

SCAN ON

DIABETES

in First Nations Communities of Quebec



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HEALTH AND SOCIAL SERVICES COMMISSION

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Summary

Introduction: The prevalence of type 2 diabetes, as well as its precursor, prediabetes, is growing among First Nations populations. Youth and adolescents are increasingly affected by the disease and a lack of conclusive data is available on the subject, particularly concerning non-agreement First Nations. The objectives of this study are: 1) to identify the needs of the communities in order to fight more effectively against diabetes based on the following focus areas: prevention, promotion, screening, care and treatment as well as capacity-building; 2) to determine the proportions of individuals affected by diabetes and prediabetes; and 3) to identify the characteristics of the targeted communities in order to better determine the non-biological factors contributing to the emergence of diabetes and prediabetes.

Methodology: Interviews were conducted with several stakeholders working in the communities. Health Directors, nurses, nutritionists and community health representatives were therefore interviewed. Also, a sample of 1000 patient medical files from health centres among ten communities was surveyed. These medical files were analyzed in order to collect data on diabetes, prediabetes, blood pressure, cholesterol and triglycerides. A third data collection form, the environmental walk, allowed for information to be gathered on the cost, quality and availability of certain food. It also allowed for surveying the infrastructures available for sports activities and documenting the restaurant services in the communities. The results were analyzed in a descriptive fashion and are presented based on the geographical isolation level of the communities.

Results: To become effective in their fight against diabetes, the communities have needs in terms of financial and human resources that are not met in a satisfactory manner. It has also been observed that the greater the isolation level of the communities, the less access they have to specialized services (ophthalmologists, nutritionists, sports centre, etc.). In the Quebec region, the average proportions of people with diabetes and prediabetes in the communities studied are 16.2% and 13.8%, respectively. On the other hand, results indicate that the quality and diversity of food diminishes as the distance from major urban centres increases, while the cost of food increases significantly with the level of isolation.

Conclusion: Notwithstanding the communities' level of geographical isolation, the proportion of people with diabetes and prediabetes is high compared to the non-Aboriginal population. We hope the results of this research will help decision-makers in better identifying the needs and issues related to diabetes in First Nations communities. Thus, it will be possible to better target culturally-adapted actions to undertake, while taking into consideration distinct geographical contexts, in order to reduce the existing gap in terms of the incidence of diabetes among First Nations and the non-Aboriginal people of Quebec.

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Definition of Acronyms

ADI: Aboriginal Diabetes Initiative

AFG: Abnormal Fasting Glucose

AHA: American Heart Association

AFNQL: Assembly of First Nations of Quebec and Labrador

BMI: Body mass index

CDA: Canadian Diabetes Association

CHR: Community Health Representative

CVD: Cardiovascular disease

DBP: Diastolic Blood Pressure

FNHIB: First Nations and Inuit Health Branch

FNQLHSSC: First Nations of Quebec and Labrador Health and Social Services Commission

FNRLHS: First Nations Regional Longitudinal Health Survey

GD: Gestational diabetes

GH: Glycosylated haemoglobin

HDL: High-density lipoprotein

IDF: International Diabetes Federation

IFG: Impaired Fasting Glucose

IGT: Impaired Glucose Tolerance

LDL: Low density lipoprotein

MetS: Metabolic Syndrome

NHLBI: National Heart, Lung, and Blood Institute

NNADAP: National Native Alcohol and Drug Addiction Program

OGTT: Oral Glucose Tolerance Test

PA: Physical activity

RHS: Regional Health Survey

SBP: Systolic Blood Pressure

T1D: Type 1 Diabetes

T2D: Type 2 Diabetes

TBC: Total Blood Cholesterol

TG: Triglycerides

WC: Waist circumference

Scan on Diabetes among First Nations Communities of Quebec: Highlights

PREVALENCE OF DIABETES AND PREDIABETES IN THE COMMUNITIES

- The known proportion of diabetics based on our sampling varies between 13.0% and 22.0% depending on the geographic isolation zone.¹
 - The highest proportion of diabetics was observed in zone 2, while the lowest proportion was found in zone 4.
 - The majority of the diabetics in our sampling are older than 55 years of age.
 - More women than men in our sampling are diabetic.
- The proportion of people with prediabetes based on our sampling varies between 11% and 17% depending on the geographic isolation zone.
 - Zone 4 is the zone in which the highest number of people with prediabetes were identified.
 - The majority of those with prediabetes in our sampling were women.
 - There are more people with prediabetes than diabetes among the 18-34 years and 35-54 years age groups.

INFRASTRUCTURES AVAILABLE

- All the communities offer at least one location for practicing physical activity. Many communities offer access to the school gym when this type of infrastructure is available.
- Public transportation is available only in a few communities located in zone 1. However, a few communities have set up a community taxi service.

