020). The Nunavik Inuit Land Claims Agreement (NILCA), for its part, applies on the offshore Nunavik, what is referred to as the Nunavik Marine Region (NMR); this agreement came into effect in 2007 and was signed by the governments of Canada, Nunavut, and the Makivik Corporation (Makivvik).

Figure 1. Map of Nunavik and its Communities



The Nunavik Marine Region Wildlife Board (NMRWB) was established under to the NILCA to serve as the main instrument of wildlife management in the NMR. Its management decisions are made in consideration of both traditional Inuit Knowledge, especially from the Anguvigaq, and western science. The board comprises members from four parties:; Makivvik, Fisheries and Oceans Canada, the Department of Environment and Climate Change Canada, and the government of Nunavut. Among its various responsibilities under the NILCA, the NMRWB has sole authority to establish, modify, or remove levels of total allowable take or harvesting for all species in the NMR, modifying these from time to time as circumstances require.

Food systems in Nunavik operate on a mixed economy in which Nunavimmiut (Inuit from Nunavik) consume both country foods and market foods (see Table 1). The availability and consumption of these foods can vary between communities due to differences in the availability and abundance of local species. For instance, beluga is more commonly consumed by communities in the Hudson Strait region than the Hudson Bay (Allaire et al., 2021). Additionally, some country foods are more accessible than others in terms of the effort and resources required to harvest them. For example, harvesting fish and berries involves different time commitments, ecological knowledge, and coordination than pursuing larger species like caribou or marine mammals, which often require multiple harvesters and extended periods away from the community. There is also a temporal component, as certain country foods are only available during certain times of the year.

While country foods are harvested locally, an individual household may obtain food in many ways. Besides direct harvesting, a household may also receive country foods through a friend or relative in the community or region, or from other regions. Food-sharing networks are an important part of Inuit culture. According to the 2017 Qanuippitaa? regional health survey, 93% of Nunavik households reported giving food to one

Table 1. Country Foods and Market Foods Consumed in Nunavik Based on Allaire et al. (2021)

Country Foods	Market Foods
beluga, seals, walrus, caribou, polar bear, muskox, partridge, goose, arctic char, salmon, trout, pike, walleye, whitefish, sculpin, mollusks, clams, scallops, whelks, seaweed, and berries	vegetables, fruit, processed meat, red meat, chicken, turkey, eggs, canned fish, legumes, bread, pasta, nuts, milk, yogurt, and cheese

or more other households, while 86% of individuals reported receiving food from others (Allaire et al., 2021). Additionally, there are government-sponsored programs for country foods, such as community freezers and hunter support programs (Kishigami, 2000; Ramirez Prieto et al., 2024). These programs hire local hunters and pay for their supplies so they can hunt on behalf of the community. The hunter support program can also help facilitate the delivery of country foods between communities if one community is having difficulty hunting.

Market foods consumed in Nunavik are purchased at local grocery stores or obtained through outshopping (ordering food from southern retailers for delivery to the community). All communities have a community-owned co-op store, and 10 of the 15 communities have a store operated by the Northwest Company. However, nutrient-dense market foods are often very expensive, and households with lower socioeconomic capacity tend to eat more processed, less nutritious market foods, which have been associated with negative health consequences such as obesity, diabetes, and hypertension (Kuhnlein & Receveur, 2007; Little et al., 2021).

Despite the diversity of food sources available to Nunavimmiut, food insecurity remains a pressing issue in Nunavik, driven primarily by economic barriers that include high food costs, limited employment opportunities, and low household incomes—factors that restrict access regardless of food availability (Naylor et al., 2023). More than three-quarters of Nunavimmiut (78%) reported experiencing some level (marginal, moderate, or severe) of food insecurity in 2017. Food insecurity was associated with certain social and economic factors (Furgal et al., 2021). For example, food insecurity was more common among youth (aged 16 to 19) than adults or Elders, among individuals that make less than 40,000 CAD a year, and in communities in the Hudson Bay region (Furgal et al., 2021).

Participatory Workshops as Tools to Co-Produce Knowledge

Community members in Nunavik, like other Arctic and sub-Arctic communities, possess a deep, multigenerational, and locally specific knowledge (Berkes et al., 2007; Tremblay et al., 2006). Local knowledge is the collective knowledge held by local people over time through their experiences, observations, and interactions with their surroundings (Warburton & Martin, 1999). Traditional or Indigenous Knowledge includes culturally rooted practices (Bruchac, 2014). In the North, there is also Inuit Qaujimajatuqangit (IQ) which refers to the collective body of Inuit knowledge, values, and worldviews developed through generations of lived experience on the land (Karetak et al., 2017).

