

Twenty “must-read” research articles for primary care providers in Nunavik: scoping study and development of an information tool

Vincent Paquin^a, Glenda Sandy^a, Gentiane Perrault-Sullivan^a, Gabriel Fortin^b, Michel Cauchon^c, Christopher Fletcher^{a,d}, Jean Ouellet^c and Mélanie Lemire^{a,d}

^aAxe santé des populations et pratiques optimales en santé, Centre de recherche du CHU de Québec, Université Laval, Québec, QC, Canada; ^bMedical Department, Inuulitsivik Health Center, Inukjuak, QC, Canada; ^cDépartement de médecine familiale et de médecine d'urgence, Université Laval, Québec, QC, Canada; ^dDépartement de médecine sociale et préventive, Université Laval, Québec, QC, Canada

ABSTRACT

While health needs in Nunavik are distinct, there is a scarcity of knowledge transfer intended for local primary care providers. We aimed to build an information tool in the form of a newsletter and a website to share with them a selection of relevant research articles. To identify such articles, a scoping study of Inuit health research published between 2012 and 2017 was conducted. Selection criteria were adapted from the framework of information mastery. After a database search yielding 2896 results, publications were screened for eligibility. Next, the 226 eligible articles were evaluated and scored for their relevance, their methods (including community participation), their local applicability and their clinical utility. The 20 highest-scored articles were selected for dissemination in a newsletter. They were summarised and presented in 6 thematic emails: Child Development, Infectious Diseases, Traditional and Modern Medicine, Metabolism, Nutrition and Contaminants, and Inuit Perspectives. The newsletter was sent to over 190 health workers and regional stakeholders in Nunavik and was also published online. We hope that this project will foster knowledge sharing and inter-sectorial collaboration between research, public health and clinical care. Trends in Inuit health research are discussed.

ARTICLE HISTORY

Received 13 October 2018
Revised 21 January 2019
Accepted 28 January 2019

KEYWORDS



Inuit health; knowledge transfer; information management; primary care; Indigenous health; scoping review

Introduction

The majority of the population in Quebec, Canada, is concentrated on the southern part of the province, while most Quebec Inuit inhabit Nunavik, its northernmost region (Figure 1). Nunavik is the name for the Inuit controlled region north of the 55th parallel created through the James Bay and Northern Quebec Agreement. Health care in this region is generally provided by nurses and general physicians who reside in the villages yet who come from southern Quebec. They are all trained in southern educational institutions, where the curriculum focuses on the health needs of the non-Inuit dominant population with perhaps a few brief hours on Indigenous health, cultural competency, and social dimensions of health and healing. Before beginning to work in the North, physicians and nurses receive a two-day training on Inuit culture and life in the Arctic. This short introduction leaves many feeling unprepared for the specific challenges of practising in northern Indigenous communities [1]. The additional intensive training required to become an expanded-role nurse in a remote region is oriented to the

acquisition of general and specialised clinical skills [2], an already vast topic that easily overshadows the more specific issues of health in Nunavik.

It is an irony then that, once involved in northern practice, knowledge gaps in working with Indigenous communities become evident, yet it becomes more difficult to access professional literature and to identify relevant materials [3]. Most national practice guidelines reflect the health and contexts of the majority population and are silent on vulnerable sub-populations like Indigenous Peoples. While a few guidelines are designed for Indigenous and northern health, such as the position statements from the First Nations, Inuit and Métis Health Committee of the Canadian Paediatric Society [4], these are the exception. Population-specific knowledge and adapted practice recommendations are important for providing effective health care. For example, the difference of *Helicobacter pylori* infection prevalence between Indigenous and non-Indigenous populations in Canada drastically changes its investigation and management [5]. While *H. pylori* prevalence is low in southern Canadian cities and in developed countries in general, it is high in

CONTACT Vincent Paquin  vincent.paquin.4@ulaval.ca  Axe santé des populations et pratiques optimales en santé, Centre de recherche du CHU de Québec, Université Laval, Québec, QC, Canada

© 2019 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.



Figure 1. Map of Canada identifying Nunavik (centre-right).

several Arctic regions and Indigenous communities. Because of this higher prevalence, the probability of having a positive test result for *H. pylori* (serology, urea breath test or stool antigen test) is higher, regardless of symptomatology. In this situation, testing on the basis of non-specific complaints such as dyspepsia leads more often to falsely positive results and inadequate management. In contrast, North American clinical guidelines for *H. pylori* recommend non-invasive testing for infection in presence of dyspeptic symptoms. This example serves to show how nurses and physicians often need to adapt standard practices to the local context of northern communities.

While comparatively rare, research with the potential of positively informing clinical practices has been conducted specifically on Inuit health in recent years. Notable examples are the Qanuippitaa? 2004 and Qanuilirpitaa? 2017 Nunavik Inuit Health Surveys [6,7]. These two vast cross-sectional health surveys reached the 14 communities of Nunavik to document physical, mental and community health outcomes in the Nunavik population. Regional and national health organisations, universities and the communities collaborated in the endeavours. Afterwards, results were disseminated – or, in the case of Qanuilirpitaa? 2017, will be disseminated in the near future – to health workers and communities.

Conversely, based on our experience in the North as clinicians and researchers, the accessibility of research results and their integration into clinical practice remain a challenge in the Arctic. For example, free access to research literature is insufficient in the health-care

system. Notably, bibliographic databases (such as Cochrane, MEDLINE and EBSCO) are not available in many Canadian ministries of health, including in Quebec and Nunavut [8]. In addition to the barriers to access, the identification of useful knowledge in literature can be time-consuming and difficult to integrate into the day-to-day clinical work of practitioners. Together, these conditions impact the quality and pertinence of care to Indigenous people and communities, especially where health-care providers are members of the majority, non-Indigenous population.

As researchers and health-care providers, we recognise the structural constraint on effective practice in northern communities and have sought to address it by developing and sharing a health research information tool for primary care providers in Nunavik. The information mastery (IM) framework [9] provides a conceptual model to identify clinically relevant information in research literature. In this model, clinically relevant information has three characteristics: (1) it focuses on outcomes that are important to the patient or community, (2) it involves an intervention or a practice that is feasible, and (3) if true, it requires a change in clinical practice (we will refer to these latter two aspects as *clinical utility*) [9].