ACCESSIBILITY AND DIVERSITY OF FOOD

- The cost of food increases with the communities' level of geographic remoteness. For a list of given items (which in no case represent the consumer price index), the cost is \$93 in zone 1, \$97 in zone 2, \$123 in zone 3 and \$154 in zone 4.

¹Zone 1: A geographic zone where the First Nation is located less than 50 km from the nearest service centre with year-round road access.

Zone 2: A geographic zone where the First Nation is located between 50 and 350 km from the nearest service centre with year-round road access.

Zone 3: A geographic zone where the First Nation is located more than 350 km from the nearest service centre with year-round road access.

Zone 4: A geographic zone where the First Nation has no road access to a service centre and, as a result, experiences a higher cost of transportation.

The definition of the geographic isolation zones is taken from INAC's Band Classification Manual.

- **The quality of fruits and vegetables as well as their diversity decreases with the communities' level of remoteness.** In zone 1, damaged and poor quality fruits and vegetables were found in 10% of grocery stores. In zone 2, fruits are damaged in 67% of stores and vegetables in 33%. In zone 3, this is the case in 50% of food stores, and in zone 4, poor quality fruits and vegetables were found in all the grocery stores visited.
- **The accessibility and proximity of grocery stores depend on the communities' level of remoteness.** In zone 1, 90% of grocery stores are located outside the communities. In zone 2, that proportion decreases to 25%, in zone 3, 50%, and there are none in zone 4.
- **Food services** located within the communities or in proximity to them **mostly offer junk food choices.**

DIABETES-RELATED ACTIVITIES OFFERED TO THE POPULATION

- **Several prevention and promotion activities are offered in First Nations communities in all geographic isolation zones.** However, the financial and human resources are not sufficient to meet the needs in terms of prevention and promotion for people with diabetes (prevention of complications), prediabetes and other people at-risk.
- **Diabetes screening activities are carried out in several communities.** Most of these activities are carried out on a punctual basis when patients consult at the health centre.

USE OF A TRADITIONAL APPROACH

- **Most interveners do not speak the First Nations language** of the community in which they work.
- **Most interveners seldom use traditional approaches** for screening, care and treatment of diabetics.
- **The community radio is often used as a communications means** for performing prevention and promotion activities in the communities, in the **First Nations' traditional language.**

ACCESS TO TRAINING FOR THE INTERVENERS

- **Communities located in proximity to urban centres can easily access training on diabetes for their health staff. However, the greater the geographical isolation, the more difficult it becomes, considering that the professionals (nurses, nutritionists, etc.) must leave for long periods of time if they want to attend training and conferences usually offered in urban centres.**

Chapter 1: Introduction

1.1 Brief definition of type 2 diabetes and prediabetes

Type 2 diabetes is (T2D) an asymptomatic disease [1,2] characterized by insulin resistance (a resistance to the effect of insulin in diabetics occurs when the body cells become less sensitive and eventually resistant to the action of insulin [3]) and impaired insulin secretion by the pancreatic beta cells) [1,4]. Generally, T2D occurs in two stages:

1. *Insulin resistance* with normal glycaemia and hyperinsulinemia (extra insulin in the blood);
2. *Diabetes*, when the pancreas is no longer able to produce the required quantity of insulin [1,2].

T2D represents 85% to 90% of all cases of diabetes [1,4]. A person is considered to be diabetic when his/her fasting plasma glucose value is higher than 7.0 mmol/L and/or when his/her glycaemia value after an oral glucose tolerance test (glycaemia measurement two hours after the administration of 75 grams of glucose) is higher than 11.1 mmol/L [1]. Diabetes is a disease that can result in several complications such as cardiovascular disease (CVD) [2,4,5], blindness [2,4,6], nephropathy [2,4,7], neuropathy [2,4] and the amputation of the lower extremities [2,4]. As for type 1 diabetes (T1D), or juvenile diabetes, it is characterized by an absolute deficiency of insulin secretion [8-11]. It generally occurs during childhood [6,7] or in the first years of adolescence [3].

Prediabetes corresponds with a higher blood glucose level than normal, but lower than what is required for a diabetes diagnosis. The term prediabetes encompasses impaired glucose tolerance (IGT) and abnormal fasting glucose (AFG). These two conditions expose individuals who are affected by diabetes and its complications [9]. Approximately one-third of individuals presenting impaired glucose tolerance will develop T2D within the next five to ten years [4]. Abnormal fasting glucose is diagnosed by a fasting glucose that is situated between 6.1 mmol/L and 6.9 mmol/L. As for impaired glucose tolerance, it is diagnosed by measuring blood sugar level following an oral glucose tolerance test. The IGT is characterized by a blood sugar level that is greater than 7.8 mmol/L and lower than 11.0 mmol/L [9].