Historically, the integration of local or traditional knowledge into scientific research was absent (Fischer, 2000). When the value of this knowledge was eventually recognized by the academic scientific community, it was often collected in an extractive and exploitative manner. This practice—commonly referred to as "neo-colonial," "helicopter," "parachute," or "hit-and-run" research—resulted in the appropriation of local knowledge without equitable benefits or involvement of the communities themselves (Graugaard, 2020; Stefanoudis et al., 2021). This extractive approach has perpetuated colonial dynamics and strained the trust between scientific researchers and Indigenous communities, hindering the potential for meaningful collaboration.

Recognizing the shortcomings of extractive research, a shift toward collaborative, community-based research that co-produces knowledge with and for a community has gained traction. This approach emphasizes partnership and shared decision-making between scientists and community members (Berkes et al., 2007; Yua et al., 2022). Co-production of knowledge acknowledges the importance of diverse knowledge systems and aims to create research that is relevant, inclusive, and beneficial to all stakeholders (Armitage et al., 2011). By working collaboratively, researchers and community members can bridge the gap between scientific understanding and Indigenous knowledge, leading to a more holistic comprehension of complex issues.

Participatory workshops are one way that knowledge can be co-produced with community partners (Djenontin & Meadow, 2018). Workshops can be defined as arranged events of limited dura-

tion where participants with a common domain, field, or agenda come together to actively participate, influence the workshop's direction, and practice relevant techniques, skills, and situations (Ørngreen & Levinsen, 2017). Workshops are conducted by individuals experienced in the domain and are designed to promote genuine participation, with small participant groups allowing for personal attention and active engagement. The expected outcome of such workshops includes generating new insights and collaborative understandings related to complex social-ecological processes. Participatory workshops have been used effectively in Nunavik and broader Arctic contexts to co-produce knowledge about food systems, ecosystems, and community futures, including through scenario co-development processes with Nunavimmiut communities (Falardeau et al., 2019, 2025).

Developing a participatory workshop on food systems in Nunavik

The purpose of this workshop was to co-produce with Nunavimmiut a general description of the food system of a typical household in Nunavik, while recognizing that every community has unique assets, histories, infrastructures, programs, and challenges that no single general model can fully capture. Nonetheless, such a description provides a valuable foundation for understanding broad patterns in how households access food and the barriers they face across the region. Specifically, this workshop sought to better understand the various food acquisition pathways that a typical household interacts with, the challenges associated with accessing these pathways, and how various social and environmental conditions shape household decision-making within this food system.

The workshop proposal received institutional review approval from the Centre Hospitalier Universitaire (CHU) de Québec Université Laval (SIRUL 128984). To gain this approval, researchers first consulted with various community partners about the workshop idea. Particularly, researchers spent months discussing this workshop with the Anguvigaq, Nunavik Marine Region Wildlife Board (NMRWB), Kativik Regional Government (KRG), Makivvik Corporation, Nunavik Regional Board of Health and Social Services Nunavik Nutrition (NRBHSS), and Nunavik Nutrition and Health Committee (NNHC) to gain their support and invitation letters. This process helped ensure that participants were safeguarded, their knowledge and time were respected, and this work would benefit the Nunavimmiut.

In November 2023, a workshop was held in Kuujjuaq, Nunavik (Québec) as part of the "Sustainable and resilient country food systems for future generations of Nunavimmiut—Promoting food security while adapting to changing northern environments" project funded by Sentinelle Nord (the principal investigators [PIs] were authors Kenny and Maps). The workshop included 17 community members across five communities (Kuujjuaq, Kangirsuk, Chisasibi, Kangiqsualujjuaq, and Kangiqsujuaq), as well as two interpreters. Ten participants identified as female and seven as male. Participants represented Elders, youth, harvesters, heads of households, and Inuit employees of regional organizations. Participants were recruited by sending invitation letters through the community partners previously consulted, who then disseminated these letters to individuals within their networks.

The workshop lasted two days, during which various activities were facilitated so that information could be gathered about the local food system, food preferences, and common challenges faced when trying to acquire food. The workshop was held in English with Inuktitut simultaneous interpretation and text written in Inuktitut syllabics. Specifically, the workshop engaged participants in two key tasks directly aligned with the study's research questions. First, participants mapped a conceptual food system and identified challenges within it, addressing the objective of understanding the primary sources of food for households, how they access these sources, and the barriers they face. Second, through participatory scenarios, the workshop explored household decision-making processes in acquiring and consuming food, providing insights into the key factors that influence these decisions. The step-by-step protocol for these activities can be found in the Appendix.