Additionally, for research knowledge to be relevant to Indigenous populations, it should respect and integrate the local knowledge, lived contexts and priorities [10,11]. In a context of ongoing inequalities of health and power related to colonisation [12,13], community

participation in research is central for producing results that are meaningful to all [10,11,14,15]. For example, the survey components of Qanuilirpitaa? 2017 were determined after consultations with community leaders and health professionals in Nunavik in order to address the local needs and preoccupations. Also, cultural and geographic refinements are required if the IM model is to be effectively applied to the practice contexts we seek to influence. The use of a broad term (for example “Indigenous Peoples”) to define the study population poses the risk of losing the diversity of realities encompassed by such category [16,17]. Moreover, health-care systems are notably different between regions inhabited by the Inuit (e.g. Alaska, Nunavut, Nunavik, Greenland) [18]. Thus, results from a study conducted in one location cannot automatically be transposed to another. In short, the appraisal of clinical relevance of Indigenous health research literature should include its utility for clinicians, its relevance for communities, its community involvement, and its local applicability.

Once relevant research information is identified, IM in a clinical setting can be assisted by an information tool [9]. The roles of an information tool are to bring new relevant information to practitioners and to allow them to find the information again when needed. Websites such as UpToDate and Medscape are well-known information tools used internationally by health professionals [19,20]. They have features that alert users of new relevant information (e.g. newsletters), and features for retrieving specific information on the spot (e.g. search engines). Similar smaller-scale resources do not exist for clinicians working with Inuit populations, despite the complexity of providing health care that meets the local needs and that is sensitive to the impacts of colonisation [12,13].

To address the scarcity of research knowledge sharing with primary care providers in Nunavik, we conducted a scoping study of recent literature on Inuit health relevant for dissemination to them. The selection process was guided by the criteria of clinical relevance introduced above. The identification of relevant research topics was informed by the components of the Qanuilirpitaa? 2017 Nunavik Inuit Health Survey, since these are based on one of the most recent Inuit consultations on health priorities in Nunavik [6]. The selected articles were then summarised and shared with health professionals through an information tool, in the form of a newsletter and a website. The present paper details the methods and results of the scoping study, the development of the information tool, as well as an evaluation of the overall project design for further use in Indigenous contexts.

Methods

To guide the literature review process, we used a scoping study design adapted from Arksey & O'Malley's framework [21]. In contrast to systematic reviews, this type of review is more convenient to map current knowledge on a broad research question. The stages of the scoping study are listed in Table 1. We removed the “Charting the data” stage from the original framework because the heterogeneity of research topics included in the scope of review did not allow comparisons between the data of each study. The first four stages, presented below, led to a selection of articles and their summarisation. The dissemination of results (Stage 5) was achieved through the development of an information tool and is presented in the Discussion. As advocated by Daudt et al. [22], an inter-professional team participated in the whole process.

Identifying the research question

Our research question was: *What are the research findings, from recent literature, that could be relevant for dissemination to primary care providers working in Nunavik?* The focus was on the Inuit population of Nunavik, but research on other Inuit populations across Canada, Alaska and Greenland was also included. All areas of health research were included in the scope of review, provided that these areas were identified as relevant (see Article selection, below).

Identifying potentially relevant articles

A literature search was conducted on 31 May 2017 to collect all academic research articles published in the last five years (January 2012-May 2017) on Inuit health. A library scientist assisted in developing the literature search strategy. The goal was to find research on any

Table 1. Scoping study stages, modified from Arksey & O'Malley [21] and oriented toward the development of an information tool.

	Arksey & O'Malley framework	Modified framework
Stage 1	Identifying the research question	Identifying the research question
Stage 2	Identifying relevant studies	Identifying potentially relevant articles*
Stage 3	Study selection	Article* selection
Stage 4	Charting the data	Collating, summarising and reporting the results
Stage 5	Collating, summarising and reporting the results	Disseminating the results
Other	Consultation exercise (optional stage)	Inter-professional collaboration (transversal)

*Inclusion criteria were not limited to original studies, as literature reviews were also eligible articles (see Table 3, Inclusion criteria).

topic related to human health but within Canadian Inuit or related Arctic populations. To this end, two health-oriented databases were chosen: MEDLINE (Ovid) and PsycInfo. Keywords (Table 2) were searched in the titles and abstracts only. Limits were set for language (English or French) and year of publication (2012–2017).

Article selection

Between June 2017 and February 2018, a 3-step selection was conducted in order to narrow down the initially large number of articles. First, an initial screening of titles and abstracts was done using eligibility criteria. Second, the eligible articles were scored using a more detailed set of criteria, referred to as the evaluation criteria. Third, the selection of highest-scored articles was established in consultation with public health stakeholders.

Eligibility screening

Titles and abstracts of the articles were reviewed, and their full texts were consulted whenever more information was deemed necessary. To be included, articles had to meet all eligibility criteria (Table 3). The criteria for relevance to the patient/community (Table 3-B) and for the potential impact on clinical practice (Table 3-D) were adapted from the IM framework [9]. Research topics were considered relevant if they were included in the

components of the Qanuilirpitaa? 2017 survey. These components were (1) Physical Health: self-rated health, cardiometabolic health, *H. pylori*, zoonosis, waterborne diseases, sexually transmitted infections, respiratory and oral health, nutrition, contaminants; (2) Mental Health and Related Determinants: depression, suicide, stress, resilience, victimisation, bullying, justice, family relationships, men's health, substance use, gambling, dependencies, sexual health, online communication; (3) Community-Level Determinants of Health: socio-demographic factors, cultural factors, community involvement and roles, community safety, service accessibility, social inclusion/exclusion, and natural environment [6]. In addition to these components, during the review, one co-author of the present article provided clinical insights based on his experience as a family physician in Nunavik (GF). Finally, the "Currentness" criterion (Table 3-C) was adopted to discard older articles when a more recent and comprehensive article, found in the process of the present review, focused on the same research question.