1.2 Context for the prevalence of type 2 diabetes among First Nations members

Before 1950, T2D was rare among the First Nations populations [11]. Nowadays, the literature indicates that T2D prevalence rates as high as 40% to 70% have been reported in some First Nations communities [12]. For example, among the Pima Indians, the T2D prevalence rate was 28% among those aged 35 years and over before a screening of the whole population was carried out. Following this screening, the prevalence rate among that population raised to 50% [13]. Based on the results of the First Nations Regional

Longitudinal Health Survey (FNRLHS) performed in 2002, the T2D prevalence rate adjusted according to age, compared to the Canadian population, is respectively 3.6 and 5.3 times higher for men and women [74]. However, the T2D prevalence rate among First Nations members remains underestimated in most communities. In fact, in the majority of the First Nations communities of Quebec, large scale screening has yet to be performed [74].

The literature demonstrates a tendency for high T2D prevalence among the First Nations populations. In fact, the data from the Regional Medical Survey (the RHS pilot) estimated a diabetic proportion of 14% in 1997. In 2002, the RHS estimated this proportion to be 19.7%. In the Quebec region, the same surveys revealed proportions of 10% in 1997 and 14.5% in 2002. It has also been observed among the First Nations members that the prevalence of T2D is in progression among increasingly younger age groups [4,14,16-18] and among adolescents [16].

Finally, the risk of dying from diabetes and its complications is five times higher among women living in First Nations communities than among the Canadian women of the general population [11].

1.3 Objectives of the Scan

The Scan on diabetes among non-agreement First Nations of Quebec was developed with a view to fulfilling three objectives: 1) Identifying the needs in First Nations communities in terms of prevention, promotion, screening, care and treatment, and capacity-building, in association with type 2 diabetes; 2) Determining the known proportion of people with diabetes and prediabetes in the First Nations communities based on the geographic isolation zone²; 3) Studying the environment and factors fostering the development of diabetes in First Nations communities.

1- Identifying the needs of the communities

The first objective of the study is to identify the needs of the communities in order to fight more effectively against diabetes, based on the following focus areas: prevention, promotion, screening, care and treatment and capacity-building. More specifically, the needs in terms of human and financial resources, access to healthy food, and the infrastructures available in the community were targeted.

²Zone 1: A geographic zone where the First Nation is located **less than 50 km** from the nearest service centre with year-round road access.

Zone 2: A geographic zone where the First Nation is located **between 50 and 350 km** from the nearest service centre with year-round road access.

Zone 3: A geographic zone where the First Nation is located **more than 350 km** from the nearest service centre with year-round road access.

Zone 4: A geographic zone where the First Nation has **no road access** to a service centre and, as a result, experiences a higher cost of transportation.

The definition of the isolation zones is taken from INAC's Band Classification Manual.

2- Determining the proportion of known diabetics and prediabetics

The second objective consists in determining the known³ proportion of diabetics and prediabetics among the community health centres. The data collected for the purpose of determining these proportions was thus surveyed. It is to be noted that the data collected represents only the people who frequent the various health centres rather than the entire community populations.

Furthermore, in order to obtain a sample that is representative of the community that would allow for determining a genuine T2D prevalence, it would have been necessary to carry out screening among a selected sampling of the population. Considering the time and resources at our disposal for the study, this would have been unrealistic.

This part of the study made it possible to determine the proportion of known diabetics and prediabetics for each of the geographic isolation zones.

3- Analyzing the environment

The last objective of the Scan consists in analyzing the environment that can influence the development of diabetes. By environment, we are referring to what fosters the development of diabetes within society. In the context of this study the following elements were taken into account: physical activity (i.e. access to sports facilities as well as the various sports activities available in the communities), access to healthy food (cost and availability), food services offered in the communities, and finally, access to various services such as a school, health centre, pharmacy and community centre.

1.4 The concepts

In the context of this study, five key concepts were used in order to better understand the needs of the communities: prevention, promotion, screening, care and treatment and capacity-building. These are defined in the following paragraphs:

Prevention

Prevention is defined as the activities that prevent the onset of health problems. The World Health Organization (WHO) defines three levels of prevention (Health Promotion Glossary, WHO, 1998):

Primary prevention: A series of actions aiming to reduce the incidence of a disease, thus targeting a reduction in the appearance of new cases. By taking an upstream approach, this type of prevention prevents the appearance of the disease. In the context of the Scan, the term “prevention” shall refer to primary prevention.

³ The proportion of known diabetics signifies that the presence of the disease is already known by the patient and the health centre and that it has been diagnosed by a physician. However the number of known diabetics in a health centre is not necessarily representative of a community's total population of diabetics. This can be explained by the fact that several diabetics are still asymptomatic, not aware of the symptoms of diabetes or that they have yet to consult.