Consistent with the National Inuit Strategy on Research (ITK, 2018), which affirms Inuit ownership, access, and control over data derived from

their peoples and lands, findings were shared back with participating communities and regional partners prior to publication, and feedback from these engagements was meaningfully incorporated into the final manuscript. Raw data that include workshop maps, notes, and recordings are held securely by the research team and will be shared proactively with community partners and regional organizations; any future use or reanalysis requires explicit free, prior and informed consent (FPIC) from the relevant communities. It is worth noting that at the time of this research, Nunavik lacked a centralized research governance mechanism—a gap the emerging organization Atanniuvik[1] is being established to address, with a mandate to oversee research review and approval in a manner grounded in Nunavik Inuit self-determination (Atanniuvik, n.d.).

Map a conceptual food system and identify challenges within that system

Food system mapping is an approach used to identify all stakeholders, institutions, goods, activities, food flow rates, and policy, economic, and environmental characteristics within a food system (Allen & Prosperi, 2016; Jacobi et al., 2019). In this activity, participants were separated into two groups based on whether their community was based on the Ungava Bay/Hudson Strait area or the coast of the East Hudson Bay. Each group was given a large piece of paper, "Food Location Cards," two different colored markers, and yellow triangle "Challenge" tokens (Figure 2). The "Food Location Cards" represented places where a household might get food (the environment, grocery store, friend's house, etc.). The Challenge tokens represented the difficulties (e.g., time, money, knowledge, etc.) that households might face when trying to utilize these pathways.

Participants were asked, "where does a typical Inuk household get food from?" Then, they were instructed to draw the flow of food or pathway from these locations to the household and to identify if these flows were market foods or country foods using the two different color markers.

This activity was a deductive approach, as preconceived options for the Food Location and Challenge tokens were created based on literature, but community members were always encouraged to disclose new Food Locations or Challenges that were not provided.

Identify household decisions in acquiring and consuming food through participatory scenarios

The next activity used the food system conceptual maps created in the first activity (Figure 2) in conjunction with provided scenarios to understand

Figure 2. Examples of the Food Systems Maps Generated in Response to the Question, "Where does a typical Inuk household get food from?"



[1] https://atanniuvik.ca

how a household would make decisions about where to acquire food based on the scenario (Figure 3). While scenario planning has roots in military strategy and business (von der Gracht, 2008), it has more recently been applied to investigate community systems (Bennett et al., 2016; Brown et al., 2016; Flynn et al., 2018; Ogilvy, 2002; Rawluk & Godber, 2011; Zapata & Kaza, 2015), including in Nunavik (Falardeau et al., 2025).

Each group was given 10 "Order Cards" labeled 1 to 10. These numbers represented first choice, second choice, third choice, etc., for where a household would go to acquire food for the given scenario (e.g., through harvesting, the Co-op store, etc.). Ten cards were chosen because that is considered the upper end of the maximum cognitive load that humans can effectively manage and prioritize around (Miller, 1956). Each group was presented with four scenarios and asked to rank their preferences for acquiring food by placing the preference cards on the food location cards. The following scenarios were given:

1. What is the first place, second place, third place, etc., that a typical Inuk household would get food from *if* the household had *low income* and *no hunter*?
2. What is the first place, second place, third place, etc., that a typical Inuk household would get food from *if* the *community freezer were broken*?
3. What is the first place, second place, third place, etc., that a typical Inuk household would get food from *if* the household had *high income* and *not very skilled hunter*?
4. What is the first place, second place, third place, etc., that a typical Inuk household would get food *if* there was an *extended period of poor harvest* by hunters in the community?

Only four scenarios were able to be explored due to time constraints. However, these scenarios were selected because previous work has suggested that income, status of a hunter, and country food availability were key determinants of food security (Allaire et al., 2021, Gilbert et al., 2021). The research team acknowledges the cultural sensitivity surrounding harvesting capacity and food security in Inuit communities, where hunting is a deeply valued source of cultural identity and pride. To navigate this sensitivity, scenarios were deliberately framed around 'a typical Inuk household' rather than directed at individual participants. This approach draws on established qualitative research methodology suggesting that hypothetical, third-party framing reduces social desirability bias by making responses less self-implicating, thereby allowing participants to discuss sensitive topics more openly and candidly (Bergen & Labonté, 2019; Fisher, 1993; Ried et al., 2021)

Figure 3. An Example of the Food System Map Being Used with the "Order Cards"



Data Analysis

Thematic qualitative anal-

ysis was used to evaluate both the conceptual food system maps and the decision-making processes associated with each scenario. Thematic analysis is a flexible and widely used qualitative method that systematically identifies, analyzes, and interprets patterns or themes within qualitative data (Riger & Sigurvinsdottir, 2016). This approach supports the examination of complex datasets by capturing both explicit and implicit meanings, thereby facilitating a detailed understanding of participants' experiences and perspectives. By organizing large volumes of qualitative information into coherent themes, thematic analysis enables the synthesis of key insights and allows for comparison across groups and scenarios (Riger & Sigurvinsdottir, 2016).