The screening of publications was conducted by one reviewer. The publications were sorted by year, starting with the most recent entries in order to subsequently identify older publications that did not meet the "Currentness" criterion. A second reviewer independently screened a random sub-sample of 200 publications for later assessment of inter-rater reliability. A Cohen kappa

Table 2. Keywords used in this scoping study to search the MEDLINE and PsycInfo databases for research articles on Inuit health.

Single-term queries	"Inuit", "Inuk", "Eskimo", "Kalaallit", "Inupiat", "Aleut", "Nunangat", "Nunavik", "Nunavut", "Nunatsiavut", or "Inuvialuit"
Double-term queries: combinations of <i>location</i> and <i>population/context</i> keywords	<i>Location</i> : "Arctic", "Alaska", "Circumpolar", or "Greenland". <i>Population/context</i> : "population", "resident", "Indigenous", "Aboriginal", "native", "community", or "health"
Thesaurus	<i>MeSH (MEDLINE)</i> : "Inuit", "Alaska Natives", or "Arctic Regions/epidemiology". <i>Thesaurus (PsycInfo)</i> : "Inuit" or "Alaska Natives"

Table 3. Eligibility criteria for screening the publications previously identified through the literature search of this scoping study.

A. Study population and type of publication

Inclusion criteria

- (1) Quantitative, qualitative, or mixed study, case study, or literature review;
- (2) Research on the human physical, mental, emotional, or spiritual well-being, or research on health care;
- (3) Study population including, but may not be limited to, Inuit or related (Yupik, Inupiat, Aleut) people of the Arctic;
- (4) Article published between 2012 and 2017, and presenting preliminary or final results;
- (5) Article published in English or French;
- (6) Article published in a peer-reviewed journal.

Exclusion criteria

- (1) Research in which American Indians and Alaska Natives, or First Nations and Inuit, are merged into a single group;
- (2) Research focusing on Sami or Yakut people;
- (3) Editorial, commentary, book chapter, or dissertation (thesis);
- (4) Article on research methods.

B. Relevance of the research topic

The research addresses an issue identified as relevant in Nunavik based on the components of the Qanuilirpitaa? 2017 survey.

C. Currentness

The article is still relevant in the light of more recent research identified in the present review process.

D. Health care utility

The research findings could help clinicians give better care to patients and communities in Nunavik, and/or the research findings could influence the elaboration of public health policies and/or programs.

coefficient was calculated by comparing the outcomes (acceptance or refusal for each publication) of the two reviewers. For interpretation of the coefficient, the divisions by Landis and Koch [23] were used: <0.00 is poor inter-rater agreement, 0.00–0.20 is slight, 0.21–0.40 is fair, 0.41–0.60 is moderate, 0.61–0.80 is substantial, and 0.81–1.00 is almost perfect.

Evaluation

Based on their full texts, the eligible articles were given a score using the evaluation criteria (Table 4). These evaluation criteria were jointly developed by the authors of this paper and were first tested on a few articles for improvement. Then, they were submitted to the Nunavik Nutrition and Health Committee (NNHC) of the Nunavik Regional Board of Health and Social Services (Board of Health and Social Serv) for comments. The NNHC is composed of public health professionals and regional stakeholders, and one of its mandates is to supervise and counsel research activity in Nunavik. Changes suggested by the NNHC were included, and the final criteria list was approved by the committee. Aspects of relevance and utility were again included in these evaluation criteria (Table 4-A and D), as they were in the eligibility criteria, to ensure a more careful assessment of the full texts. Research conducted elsewhere in the Canadian North was deemed more directly applicable to Nunavik than research in Alaska or Greenland, based on the stronger similarities of health issues and health-care systems across the Canadian North [18]. The “Clinical utility” criterion (Table 4-D) refers to the potential for changing clinical practice, a key aspect of clinical relevance [18],

while also acknowledging the value of non-clinical research for informing the broader understanding of health issues by clinicians. Using the evaluation criteria, two independent reviewers scored the articles on a 9-point scale. Scores were summed for a maximum possible score of 18 points.

Consultations

After the scores of the two evaluators were summed, articles were sorted by their total score. The cut-off point for selecting the highest-scored articles to be included in the information tool was decided after consultations with the NNHC.

Collating, summarising and reporting the results

The selection of articles was divided into themes, which were inferred from the selection of articles itself. To present the reader with an overview of the knowledge gathered, each article was summarised in 2–3 sentences and reported by theme.

Results

The literature search yielded 2896 results after removal of duplicates (Figure 2). At the eligibility screening, the Cohen kappa coefficient for a sub-sample of 200 publications was 0.39 (fair agreement). At the evaluation step, there was an average difference of 1.4 between the scores of the two reviewers, and the average summed score was 10.88 (median=11).

During the consultation with the NNHC (last step of the article selection stage), a first selection of the articles with

Table 4. Evaluation criteria for scoring the eligible articles found in this scoping study, in order to select articles of interest for primary care providers in Nunavik.

A. Relevance	/2
A1. The research addresses an issue identified as relevant in Nunavik based on the components of the Qanuilirpitaa? 2017 survey.	/1
A2. The research makes a new and distinct contribution to the body of knowledge on Inuit health or care to the Inuit.	/1
B. Methods	/3
B1. The research design and methods are described in the article. (If the paper is a case report, no point is awarded for this criterion.)	/1
B2. The article reports no conflict of interest.	/1
B3. The article reports that the research was designed, conducted and/or reviewed in collaboration with community members and/or local organisations (as mentioned in the list of authors, in the acknowledgement section, or in the methods section).	/1
C. Local applicability	/2
The research findings are applicable to Nunavik in the light of local considerations such as culture, the health care system, epidemiology, demographics, etc.	
<ul style="list-style-type: none"> • 2 points: the research was conducted in Nunavik or elsewhere in the Canadian North in conditions strongly similar to those in Nunavik; • 1 point: the research was conducted in conditions partially similar to those in Nunavik OR the research is a review of literature in which most studies do not meet the 2-point criterion. 	
D. Clinical utility	/2
The research findings could help primary care providers (nurses or physicians) give better care to patients in Nunavik.	
<ul style="list-style-type: none"> • 2 points: the findings could have a direct influence on prevention, diagnosis, prognosis, treatment, follow-up, inter-professional collaboration, or patient–clinician relationship; • 1 point: the findings could have an indirect influence through improved understanding of a situation. 	
Total	/9