Secondary prevention: A series of actions aiming to decrease the prevalence of the disease, thus reducing its duration or evolution. It allows for an early detection of the disease as well as an efficient and rapid intervention in order to address the health problem. Screening is part of secondary prevention. In the context of the Scan, the term “screening” shall refer to secondary prevention.

Tertiary prevention: A series of actions aiming to limit the occurrence of the chronic disabilities or relapses within the population. Tertiary prevention therefore aims to decrease the consequences of the disease, by rehabilitating the individual, for example. In the context of this Scan, tertiary prevention is included in the concept of care and treatment.

Promotion

According to the *Programme national de santé publique du Québec* 2003-2012:

“The promotion of health and well-being includes all of the actions aiming to influence the health determinants in such a way as to enable the individuals, groups and communities to have greater control over their health by improving their conditions and lifestyles (free translation) (p. 19.)”

Among other things, it targets:

- The creation of favourable environments;
- The development of sound public policies;
- The reinforcement of community action;
- The development of the potential of individuals;
- The reorientation of the healthcare.

In the context of this Scan, two health promotion elements were verified: the characteristics of the available food offer and ensuring that the development of the potential of the individuals is addressed based on promotion such as posters inciting diabetes screening and guides such as Canada’s Food Guide for First Nations, Inuit and Métis.

Screening

Screening consists of presumptively identifying subjects who have a disease or an anomaly that has gone unnoticed up until that point, meaning those who are apparently healthy but are probably affected by a given disease. The screening does not aim to make a diagnosis (Wilson and Jungner (1970) *Principes et pratique du dépistage des maladies*. WHO, Geneva, 170 p.).

According to the Canadian Diabetes Association (CDA), a diabetes screening test is done with a fasting intravenous glycaemia analyzed in a laboratory [8]. The screening test can also be done by measuring the blood sugar level in a blood sample [17-19].

A fasting capillary glycaemia should not be used to detect diabetes since it overestimates the number of cases [21].

Still according to the 2008 Clinical Practice Guidelines of the Canadian Diabetes Association for the prevention and treatment of Diabetes in Canada, it is important to anticipate the following:

1. The screening of diabetes every year or every two years among adult Aboriginal people presenting at least one additional risk factor.
2. The screening of diabetes every two years among Aboriginals starting from the age of ten years or from confirmed puberty when at least one additional risk factor is present.

Care and treatment

The definition of the concept of care and treatment of diabetes used by the Diabetes Educators Section (DES) includes access to the following professionals: nutritionists, nurses, dentists, ophthalmologists and optometrists, as well as access to care for complications such as nephropathy and retinopathy.

Capacity-building

Capacity-building is defined through access to diabetes-related training for care giving personnel and key interveners. For example, the training sessions that are offered by Health Canada, the *Ordre des infirmières et infirmiers du Québec* (OIIQ), the *Ordre professionnel des diététistes du Québec* (OPDQ), the community physician, hospitals, universities, etc.

1.5 Structure of the report

The report on the Scan on Diabetes among Non-Agreement First Nations Communities of Quebec is divided into ten chapters.

Chapters one and two present the introduction and the research framework. Chapter three addresses the literature review and chapter four describes the methodology used for each component of the research as well as for the data analysis.

Chapters five, six and seven focus on the data analysis. Chapter five examines the data collected through the interviews carried out with nurses, health directors, nutritionists and community health representatives. Chapter six analyzes the quantitative data collected while studying the medical files. In this chapter, the known proportions of diabetics and prediabetics are presented. As for chapter seven, it presents the data collected during the environmental walks. In this chapter, the cost of food, their availability, access to sports infrastructures and available food services in the

communities are all addressed. All of the results of these three chapters will be analyzed based on the communities' level of geographic isolation.

Finally, chapter eight proposes a discussion regarding the results obtained while chapter nine focuses on the recommendations made in light of these results. A brief conclusion brings the report to a close.

Chapter 2: Research Framework

2.1 Portrait of the First Nations of Quebec

“Before 1500, Aboriginal societies in the Americas and non-Aboriginal societies in Europe developed along separate paths, in ignorance of one another. The variety in their languages, cultures and social traditions was enormous. Yet on both sides of the Atlantic, independent peoples with evolving systems of government - though smaller and simpler than the nations and governments we know today - flourished and grew.”

“The Americas were not, as the Europeans told themselves when they arrived, terra nullius - empty land.”

- Derived from the *Report of the Royal Commission on Aboriginal Peoples*, 1996.

In Canada, as stipulated in the Canadian Constitution, the Aboriginal population is divided into three groups that differ from each other on cultural, linguistic and geographical levels which are the Inuit, Métis and First Nations (erstwhile referred to as Indians). Nearly 4% of the Canadian population identifies as belonging to one of these three groups [21].