Analysis followed a multistage, iterative process. Initial familiarization with the data involved repeated review of digitized photographs of the conceptual food system maps, participant notes, and preference cards to ensure comprehensive contextual understanding. Open coding was then conducted, with initial codes assigned to distinct concepts, relationships, and decision factors evident in the materials. These codes were subsequently grouped into broader categories based on conceptual similarity and recurrence across groups and scenarios. All coding was conducted by the first author, with codes and emerging themes subsequently reviewed by the broader research team to ensure consistency and interpretive rigor. Any discrepancies or differences in interpretation were resolved through iterative discussion until consensus was reached. Through iterative refinement, categories were merged, revised, or expanded to develop a final set of overarching themes that represented key components of the food system and the primary factors influencing food acquisition decision-making.

Data Validation

In May 2025, preliminary findings from the workshop were shared during a follow-up community engagement event in Kuujjuaq to support validation of the results. It was facilitated by a local community member with extensive experience in local food system research. The session included seven community members, two of whom were Elders, while five identified as primary household members responsible for food preparation and acquisition. During this engagement, the conceptual food system model and decision-making tree were presented and discussed. Participants indicated broad agreement with the overall findings but noted that social media plays a more significant role in food acquisition than was captured in the initial analysis. Additionally, participants emphasized that decision-making pathways vary substantially across communities, reflecting local contexts and constraints. These insights were incorporated into the final conceptual models and results.

Results

Conceptual Food System: Where does a typical Nunavimmiut household get food from?

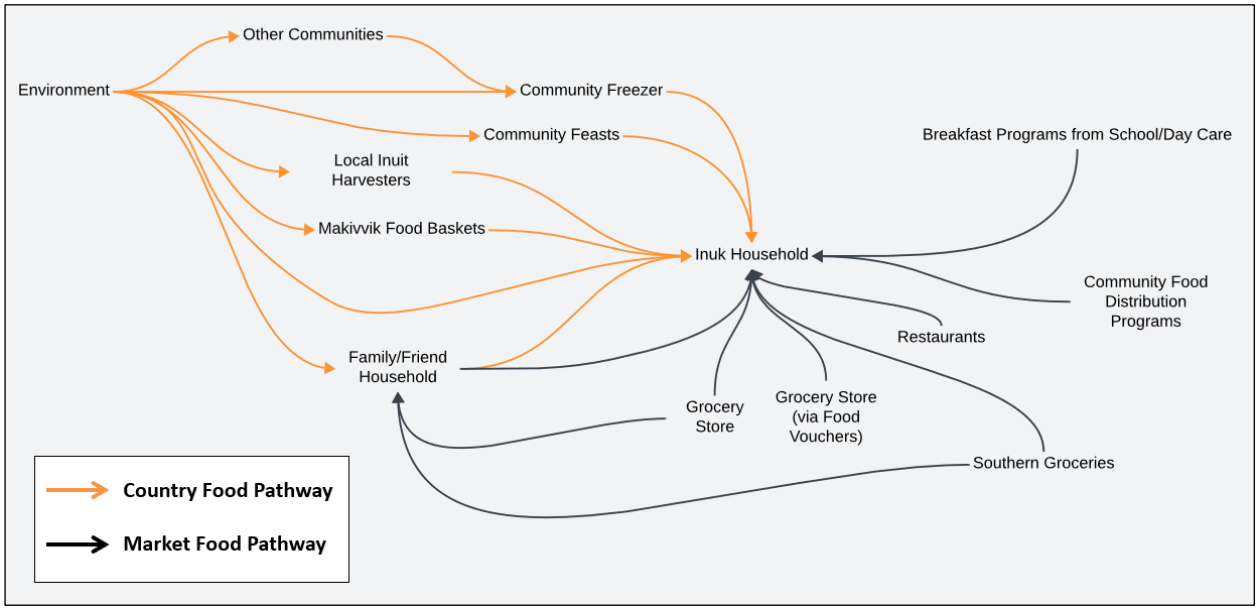
The food system for a typical household is complex. When the workshop maps were combined and simplified, the conceptual food system mapping exercise revealed 13 distinct food sources: the environment, other communities, community freezer, from local Inuit harvesters, Makivvik food baskets, family/friend households, grocery stores, southern grocery stores, food programs (food banks/soup kitchens), breakfast programs, food vouchers, community feasts, and restaurants (Figure 3).

Households obtain country food through multiple avenues, with the natural environment being the primary source acquired via harvesting (Figure 4). Households possessing the necessary resources engage directly in harvesting from the environment. Another source is the community freezer, supplied by community hunters employed through the Hunter Support Program, which also facilitates the transport of harvests from other communities. Local Inuit harvesters, skilled individuals who provide additional country food, are supported by households lacking their own hunter or having less skilled household hunters. Community feasts, held several times a year for cultural reasons and sponsored by community hunters and the Hunter Support Program, serve as another source of country food. Additionally, Makivvik annually provides 1 kg (2.2 lbs.) of shrimp to each household around Christmas in addition to other food gift baskets.