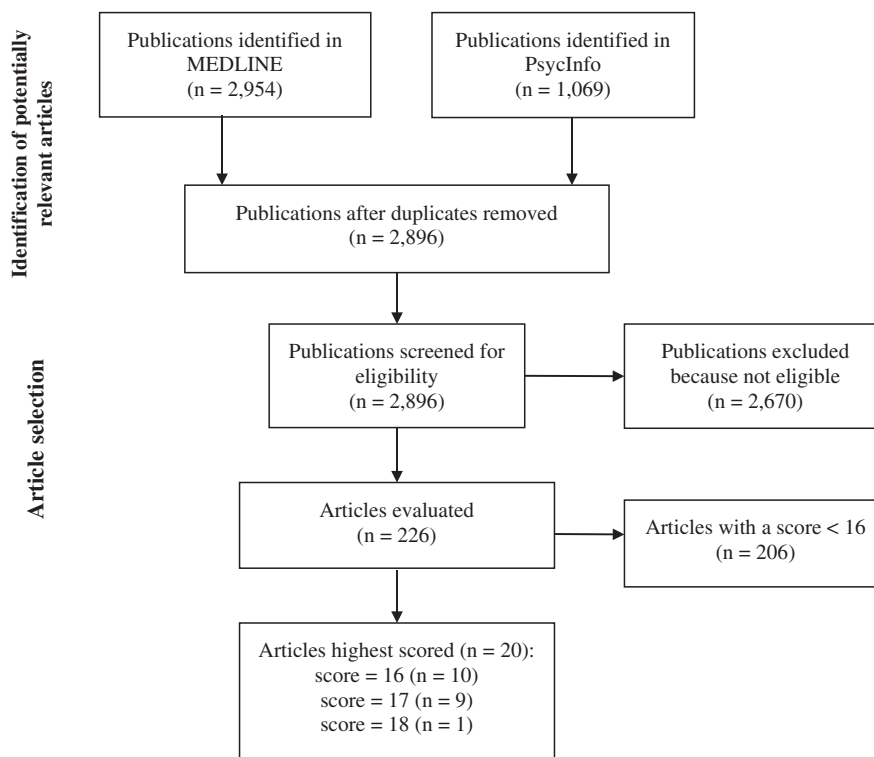


Figure 2. Flow diagram of the scoping study indicating the numbers of articles throughout the identification of potentially relevant articles and the article selection stages.

a score of 17 or 18 ($n=10$ articles) was proposed. The NNHC underlined that none of these articles focused on tuberculosis, despite it being a current health priority in Nunavik due to its high incidence [24]. Thus, it was decided to extend the selection to all articles with a score of 16 or above ($n=20$ articles) in order to cover more topics, including tuberculosis. This extended selection was presented to the NNHC, who agreed to its dissemination. The articles selected for the information tool are listed in Table 5.

An overview of the selection of articles is presented below. The relevance of each theme is indicated, mainly in relation to the components of Qanuilirpitaa? 2017 since they were the primary source of information for relevance to communities and public health. The eventual clinical utility is also presented, along with community involvement in research whenever the information was available in the article.

Child development

The literature review results include 4 articles on child development in Nunavik: Boucher et al. (2012) [25], Ethier et al. (2012) [26], Fraser et al. (2012) [27] and Turgeon O'Brien et al. (2016) [28]. Boucher et al. [25] showed that prenatal mercury and postnatal lead exposure was associated with symptoms of attention-deficit/hyperactivity

disorder (ADHD) in Nunavik Inuit children. Moreover, Ethier et al. [26] showed that intrauterine exposure to mercury and lead was associated with visual brain dysfunctions in school-aged Inuit children. These two studies contributed to inform the nutritional counselling of Inuit pregnant women (see *Nutrition and contaminants*). Consumption of alcohol, included in the Qanuilirpitaa? 2017 survey, was previously studied by Fraser et al. [27]. They evaluated binge drinking among pregnant women in Nunavik and found associations with impaired fetal growth and visual acuity at six months. Data on self-reported lifestyle during pregnancy (notably tobacco and cannabis consumption) are provided in the article. Both Fraser et al. [27] and Ethier et al. [26] acknowledged support by community associations and/or municipal councils in their articles. Turgeon O'Brien et al. [28] studied anaemia, a deleterious condition for development, in preschool children of Nunavik. They found that iron deficiency was frequently hidden by inflammation status, which can falsely normalise serum ferritin levels. The article provides evidence for using ferritin cut-offs adjusted for inflammation to improve the clinical diagnosis of iron deficiency.

Infectious diseases

Four of the selected articles address infectious diseases in Nunavik: Fox et al. (2015) [29], Morse et al. (2013)

Table 5. Articles selected in this scoping study for dissemination to primary care providers in Nunavik.

First author	Title
<i>Child development</i>	
Boucher [25]	Prenatal methylmercury, postnatal lead exposure, and evidence of attention deficit/hyperactivity disorder among Inuit children in Arctic Quebec
Ethier [26]	Effects of environmental contaminant exposure on visual brain development: a prospective electrophysiological study in school-aged children
Fraser [27]	Effects of binge drinking on infant growth and development in an Inuit sample
Turgeon O'Brien [28]	Using soluble transferrin receptor and taking inflammation into account when defining serum ferritin cutoffs improved the diagnosis of iron deficiency in a group of Canadian preschool Inuit children from Nunavik
<i>Infectious diseases</i>	
Fox [29]	Inadequate diet is associated with acquiring Mycobacterium tuberculosis infection in an Inuit community. A case-control study
Morse [30]	A randomised controlled trial comparing sequential with triple therapy for Helicobacter pylori in an Aboriginal community in the Canadian North
Pufall [31]	Prevalence of zoonotic anisakid nematodes in Inuit-harvested fish and mammals from the eastern Canadian Arctic
Thivierge [32]	Cryptosporidium hominis is a newly recognised pathogen in the Arctic region of Nunavik, Canada: molecular characterisation of an outbreak
<i>Traditional and modern medicine</i>	
Cayer [33]	Characterisation of the anxiolytic activity of Nunavik Rhodiola rosea
Van Wagner [34]	Remote midwifery in Nunavik, Quebec, Canada: outcomes of perinatal care for the Inuulitsivik health centre, 2000–2007
<i>Metabolism</i>	
Kellet [35]	Is severe obesity a cardiovascular health concern in the Inuit population?
Saudny [36]	Poor self-reported health and its association with biomarkers among Canadian Inuit
Medehouenou [37]	Overweight and obesity prevalence among school-aged Nunavik Inuit children according to three body mass index classification systems
<i>Nutrition and contaminants</i>	
Lemire [38]	Local country food sources of methylmercury, selenium and omega-3 fatty acids in Nunavik, Northern Quebec
Gagne [39]	Consumption of tomato products is associated with lower blood mercury levels in Inuit preschool children
Turgeon O'Brien [40]	Effect of dietary calcium intake on lead exposure in Inuit children attending childcare centres in Nunavik
<i>Inuit perspectives</i>	
Cerigo [41]	Inuit women's attitudes and experiences towards cervical cancer and prevention strategies in Nunavik, Quebec
Fraser [42]	Experience and representations of health and social services in a community of Nunavik
Hordyk [1]	End-of-life care in Nunavik, Quebec: Inuit experiences, current realities, and ways forward
Hordyk [43]	Inuit interpreters engaged in end-of-life care in Nunavik, Northern Quebec