The Inuit are defined as being Aboriginal people who live beyond the forest boundaries in the Northwest Territories, Nunavut, Nunavik (northern Quebec) and Labrador. The Inuit are recognized as having originated from a population wave that arrived later than the Indians [22]. Historically-speaking, the term Métis refers to children born from an Aboriginal woman and a French, English or Scottish fur trader. From a legal perspective, the Powley Act defined three criteria for the identification of the Métis: self-identifying as a member of the Métis community, the existence of ancestral bonds with a Métis community and the current acceptance of the individual by the Métis community [23]. In Quebec, no data allows for confirming the presence of a Métis community. As for the term *First Nations*, it became more commonly used over the course of the 1970s to eventually replace the term *Indian*. There is no consensus in terms of an official legal definition [22].

In Quebec, the First Nations and Inuit represent a little over 1% of the population [24]. In 2007, with respect to First Nations only, approximately 77 000 people were registered as such out of a total population of more than 7 600 000 residents [25].

Composed of 41 communities that are present on the territory of Quebec, the First Nations are divided among ten Nations: Abenaki, Algonquin, Attikamekw, Cree, Innu, Malecite, Mi'gmaq, Mohawk, Naskapi and Wendat. These Nations essentially fall under two linguistic families. The Mohawk and Wendat Nations both stem from the Iroquoian linguistic family while the other Nations stem from the Algonquian linguistic family. Following the arrival of the Europeans during the XVI and XVII centuries and the implementation of an assimilation process by the federal government, the English and French languages became second languages that are used in the communities.

Each of these ten Nations has their own unique history, beliefs, way of life, know-how and life skills. Furthermore, among the communities of a same Nation, notable differences can be perceived, particularly on a historical and cultural level. However, the First Nations maintain a similar spiritual relationship with the environment they live in; this translates into a holistic view of nature and a search for balance and harmony.

From a demographic perspective, nearly half of the population of the First Nations communities is less than 30 years of age [24]. The birth rate is increasing and in 2000, this rate was established at around 23.4 births per 1000 citizens, which nearly doubles the Canadian rates [26]. Moreover, for many years now, a rapid demographic growth has been observed among the First Nations of Quebec population. Furthermore, even though the number of First Nations members who live in urban settings is increasing, more than 70% of the individuals still reside within one of the 41 communities [25].

The northern part of the Quebec territory is inhabited by the Inuit - a distinct Aboriginal people. The approximately 10 000 Inuit residing in Quebec are divided among 14 villages that are located along the coastline of the Hudson Bay, the Hudson Strait and Ungava Bay [24]. They, as well as the Cree and Naskapi Nations, are different from the other Nations because of their status as agreement communities. These Nations have in fact reached agreements with the Quebec government which provide them with a political and administrative autonomy in addition to access to provincial public services (The James Bay and Northern Quebec Agreement from 1975 and the North-eastern Quebec Agreement from 1978). As for the Inuit, they opted to be essentially connected with the institutions of Quebec rather than being subject to a federal law, contrarily to the Naskapi and the Cree who receive federal services as well.

The members of the non-agreement First Nations of Quebec, as for the First Nations across the country, are subject to the Indian Act. This Act, dating from 1876 and amended many times since, defines certain obligations of the federal government and governs the management of the human and material resources of the Indians. Although modifications have been made to it, particularly in 1951 and 1985, the act has essentially remained unchanged. In order to be recognized by this Act, the individuals must fulfil certain criteria and be registered in the registry held by Indian and Northern Affairs Canada. As for the agreement communities, in 1984, the Parliament of Canada adopted the Cree-Naskapi (of Quebec) Act, which legally governs these two Nations [24].

The organizational modes among the First Nations in the Quebec region are similar from one community to another. The band council, composed of a Chief and councillors elected in accordance with the local customs or the regulations established by the *Indian Act*, represents the political and administrative organization of the community. Each band council governs the services that are provided locally, such as health services, social services, education, fire protection and public security. Among the Inuit, the organizational mode is different. In fact, each of the 14 villages, which are considered to be municipalities, is directed by a mayor and councillors that are elected in accordance with an elections process that is similar to that of other municipalities of Quebec. Each village therefore has the same competencies and powers as other municipalities in areas such as public security, leisure and city planning (*Affaires municipales, des Régions et de l'Occupation du territoire*, 1999).

At the regional level, the First Nations members are represented by various organizations that ensure the defence of their interests while representing them among the governments. In this regard, the Assembly of First Nations of Quebec and Labrador (AFNQL) regroups all of the communities and constitutes a political authority through which the Chiefs of Quebec and Labrador deliberate on all issues that concern the First Nations. Its Regional Chief is the official spokesperson of the First Nations with respect to the different levels of government and the non-Aboriginal population. In fact, various regional organizations come under the AFNQL such as the First Nations of Quebec and Labrador Health and Social Services Commission (FNQLHSSC) (FNQLHSSC, 2008).