Market foods are acquired through various

Figure 4. A Simplified Food System Map Showing All the Different Ways a Typical Inuk Household in Nunavik May Acquire Food

The orange arrows represent country food flows or pathways, and the black arrows represent market food pathways.



means, including local and southern grocery stores, government programs, and community resources (Figure 4). All communities have a Co-op store and a Northern Store as common market food sources. Southern grocery stores play a role for households with members who often travel south for work, as they often shop in the South where it is less expensive and return with groceries. Government programs contribute to market food availability. For instance, breakfast programs offer meals at local schools for children. Also, the food voucher program, sponsored by Local Community Services Centres (CLSCs), provides qualifying individuals with vouchers to purchase food at grocery stores. Food banks and soup kitchens offer additional support. While less commonly used, restaurants serve as a source of market food for younger individuals or special occasions, although not all communities have restaurants.

Notably, family members' and friends' households occupy a unique place in the food system, as they provide both country food and market food. This dual role underscores their importance in the overall food network and the community's reliance on both types of food sources.

Lastly, the role of social media emerged as an important conduit for accessing both country and market foods. Participants underscored the centrality of social media platforms, particularly Facebook community groups and local WhatsApp chats, as informal marketplaces and sharing hubs. These platforms were used to (1) announce the availability of country food (e.g., caribou, char, seal meat) for sale or trade; (2) coordinate sharing of harvested foods among kin or neighbors; (3) advertise grocery store sales; and (4) circulate information about food program sign-ups, freezer status, or feast dates. In practice, this meant that households without direct harvesting capacity could still access country foods by quickly responding to posts, while those with excess catch could redistribute efficiently.

What are the challenges when interacting with the food system?

Participants identified several challenges in accessing food, with high costs and transportation barriers being the most noteworthy. All participants emphasized the extreme cost of living in the North, particularly the high prices of food and fuel. Transportation impeded access to both country foods and market foods across nearly all the identi-

fied food pathways. Households lacking access to transportation or disposable income for fuel often struggle to make trips to grocery stores or government-supported food locations like food banks.

Time constraints also pose substantial challenges to food acquisition, especially for households with members holding office jobs or having childcare responsibilities, making it difficult to allocate time for harvesting activities. Hunting may require individuals to leave home for days, which is hard to accommodate with fixed work schedules. Consequently, households wanting to harvest may be prevented due to the absence of a hunter, limited time, lack of transportation, or high fuel and equipment costs.

While community resources like the community freezer and the broader Hunter Support Program are valuable, they face limitations that hinder their effectiveness. The community freezer sometimes breaks down or runs out of food quickly, preventing everyone from obtaining country food. The Hunter Support Program's capacity to deliver country food from other communities is limited by its annual budget from the Kativik Regional Government. Additionally, hiring local Inuit harvesters is generally accessible only to high-income households.

Social factors also shape food access, with the strength and reach of social networks playing a central role in determining what food sources households can draw upon. Community feasts and the annual Christmas baskets from Makivvik, often containing 1 kg of shrimp, were positively viewed by participants but recognized as providing only short-term, supplementary support. Acquiring food from family or friends is an important pathway for many households, but can be challenging when social connections are limited, when family members have relocated to other communities, or when households occupy different social positions within the community. Additionally, while community-based food distribution programs such as food banks and soup kitchens provide support in some communities, participants noted that these programs are not consistently available across Nunavik. Additionally, a lack of awareness about government programs further hinders households from accessing available support. Participants noted that some households might not know how to enroll in programs like the food voucher system offered by the CLSCs, limiting their ability to benefit from these resources.

Participatory scenarios: What factors impact the decision-making process for Nunavimmiut when acquiring food?