[30], Pufall et al. (2012) [31] and Thivierge et al. (2016) [32]. The latter three, respectively, focus on *H. Pylori*, a zoonosis, and a waterborne disease, which were health issues included in the Qanuilirpitaa? 2017 survey. Fox et al. [29] explored the links between diet, lifestyle and the risk of tuberculosis infection in a community of Nunavik. Many risk factors were found in their study, including inadequate intake of fruits and vegetables, increased room occupancy, and visiting a gathering house. Morse et al. [30] compared the efficacy of two treatment regimens for *H. pylori* infections in Aklavik (Northwest Territories). Post-treatment effectiveness was low for the standard therapy, while effectiveness of the alternative treatment (sequential therapy) was better, although the difference did not reach statistical significance. Pufall et al. [31] assessed the prevalence of zoonotic anisakid nematodes in Inuit-harvested fish and mammals from Nunavik, Nunavut and Nunatsiavut. Community collaborators participated in choosing the species to be tested, and local hunters provided the samples. High-risk and low-risk fish and mammals were identified. Thivierge et al. [32] investigated an outbreak of *Cryptosporidium hominis*, a waterborne pathogen newly recognised in Nunavik. A higher incidence was found among children, who may suffer impaired development after an episode of cryptosporidiosis.

Traditional and modern medicine

Two articles by Cayer et al. (2013) [33] and Van Wagner et al. (2012) [34] address the integration of traditional Inuit practices with modern medicine. Research on this theme can promote cultural continuity and self-determination, which are important determinants of Inuit health [13]. First, Cayer et al. [33] examined the anxiolytic effects of the Nunavik variety of *Rhodiola rosea* in animal models. The Inuit have traditionally used this plant for its health benefits. Inuit Elders of Kangiqsualujjuaq were consulted for their knowledge and the Avataq Cultural Institute, a Nunavik Inuit organisation, provided logistical support in the study. Second, Van Wagner et al. [34] conducted a retrospective study of perinatal outcomes in the midwifery-led birth centres of the Hudson Bay coast in Nunavik. The article, authored by Inuit and non-Inuit midwives, highlights the clinical success of this culturally meaningful health-care initiative.

Metabolism

Three of the selected articles focus on cardiometabolic health: Kellet et al. (2012) [35], Saudny et al. (2012) [36] and Medehouenou et al. (2015) [37]. This health issue

was included in the Qanuilirpitaa? 2017 survey. Kellet et al. [35] used data from the Nunavik health surveys of 1992 and 2004 to describe the evolution of cardiometabolic health in the Inuit. They found that despite an increase in the prevalence of severe obesity, differences in metabolic markers (insulin, LDL- and HDL-cholesterol, triglycerides, blood pressure, etc.) were not statistically significant, apart from a significant increase in waist circumference. The authors argue that high HDL-cholesterol levels in the population account for a lower cardiometabolic burden of obesity. In parallel, Saudny et al. [36] found an association between poor self-rated health and abnormal metabolic parameters in Canadian Inuit populations. These parameters included at-risk fasting glucose levels, elevated hs C-reactive protein levels, at-risk waist circumference with high triglycerides levels, and body mass index (BMI) positive for obesity. This study was part of the International Polar Year Inuit Health Survey, which used a participatory health research approach. Finally, Medehouenou et al. [37] compared BMI classification systems for identifying overweight and obesity among Nunavik Inuit children. The authors argue that one system, the International Obesity Task Force classification, was less likely to misclassify overweight as obesity, thus being more specific than the two others (the World Health Organization and the Centers for Disease Control and Prevention classifications).

Nutrition and contaminants

Nutrition and environmental contaminants were the focus of 3 articles: Lemire et al. (2015) [38], Gagne et al. (2013) [39] and Turgeon O'Brien et al. (2014) [40]. This topic was identified as a priority in Nunavik during the consultations for Qanuilirpitaa? 2017. Lemire et al. [38] studied the local country food sources of mercury in Nunavik. They found that beluga meat was the primary country food contributing to mercury intake, while most other food sources were considerably low in mercury but were important contributors of polyunsaturated fatty acids and selenium intakes. The authors indicate that, after previous research showing impacts of prenatal mercury exposure on child development in Nunavik, their results helped inform the Board of Health and Social Serv's nutritional recommendations for childbearing-age women. Likewise, Gagne et al. [39] identified nutritional factors associated with blood mercury levels in Nunavik Inuit children. Their results show an inverse association between intake of tomato products and blood mercury levels. Using the same cross-sectional data, Turgeon O'Brien et al. [40] found a strongly significant association between higher dietary calcium intake

in Inuit children and lower blood lead levels. The data collection for these two articles was conducted in child-care centres of Nunavik with the help of local workers.