2.2 Ethics framework

Before undertaking this Scan on diabetes among First Nations, a preliminary step consisted of ensuring that the Assembly of First Nations of Quebec and Labrador (AFNQL) Research Protocol was going to be respected and applied over the course of the entire process.

The Research Protocol of First Nation of Quebec and Labrador was adopted in 2005 by the AFNQL. This research protocol was developed in order to provide First Nations with a reference guide addressing the various research activities conducted within their communities. This document presents the guiding principles aiming to direct any research endeavours, such as the ownership, control, access and possession (OCAP) principles, and the various methods and approaches to be favoured. The protocol also provides an array of models that can serve to guide researchers. The AFNQL Research Protocol can be consulted on the website of the First Nations of Quebec and Labrador Health and Social Services Commission (FNQLHSSC) at: <http://www.cssspnql.com/eng/recherche/documents/Protocoleng.pdf>.

2.3 FNQLHSSC Blueprint

In 2007, through the First Nations of Quebec and Labrador Health and Social Services Commission (FNQLHSSC), which tabled the 2007/2017 Blueprint, the communities set the objective of reinforcing early disease screening activities, particularly for diabetes and its complications. This Blueprint thus supports communities in their desire to reduce the onset of obesity, diabetes and other chronic diseases. This project, through its objectives, is perfectly integrated into the foundations of this Blueprint. The 2007/2017 Blueprint can be consulted on the FNQLHSSC website at: <http://www.cssspnql.com/eng/nouvelles/documents/Blueprint.pdf>

2.4 Partners and working group

Several partners were involved in carrying out the Scan on Diabetes among First Nations Communities of Quebec. This section presents these partners.

The FNQLHSSC is an organization that was created by the Chiefs' Assembly of the First Nations of Quebec and Labrador in 1994. Its mission is to improve the physical, mental, emotional and spiritual health of First Nations members by playing an advisory and supportive role among the communities. The FNQLHSSC is comprised of several different sectors: social services, health, research, early childhood, social development and administrative services. Among other things, the health sector is involved in the fight against diabetes in the communities. As such, the sector employs a healthy lifestyles promotion agent. This agent's mission is to work on improving the health of First Nations members by supporting the work of communities in establishing preventive measures such as strategies oriented towards the promotion of healthy lifestyles. The agent's role is to plan regional activities aiming to support the health interveners in the communities. The person in this position also sits on the Aboriginal Diabetes Initiative Regional Advisory Committee and represents the communities and their diabetes-related needs in terms of prevention, promotion, screening, care and treatment and capacity-building.

From a federal perspective, the First Nations and Inuit Health Branch (FNIHB) supports the efforts of the First Nations and Inuit members in order to reach a state of health that is comparable to that of other Canadians. The FNIHB ensures appropriate access to health care while fostering autonomy and control over health services by the First Nations and Inuit. In addition to providing continuous support, the FNIHB provides a multitude of health programs and services to the 52 Aboriginal communities, stemming from the 10 First Nations and the Inuit in the province of Quebec. Through the transfer agreements, a great many communities in the Quebec region currently ensure the management of a significant part of their health programs [29].

Another important partner for this research project is the Aboriginal Diabetes Initiative (ADI) Regional Advisory Committee in the Quebec region. Its mandate is to support the First Nations and Inuit communities in controlling diabetes, provide advice on regional projects related to ADI and foster the collaboration of the partners in developing strategies and activities to be implemented in the context of the ADI. This Committee is comprised of one representative from each of the following organizations: Health Canada - First Nations and Inuit Health, the FNQLHSSC, the Nunavik Regional Board of Health and Social Services and the Cree Regional Board of Health and Social Services. Moreover, one representative from the First Nations communities rounds out the composition of the Committee.

The ADI Program is part of FNIHB's Chronic Disease Prevention Community Program. The mission of this initiative is to establish adequate and effective programs and services in terms of prevention, promotion, support for a better lifestyle, and access to care and treatment that is adapted to the culture of First Nations, which is based in and provided by the community.

The ADI has the objective of raising awareness regarding type 2 diabetes and reducing the incidence of complications among Aboriginal peoples by implementing accessible, comprehensive and culturally-adapted programs.

The objectives of the Aboriginal Diabetes Initiative (ADI) are to⁴:

- Promote physical activity and healthy eating in order to reduce the prevalence of risk factors (such as obesity);
- Improve access to the screening and detection of cases of diabetes;
- Improve the quality of life of people suffering from diabetes and reduce the risks of complications;
- Raise awareness among individuals and inform them regarding diabetes, risk factors, complications and prevention strategies;
- Improve support for communities in order to prevent diabetes.

The five main elements of the ADI Program are:

- Community prevention projects;
- Health promotion;
- Community screening and care projects;
- Capacity-building and training;
- Surveillance, research, evaluation and monitoring.