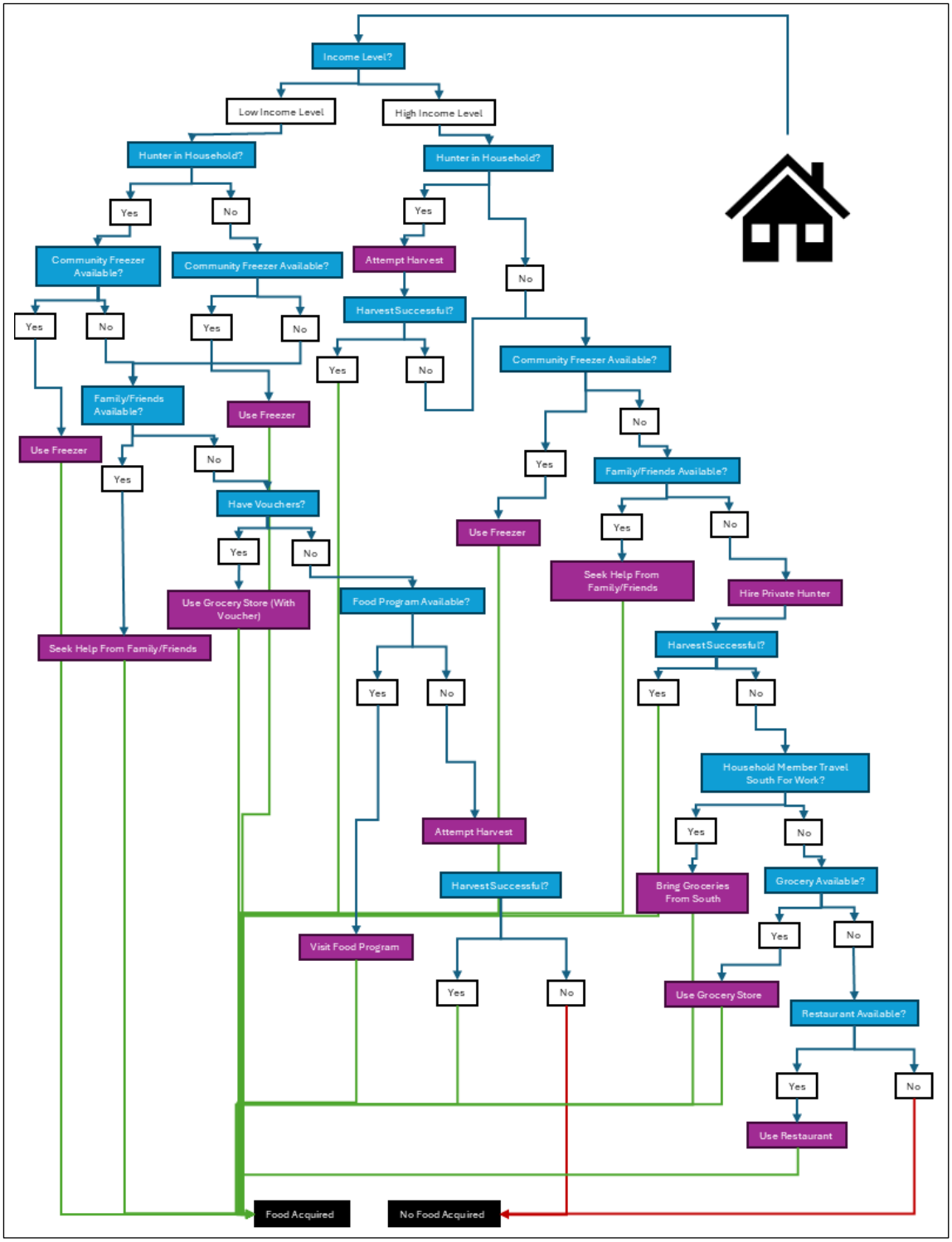
From the scenario exercises, insight was gained into how social and environmental factors impact the decision-making process for Nunavimmiut households when acquiring food (Figure 5). A major theme that emerged from the scenario exercises was the important roles that income and access to resources play in food acquisition. Low-income households without a hunter typically prioritize free sources of country food, with the community freezer being the first option. If the freezer is unavailable, these households rely on family or friends, a source which provides either country or market food at little to no cost (Figure 5). The grocery store is only considered when vouchers are available, and community distribution programs, like the food bank or soup kitchen, are only considered when available. As one participant explained, "We don't want to go to the food bank, but sometimes we have no other choice." This decision-making process highlights the economic constraints that shape the choices low-income households face.

In contrast, high-income households without a hunter have more options at their disposal (Figure 5). They also make use of the community freezer, but they can afford to hire local Inuit hunters if necessary. These households often travel south for work, purchasing groceries during these trips. Market foods from southern grocery stores, and even dining out, become accessible options when country food is scarce. One participant noted, "We bring back as much food as we can from the south, just in case the freezer runs out."

The presence of a hunter in the household, whether the household is low- or high-income, changes the decision-making process (Figure 5). Low-income households with a hunter prefer to rely on the community freezer first but will turn to harvesting if needed. However, harvesting is dependent on access to time, transportation, and

Figure 5. Decision-Making Flow Chart Illustrates the Factors Influencing How a Typical Inuk Household in Nunavik Determines Where to Acquire Food in Their Food System

Blue boxes represent key questions and conditions guiding the decision process, while purple boxes denote potential food sources. The decisions and conditions ultimately lead to food be acquired, following the green arrows, or not acquired, following the red arrows.



fuel. One participant said, "Having a hunter helps, but it's still expensive to go hunting, especially if the hunt isn't successful." High-income households with hunters prioritize harvesting country food themselves, but they also use the community freezer and may hire local Inuit hunters when needed. The ability to rely on these multiple sources emphasizes how the presence of a hunter, combined with household resources, diversifies food acquisition strategies.