Inuit perspectives

The following 4 articles placed Inuit experiences at the heart of their research, highlighting perspectives for improved health care: Cerigo et al. (2012) [41], Fraser & Nadeau (2015) [42], Hordyk et al. (2017) [1] and Hordyk et al. (2017) [43]. To begin with, Cerigo et al. [41] explored the beliefs, attitudes and experiences of Inuit women in Nunavik towards cervical cancer and prevention strategies. Results, obtained from individual questionnaires and focus groups, show an interest in learning more on these topics, as well as suggestions for how Pap smears could be better performed. Likewise, Fraser & Nadeau [42] conducted interviews with members of a community in Nunavik to understand their experiences and representations of health and social services. Many elements were outlined in the interviews, including concerns for privacy, gaps between psychosocial needs and services, and contextual factors influencing the use of services. The authors provide recommendations for health professionals. End-of-life care also faces particular challenges in Nunavik, as shown by Hordyk et al. [1] in an ethnographic study. The dynamics between patients, families, and non-Inuit service providers are explored, along with the needs of each and descriptions of cultural miscommunications. In another article, the same authors [43] highlight the multiple roles played by interpreters in end-of-life care, as well as their own needs, dilemmas and challenges. Communication guidelines are proposed for nurses and physicians working with interpreters.

Discussion

Given our initial objective to increase the circulation of knowledge between research and primary care, the focus of our literature review was necessarily broad. Our adapted scoping study process was efficient in moving from an initially large number of publications to a few relevant articles on diverse topics. The use of eligibility and evaluation criteria followed by consultations with the NNHC made the selection process efficient, systematic and goal-oriented. Inter-rater reliability was fair for the eligibility screening. At the evaluation step, scorings were moderately consistent between the two reviewers. Although differences in measure do not allow direct comparisons between the two steps, decisions at the evaluation step were probably less variable between reviewers due to a higher number of criteria combined with more precise

definitions. Nevertheless, the main limitation of the process was its subjectivity. At both steps, the appraisal of relevance (Tables 3-B and 4-A) was inevitably influenced by the individual experience of the reviewers. The first reviewer, VP, is a non-Indigenous medical student who completed an internship in a village of Nunavik during the project. The second reviewer, GS, is a nurse and a member of the Naskapi community of Kawawachikamach (Côte-Nord, Québec) who is completing a master in community health. Meetings with the co-authors and the NNHC members informed the development of the eligibility and evaluation criteria, their interpretation prior to using them, and afterwards the final selection of articles. The co-authors have diverse backgrounds and expertise: environmental health research in Nunavik (ML), medical training coordination in remote regions (JO), anthropology of Inuit health (CF), evidence-based medicine and information mastery teaching (MC), medical practice in Nunavik (GF), and mental health research in Nunavik and epidemiology (GPS). As Daudt et al. similarly noted in their scoping study [22], this interdisciplinary and intercultural collaboration was a great strength of the project.

As the last stage of our scoping study, we used the selection of articles to develop an information tool. We built it as a newsletter series, comprising one newsletter for each of the 6 themes presented in the results. All newsletters had the same structure: they began with a short description of the project, followed by summaries longer than those presented above, around 250 words for each of the 2–4 articles related to the theme. The newsletters were bilingual in English and French. They were jointly produced and revised by three co-authors, including at least two co-authors or additional reviewers expert in the newsletter's theme, and were further reviewed by the NNHC. Additional content of interest was integrated into the summaries when relevant, such as clinical guidelines, pictures or other references.

The 6 newsletters were sent by email, respectively, in March, May, June, October and December 2018, and February 2019. The NNHC provided a recipient list containing the email addresses of physicians, nurses, health administrators, dentists and other health workers in Nunavik, to which were added the addresses of researchers who expressed interest in receiving the newsletter. The sending list included over 190 recipients. Feedback from the recipients was positive, outlining an interest for the newsletters and the synthesis of knowledge they provided. The newsletters were also published and archived on a public website at <http://en.nasivvik.chaire.ulaval.ca/must-read-papers-on-inuit-health.html>.

Regarding the content of the final selection, not all articles held information with direct implications for changing clinical practices (*i.e.* clinical utility). Some scored well

because they met the other evaluation criteria, which included relevance for communities, local applicability, community involvement, etc. In some cases, the clinical utility of an article was debatable. For example, one of our authors (GF) brought to our attention that Morse et al.'s [30] article on the treatment of *H. pylori* infections, which was initially included in the selection of articles, had controversial applicability to clinical practice in Nunavik. This article suggests the possible superiority of sequential therapy, an alternative treatment regimen for eradicating *H. pylori*. However, as underlined by an editorial published in the same journal issue as Morse et al.'s article [44], the study's results showed low efficacy for the two treatment regimens and no clear superiority of the sequential therapy. Thus, considering the limited applicability of these findings, and the lack of consensus on the best treatment regimen for *H. pylori* in northern communities [5,44], we decided not to include the article in our information tool. To address the topic nonetheless, we chose to include a recent literature review on *H. pylori* in Arctic regions, by McMahon et al. (2016) [5]. It was one of the eligible articles found in the review process. Although its score was high (13 points), it did not reach the 16-point threshold required for inclusion in the selection results, mainly because McMahon et al.'s review did not comprise a majority of studies conducted in Nunavik or elsewhere in the Canadian North (see local applicability criterion: Table 4-C). On the other hand, their article was previously shared for its clinical relevance in an internal publication at the Inuulitsivik Health Center, Nunavik [45]. In short, evaluating a diverse group of articles using fixed criteria poses the risk of overlooking the complexity of some clinical problems and situations. In our case, it warranted adjustments in how the literature review results were translated into an information tool. This illustrates the importance of critical appraisal and local clinical input in the review process.

Also in relation to the selection content, community involvement was not mentioned in all the articles of our selection, although this important aspect of Indigenous health research was included in the evaluation criteria (Table 4-B3). We are aware that participatory practices were not always disclosed because they do not fall in the scope of many scientific journals, especially if done in an informal way. This would explain why it would have been omitted from some articles. Furthermore, none of the articles we selected had a formal community-based participatory research design (CPBR). CBPR is a comprehensive approach to community involvement in research [15,46], but we found that a scarcity of research conducted in Nunavik in recent years followed this model. The Qanuilirpitaa? 2017 survey represents a notable advancement in this regard: the vast scope of this Nunavik health survey was thoroughly informed by consultations with

communities and different Inuit institutions. Inuit research assistants were also trained as part of an objective to nurture local research capacities [6].