⁴ Since 2010, a new version of the objectives of the Aboriginal Diabetes Initiative is available on the following website: www.santecanada.gc.ca-ADI

Chapter 3: Literature Review

It is recognized that obesity increases the risk of cardiovascular diseases (CVD) and type 2 diabetes (T2D) [4,39]. Compared to the non-Aboriginal population, obesity is more prevalent among Aboriginal peoples in Canada, the United States, Australia, New Zealand and the Pacific Islands [4,39]. Obesity, diabetes and its cardiovascular complications can be curbed by a healthy lifestyle that includes such things as a balanced diet, regular physical activity and a low intake of alcohol and tobacco [40]. T2D is a major cause of morbidity and mortality among the First Nations people [4,12].

The objective of this chapter is to list and analyze the predisposing genetic, cultural, social and environmental factors of T2D among the First Nations individuals, while considering obesity as one of the main risk factors.

Having a parent with diabetes [12], being of Aboriginal descent [12,13] or the presence or absence of certain genes are significant parameters increasing the risk of developing T2D [11,32]. These factors are analyzed more in depth in section 3.1. Knowing that health and identity are closely related to territoriality and culture [33], section 3.2 demonstrates how the transition from a traditional lifestyle to a modern lifestyle as well as acculturation have contributed to the development of obesity and diabetes among the First Nations. The following section explores the influence of certain economic and socio-environmental factors on the development of diabetes. Finally, section 3.4 is devoted to the biological factors involved in the development of diabetes.

3.1 Predisposing risk factors

A first risk factor for T2D to be considered is the degree of Aboriginal descent. The latter is defined by the number of Aboriginal parents and grandparents [12]. The higher the degree of Aboriginal descent, the more the prevalence of diabetes increases [12,13]. The study of Brousseau and coll. shows, in this perspective, that the prevalence rate of diabetes is 22.3% among those with complete Aboriginal descent, 14.9% among individuals who are of half Aboriginal descent, and 4.1% among those who are of less than half Aboriginal descent [13]. The same applies for the number of parents with T2D: the higher the proportion, the more the prevalence of T2D increases among their children [5,12]. As such, those with one or two parents with diabetes have more chances of developing T2D compared to those whose parents do not have diabetes [34] (respectively 2.3 and 3.9 times more [5]).

Gestational diabetes (GD), another significant risk factor, predisposes the child to the development of obesity and T2D [4,11,16] and the mother to T2D [4]. The prevalence of T2D among youth ages 15 to 19 years who have been exposed *in utero* is 9 times higher than those with mothers who did not have gestational diabetes [16]. Moreover, the prevalence of this type of diabetes among First Nations women is higher compared to the high-risk and non-Aboriginal populations [4].

Age and gender are also risk factors for prediabetes and T2D [1,12]. Indeed, the prevalence of T2D increases with the aging of the population [1,12]. However, the prevalence of T2D among the First Nations seems to decrease among older generations. This is due to the increase in T2D among younger generations rather than a genuine decrease among older age groups [5,15].

Concerning gender, with the exception of the Cherokee Indians [12], the prevalence of T2D is higher among First Nations women than among the men [2,12,16,35]. Women are susceptible to suffer from gestational diabetes, which then predisposes them to T2D, as opposed to men who do not run this risk [1]. However, the increase in the prevalence over time is more significant among men than among women [16]. A study has demonstrated that over an eight-year period, prevalence increased by 37% for women, compared to 63% for men [16]. Also, the highest prevalence is reached later on in life among women than among men [2]. The prevalence of abnormal fasting glucose is also higher among First Nations women (5.56% and 13.43%) than among the men (1.45% and 5.56%) among the ages of 5 to 19 years and 20 to 40 years, respectively [12].

Finally, genetic susceptibility also contributes to the development of T2D among the First Nations [36]. The thrifty genotype [2,4,35] was introduced in the literature to explain the predisposition to T2D among certain Aboriginal populations that undergo a lifestyle transition [4]. This hypothesis implies that any excess of glucose during festive meals among hunters-gatherers was stored as fat and transformed into energy during periods with limited food availability [2,35]. The transition towards a more sedentary way of life had the effect of allowing for the continued storage of fat in the body without being subsequently burned.

3.2 Lifestyle transition and acculturation

3.2.1 Nutrition and lifestyle

Following colonization, the Aboriginal people saw their land taken from them and were confined to limited territories [4]. They became dependant on the industrialized way of life [4,14,33], sometimes incompatible with their traditional knowledge [14]. This rapid change in their lifestyle was followed by a high increase in the prevalence of obesity [4,37] and T2D [35]. Nowadays, only a minority of Aboriginals still acquire the majority of their food through hunting and fishing [11]. The abandonment of the traditional diet, low in sugar [4], high in complex carbohydrates [4,31], micronutrients and proteins [4], and particularly its substitution with a diet composed of processed foods [12,38] rich in saturated fats [2,35,38,39], refined sugar [2,35,38,39] and carbohydrates [2,35,39], often including alcohol consumption [38], is an important risk factor for T2D [11].