A recurring theme was the reliance on social networks, such as family and friends, for both country food and market food. Households without access to hunters or facing shortages in community resources turn to their social circles to fill food gaps (Figure 5). However, participants also acknowledged that not all households have the same social connections, which can limit access to shared food. "If your family is in another community, it's harder to get help," one participant explained. This reliance on social networks highlights the co-produced nature of food security, where community ties are essential for navigating resource constraints. If a low-income household has a hunter, the process changes slightly. Participants expressed that they still prefer the community freezer for country food, but if it is unavailable, they would seek help from family or friends before attempting to harvest food themselves (Figure 4). The grocery store remains an option if other sources are exhausted, with the food bank or soup kitchen again being the last resort.

Environmental conditions and the reliability of infrastructure, like the community freezer, further complicate the decision-making process. When asked how food choices would change if the community freezer broke down, participants noted that high-income households would likely be in a position to buy country food from Inuit harvesters in their community or turn more to market foods, whereas low-income households would struggle, relying more heavily on family, friends, or food banks. As one participant reflected, "Without the freezer, we'd be in trouble. Those who can't afford to hunt would have little options for country food." Similarly, during periods of poor harvests, households would continue to attempt harvesting but place more hope on the Hunter Support Program to facilitate the restocking of community freezers from neighboring communities. High-income households would transition to market foods more easily, while low-income households would experience greater food security challenges, increasing their reliance on external support. Notably, across all scenarios and income levels, country food pathways were consistently prioritized over market food sources, with market foods emerging as a second choice only when country food options were exhausted.

It should be emphasized that this decision-making model represents a simplified, linear decision model generalized from a broad consensus derived from discussions with two different groups. While it is intended to model a typical Inuk household and a typical food system in the region, it is important to acknowledge that available resources vary greatly between communities. Moreover, decision-making processes are not strictly linear or always rational, and individual households may follow varied, context-specific pathways influenced by a range of social, economic, cultural, and environmental factors.

Discussion

Arctic and sub-Arctic food systems are experiencing profound transitions due to environmental change, evolving socio-economic landscapes, and intensified resource development (Ford et al., 2021; Larsen & Fondahl, 2015; Lovecraft & Eicken, 2011). These forces intersect with the cultural, economic, and environmental dimensions of food acquisition, making it critical to document how households navigate complex and dynamic food networks (Allen & Prosperi, 2016; Berkes & Folke, 1998; Kuhnlein et al., 2009). Applying an SES lens to Nunavik food systems proves particularly valuable here because it reveals the feedback loops and interdependencies that single-factor analyses would miss. For instance, a purely economic analysis would capture the role of income in shaping food access but would miss how environmental disruptions like poor harvests interact with infrastructure failures like broken community freezers to compound food insecurity for low-income households. Similarly, a purely ecological analysis would capture species availability but miss how social networks

and cultural values mediate whether and how households can access those species. The SES framework integrates these dimensions, allowing us to see household food acquisition not as a series of independent choices but as an adaptive response to a complex, dynamic system in which ecological, social, economic, and infrastructural factors are deeply intertwined.

The findings extend existing scientifically documented knowledge by demonstrating that households in Nunavik utilize a diverse array of food sources, including direct harvesting from the environment, using community freezers, buying country food from Inuit harvesters, buying from grocery stores, and utilizing social networks of family and friends. This complexity parallels earlier research in northern regions that emphasizes multifaceted and adaptive strategies for securing food (Ford & Beaumier, 2011; Ford, 2009; Gilbert et al., 2021). Despite this adaptability, over three-quarters of Nunavik inhabitants still experience food insecurity (Furgal et al., 2021), underscoring the persistent structural and economic hurdles that challenge both the sustainability of these food systems and the communities relying on them.

Revisiting themes introduced in our introduction, we find that barriers such as the high costs of food and fuel, limited transportation options, and time constraints due to employment or childcare responsibilities align with previous research identifying economic and logistical obstacles in Arctic regions (Brockington et al., 2023; Little et al., 2021). However, this study builds on these insights by illustrating how specific household characteristics—particularly income level and the presence of a skilled hunter—affect the strategies used to acquire food. Low-income households without an active harvester rely more heavily on community freezers, social networks, and community-based food distribution programs, like food banks or soup kitchens, whereas higher-income households can more readily hire Inuit harvesters or purchase nutritious and diverse market foods during travels to the South. This stratification in access patterns adds nuance to the documentation of the SES dynamics underlying Arctic and sub-Arctic food insecurity, extending beyond general economic constraints to highlight how cultural knowledge and social ties mediate these pressures (ICC-Alaska, 2015; ITK, 2021; Kuhnlein et al., 2009).