Another point that came as a surprise in our selection was that none of the 20 highest-scored articles focused on mental health, despite this topic being particularly important for Inuit communities [47]. Because the “Relevance” criterion (Table 4-A1) was dichotomous, it gave equal weight to all topics identified as relevant. Moreover, mental health research in Nunavik represented only a small portion of the 2012–2017 literature, while the last two decades saw a boom of research on nutrition and environmental contaminants. This contrast illustrates a temporal trend in research agendas and funding. A future 2017–2019 update of our selection of articles will probably include a focus on Inuit mental health.

Despite the limitations of the review process described above, we believe our information tool will benefit Nunavik primary care providers and other health workers who wish to connect with the advances of Inuit health research. Health professionals in Indigenous communities are often solicited for help in conducting research on the ground, but they are not always informed of the results afterwards. Good practices of knowledge sharing between researchers, public health professionals and primary care providers are essential for inter-sectorial collaboration. The complexity of elaborating, disseminating and accepting guidelines by the body of health professionals exemplifies the need for such collaboration. Hence, a common understanding of the inequalities of health at play in Nunavik could foster joint advocacy efforts.

Conclusion

In summary, after conducting a scoping study of literature on Inuit health, 20 articles were selected based on eligibility and evaluation criteria, as well as local input (i.e. the NNHC, and Nunavik clinicians). Diverse themes emerged, ranging from infectious diseases to the integration of traditional practices in modern medicine. An information tool in the form of a collaborative newsletter and a website was developed from the selection of articles. The dissemination of knowledge through this tool hopefully benefited the work of primary care providers in Nunavik, as well as promoted inter-sectorial collaboration between researchers and health professionals. Future directions include a survey of health workers’ perceptions of the information tool, followed by an improved update for 2017–2019 literature including a review of grey literature published by regional, provincial and federal stakeholders.

Acknowledgments

We wish to thank all members of the NNHC for their feedback during the selection process, as well as for their help in reviewing and disseminating the information tool. It should be noted that our selection does not necessarily reflect their priorities in terms of public health research and intervention.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

VP received a research scholarship from the Faculty of Medicine at Université Laval, and GS and GPS were funded by the Nasivvik Research Chair in Ecosystem Approaches to Northern Health for conducting this project.

References

- [1] Hordyk SR, Macdonald ME, Brassard P. End-of-life care in Nunavik, Quebec: inuit experiences, current realities, and ways forward. *J Palliat Med.* 2017;20(6):647–655.
- [2] Solutions Nursing. Detailed course outline of the training in the expanded role. [cited 2018 May 30]. Available from: <http://www.solutionsnursing.ca/cmsnc3images/file/detailed-course-outline-of-the-training-in-the-expanded-role-2016-janvier-17.pdf>
- [3] Bell M, MacDougall K. Adapting online learning for Canada’s Northern public health workforce. *Int J Circumpolar Health.* 2013;72:21345.
- [4] Canadian Paediatric Society. First nations, inuit and métis health committee 2018 [cited 2018 May 18]. Available from: <https://www.cps.ca/en/documents/authors-auteurs/first-nations-inuit-and-metis-health-committee>
- [5] McMahon BJ, Bruce MG, Koch A, et al. The diagnosis and treatment of helicobacter pylori infection in Arctic regions with a high prevalence of infection: expert commentary. *Epidemiol Infect.* 2016;144(2):225–233.
- [6] St-Laurent D Qanuulirpitaq 2017: l’enquête de santé chez les Inuit du Nunavik 2017 [cited 2018 Jun 1]. Available from: https://www.ciqss.org/sites/default/files/documents/PPTQanuulirpitaq2017_DSL_2017-06-07.pdf
- [7] Anctil M. Qanuippitaa? How are we? Methodological report. Quebec: Government of Quebec; 2007. Available from: https://www.inspq.qc.ca/pdf/publications/692_esi_methodological_report.pdf
- [8] Leon G, Ouimet M, Lavis JN, et al. Assessing availability of scientific journals, databases, and health library services in Canadian health ministries: a cross-sectional study. *Implement Sci.* 2013;8:34.
- [9] Slawson DC, Shaughnessy AF. Teaching evidence-based medicine: should we be teaching information management instead? *Acad Med.* 2005;80(7):685–689.
- [10] Fletcher C. Community-based participatory research relationships with aboriginal communities in Canada: an overview of context and process. *Pimatziwin.* 2003; 1:27–62.