Our study also reinforces the cultural and nutritional significance of country foods, which participants consistently ranked as the most important food source despite their smaller fraction of total dietary intake in terms of energy or total grams consumed. This finding reaffirms that food security in Inuit communities is not solely about caloric sufficiency; it is deeply connected to cultural identity, the transfer of traditional knowledge, and the spiritual values embedded in harvesting and sharing practices (ICC-Alaska, 2015; Inuit Tapiriit Kanatami [ITK], 2021). The importance of social networks is particularly evident, as obtaining food from family or friends' households is common across all income levels. This culturally ingrained sharing economy, noted in previous research (Collings et al., 1998; Kishigami, 2000; Quintal-Marineau & Wenzel, 2019; Ready & Power, 2018), not only helps mitigate food insecurity but also underlines how values of reciprocity, community cohesion, and cultural continuity are crucial components of Arctic and sub-Arctic food systems.

In terms of adaptive responses to disruptions, be they environmental (e.g., poor harvests, changing species migration patterns) or infrastructural (e.g., broken community freezers), households exhibit varying degrees of resilience and vulnerability. High-income households tend to offset disruptions by relying on local Inuit harvesters or market-based foods, while low-income households turn more intensely toward social networks, community support services, and cheaper, though often nutrient-poor, store-bought foods. This pattern resonates with previous findings indicating that environmental stress often leads to greater reliance on market foods, whereas economic stress pushes households to depend more on country foods and reciprocal sharing arrangements (Ford & Beaumier, 2011; Ford, 2009; Gilbert et al., 2021). For many households regardless of income level, community food programs, like school breakfast programs, represent an important safety net. Our results also showed that other food programs, like food banks, are valued although inconsistently available. This aligns with other research documenting the importance of community food programs as safety

nets for food-insecure households in Arctic communities, although uptake and availability may differ between larger regional centers and the smaller communities of Nunavik (Ford et al., 2012, 2013). The interplay of these strategies underscores the adaptive capacity inherent in Arctic communities and clarifies how SES frameworks can capture the feedback loops, trade-offs, and coping mechanisms that shape community resilience and vulnerability.

Our work also documented that the expanded role of social media has important implications for understanding Nunavimmiut food systems. While traditional sharing networks remain foundational, digital platforms may act as accelerators, broadening the reach of reciprocity and lowering the transaction costs of coordination. This "digital layer" could make the food system more adaptive to disruptions (e.g., freezer breakdowns, poor harvests) by providing real-time information on alternative sources. However, reliance on social media may also create inequities. For instance, Elders or households without reliable internet access risk exclusion, and the monetization of some exchanges blurs the line between sharing and commerce. Future interventions should therefore consider digital access as a determinant of food security, alongside physical infrastructure and economic resources.

This study has several limitations that should be acknowledged. First, while 10 of 17 participants identified as female, this study did not conduct a systematic gender analysis of food acquisition patterns. Given that harvesting practices, food preparation, and household food management are often gendered activities in Inuit communities, future research should more explicitly examine how gender shapes food access and decision-making. Second, this study provides a snapshot of food system dynamics at a single point in time and does not include historical comparisons that would allow for examination of how food acquisition patterns have shifted in response to climate change or socio-economic transformations over time. Longitudinal research would strengthen understanding of these dynamics. Third, the participatory workshops were held in Kuujjuaq, and, while participants were recruited from five communities, the findings may not fully capture the diversity of food system experiences across all communities in Nunavik, each of which has unique assets, histories, and challenges. Finally, the preconstructed nature of the Food Location Cards and scenario exercises reflects a deductive approach that may have constrained participants from raising food sources or decision-making factors not anticipated by the research team.

Conclusion

This research maps complex food acquisition pathways and identifies multilayered economic, cultural, and infrastructural barriers, providing a foundation for informed policy interventions. Strengthening community-based harvesting programs, improving transportation infrastructure, and increasing budgets and maintenance for community food initiatives (e.g., Hunter Support Programs and community freezers) all have the potential to enhance food security across Nunavik. These recommendations align more broadly with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), particularly Article 21, which affirms the right of Indigenous peoples to the improvement of their economic and social conditions, including food security (UN General Assembly, 2007). Situating our findings in this international rights-based framework underscores that food insecurity in Nunavik is not simply a logistical or economic challenge but a matter of Indigenous rights.

Addressing these challenges is critical, particularly as rapid environmental and socio-economic changes continue to reshape Arctic and sub-Arctic food systems. This work underscores the ongoing need for community-based, participatory approaches that center Inuit knowledge, cultural preferences, and social networks in food security research and policy, and demonstrates the value of such approaches in generating actionable, locally grounded insights.

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