- [11] Gaudry AJP. Insurgent research. *Wicazo Sa Rev.* 2011;26(1):113–136.
- [12] Richmond CAM, Ross NA. The determinants of first nation and inuit health: A critical population health approach. *Health Place.* 2009;15(2):403–411.
- [13] Reading C, Wien F. Health inequalities and the social determinants of aboriginal peoples' health. Prince George (BC): National Collaborating Centre for Aboriginal Health; 2009. Available from: <http://www.deslibris.ca/ID/220180>
- [14] Starkes JM, Baydala LT. Health research involving first nations, inuit and metis children and their communities. *Paediatr Child Health.* 2014;19(2):99–106.
- [15] Tobias JK, Richmond CAM, Luginaah I. Community-based participatory research (CBPR) with indigenous communities: producing respectful and reciprocal research. *J Empir Res Hum Res Ethics.* 2013;8(2):129–140.
- [16] Dyck I, Kearns R. Transforming the relations of research: towards culturally safe geographies of health and healing. *Health Place.* 1995;1(3):137–147.
- [17] Gribble MO, Around Him DM. Ethics and community involvement in syntheses concerning American Indian, Alaska native, or native Hawaiian health: a systematic review. *AJOB Empir Bioeth.* 2014;5(2):1–24.
- [18] Ellsworth L, O'Keeffe A. Circumpolar Inuit health systems. *Int J Circumpolar Health.* 2013;72:21402.
- [19] UpToDate. Product - UpToDate [Internet]. Waltham (MA): Wolters Kluwer; 2018. [cited 2018 May 18]. Available from: <https://www.uptodate.com/home/product>
- [20] Medscape. About Medscape [Internet]. New York (NY): WebMD LLC; 2018. [cited 2018 May 18]. Available from: <https://www.medscape.com/public/about>
- [21] Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol.* 2005;8(1):19–32.
- [22] Daudt HML, van Mossel C, Scott SJ. Enhancing the scoping study methodology: a large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Med Res Methodol.* 2013;13(1):48.
- [23] Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics.* 1977;33(1):159–174.
- [24] Nunavik Regional Board of Health and Social Services. The Nunavik regional board joins forces with community leaders to end tuberculosis [Internet]. Kuujuaq: Nunavik Regional Board of Health and Social Services; 2018 Feb 28. [2]. Available from: https://nrbhss.ca/sites/default/files/press_release_tb_workshop_en.pdf
- [25] Boucher O, Jacobson SW, Plusquellec P, et al. Prenatal methylmercury, postnatal lead exposure, and evidence of attention deficit/hyperactivity disorder among inuit children in Arctic Quebec. *Environ Health Perspec.* 2012;120(10):1456–1461.
- [26] Ethier -A-A, Muckle G, Bastien C, et al. Effects of environmental contaminant exposure on visual brain development: a prospective electrophysiological study in school-aged children. *Neurotoxicology.* 2012;33(5):1075–1085.
- [27] Fraser SL, Muckle G, Abdous BB, et al. Effects of binge drinking on infant growth and development in an inuit sample. *Alcohol.* 2012;46(3):277–283.
- [28] Turgeon O'Brien H, Blanchet R, Gagne D, et al. Using soluble transferrin receptor and taking inflammation into account when defining serum ferritin cutoffs improved the diagnosis of iron deficiency in a group of Canadian preschool inuit children from Nunavik. *Anemia.* 2016;2016:6430214.
- [29] Fox GJ, Lee RS, Lucas M, et al. Inadequate diet is associated with acquiring mycobacterium tuberculosis infection in an Inuit community. A case-control study. *Ann Am Thorac Soc.* 2015;12(8):1153–1162.
- [30] Morse AL, Goodman KJ, Munday R, et al. A randomized controlled trial comparing sequential with triple therapy for helicobacter pylori in an aboriginal community in the Canadian North. *Can J Gastroenterol.* 2013;27(12):701–706.
- [31] Pufall EL, Jones-Bitton A, McEwen SA, et al. Prevalence of zoonotic anisakid nematodes in inuit-harvested fish and mammals from the eastern Canadian arctic. *Foodborne Pathog Dis.* 2012;9(11):1002–1009.
- [32] Thivierge K, Iqbal A, Dixon B, et al. Cryptosporidium hominis is a newly recognized pathogen in the arctic region of Nunavik, Canada: molecular characterization of an outbreak. *PLoS Negl Trop Dis.* 2016;10(4):e0004534.
- [33] Cayer C, Ahmed F, Filion V, et al. Characterization of the anxiolytic activity of Nunavik *Rhodiola rosea*. *Planta Med.* 2013;79(15):1385–1391.
- [34] Van Wagner V, Osepchook C, Harney E, et al. Remote midwifery in Nunavik, Quebec, Canada: outcomes of perinatal care for the Inuulitsivik health centre, 2000–2007. *Birth.* 2012;39(3):230–237.
- [35] Kellett S, Poirier P, Dewailly E, et al. Is severe obesity a cardiovascular health concern in the Inuit population? *Am J Hum Biol.* 2012;24(4):441–445.
- [36] Saudny H, Cao Z, Egeland GM. Poor self-reported health and its association with biomarkers among Canadian Inuit. *Int J Circumpolar Health.* 2012;71:18589.
- [37] Medehouenou TCM, Ayotte P, St-Jean A, et al. Overweight and obesity prevalence among school-aged Nunavik inuit children according to three body mass index classification systems. *J Adolesc Health.* 2015;57(1):31–36.
- [38] Lemire M, Kwan M, Laouan-Sidi AE, et al. Local country food sources of methylmercury, selenium and omega-3 fatty acids in Nunavik, Northern Quebec. *Sci Total Environ.* 2015;509–510:248–259.
- [39] Gagne D, Lauziere J, Blanchet R, et al. Consumption of tomato products is associated with lower blood mercury levels in inuit preschool children. *Food Chem Toxicol.* 2013;51:404–410.
- [40] Turgeon O'Brien H, Gagne D, Vaissiere E, et al. Effect of dietary calcium intake on lead exposure in inuit children attending childcare centres in Nunavik. *Int J Circumpolar Health.* 2014;24(5):482–495.
- [41] Cerigo H, Macdonald ME, Franco EL, et al. Inuit women's attitudes and experiences towards cervical cancer and prevention strategies in Nunavik, Quebec. *Int J Circumpolar Health.* 2012;71:17996.
- [42] Fraser SL, Nadeau L. Experience and representations of health and social services in a community of Nunavik. *Contemp Nurse.* 2015;51(2–3):286–300.
- [43] Hordyk SR, Macdonald ME, Brassard P. Inuit interpreters engaged in end-of-life care in Nunavik, Northern Quebec. *Int J Circumpolar Health.* 2017;76(1):1291868.

- [44] Jones N. What is the best regimen for helicobacter pylori eradication in Canadian Arctic aboriginals? *Can J Gastroenterol.* 2013;27(12):694–694.
- [45] Cormier M-H, Fortin G, Richer F. Helicobacter pylori. Lignes de conduite pour le Nunavik Centre de santé Inuulitsivik 2016 [cited 2018 May 21]. Available from: http://nasivvik.chaire.ulaval.ca/uploads/7/7/5/2/77524284/cormier_2016_h_pylori.pdf
- [46] Israel BA, Schulz AJ, Parker EA, et al. Review of community-based research: assessing partnership approaches to improve public health. *Annu Rev Public Health.* 1998;19(1):173–202.
- [47] Alianait Inuit-specific Mental Wellness Task Group. Alianait inuit mental wellness: action plan. Ottawa: Inuit Tapiriit Kanatami; 2007. [cited 2018 Jun 1]. Available from: <https://www.itk.ca/wp-content/uploads/2009/12/Alianait-Inuit-Mental-Wellness-Action-Plan-2009.pdf>