The literature indicates that the prevalence of being overweight and obesity among First Nations individuals is related to their degree of modernization [14]. Communities with low rates of T2D and high rates of prediabetes would be evolving in a more traditional way of life [10]. An example of this phenomenon is the prevalence of T2D, which is six times higher in a community of Pima Indians that ceased traditional agriculture

compared to a neighbouring community that still practises non-mechanized agriculture [10].

The relationship between food and culture has always been of great importance among the First Nations [4,31]. The adoption of new eating habits deteriorated the personal and social relationships associated with food, such as sharing and certain ceremonies and rites of passage [4]. Moreover, this change resulted in environmental and ecological problems [31] such as the deterioration of the ecosystem through the utilization of all-terrain vehicles [31] and the contamination of traditional foods [4] such as fish by heavy metals (lead, mercury, etc.) [31].

The First Nations youth favour foods that are produced and processed outside of the communities; these foods are less diversified than traditional foods [31]. In the community of Sandy Lake, a relationship was discovered between T2D and the consumption of junk food and fat and fried foods [11]. Incidentally, the development of T2D is predicted by the intake of carbohydrates, which is strongly related to the total intake of fat and calories [35]. Just like the youth, the First Nations women consume more soft drinks, snacks, pizzas, hamburgers, hot-dogs, submarines and foods that are high in calories stemming from saturated fats and low in calories stemming from proteins, compared to non-Aboriginal women [30].

3.2.2 The Socio-cultural influence

The socio-cultural environment influences the development of T2D among the First Nations members. This socio-cultural influence includes poverty, inadequate housing, low education level, dependency on social assistance and the consequences of the residential school-related traumas (Indian residential schools) [40]. Family separation, lifestyle including alcohol consumption, unemployment, the high level of incarceration and meals eaten alone including fast food instead of family meals are all factors further removing the individual from his/her family and community [33]. This unbalance mainly observed among younger generations influences the rates of obesity and T2D [28].

3.2.3 Physical activity

Obesity sets in when the intake of calories is higher than the energy being spent [2]. There is no doubt that physical activity has decreased with acculturation [34,41] and the transition of the First Nations members from a traditional lifestyle to a modern lifestyle [1,2,11,38]. Aboriginals who return to the forest and live a traditional way of life there, even for a short period of time, demonstrate a high level of physical activity due to the need to search for and prepare food [4,31]. A significant reduction of their weight is then observed, as well as an improved control of their glycaemia [10,11].

Significantly more First Nations individuals who are not active are overweight or obese, compared to the inactive non-Aboriginal population [30]. Moreover, First Nations women are seemingly less physically active than the men [42]. Reduced physical activity, regardless of obesity, may constitute a risk factor for T2D since it has been proven that exercise has a protective effect in terms of blood sugar levels and the metabolism of insulin [2,35].



3.2.4 Alcohol and tobacco

Individuals who consume large quantities of alcohol are at a higher risk of developing diabetes [43]. Also, the risk of T2D is predicted positively by the use of tobacco [38], which is also a predictor of physical inactivity [42]. Smokers also tend to have less healthy eating habits while drinking more alcohol than non-smokers [4].

3.3 Economic and environmental factors

3.3.1 The socio-economic influence

There are proportionally more First Nations individuals with low incomes who are obese than among the non-Aboriginal population for the same income brackets [30]. Among the Australian Aborigines, low socio-economic status is associated with a higher prevalence of obesity, diabetes and smoking [4].

The income received by the First Nations members greatly influences their eating habits. In a study carried out in Australia, nearly 30% of Aborigines fear, at least occasionally, not having enough food [4]. Many individuals with low income buy fruits, vegetables and meat only when money comes in [4]. A frequent problem associated with food among poorer First Nations families is the difficulty related to paying electricity bills. When the service is interrupted, food choices become limited since the household appliances cannot be used [4].

3.3.2 Geographic distribution

The literature reveals that the prevalence of T2D increases proportionally with urbanization [1,4]. However, when it comes to First Nations, T2D remains more prevalent in remote communities of the large centres [4]. An inverse relationship between the latitude and proportion of T2D among First Nations was hence discovered [36] with lower T2D prevalence rates in places where the protein intake is higher than the Euro-Canadian standard [2].

The Australian Aborigines living in urban settings have eating habits similar to those of the general population [4]. As for Aboriginal people, those living in the remote communities of cities have limited access to fresh and diversified food at an affordable cost [4,29]. Consequently, they consume fresh food less regularly, particularly fruits and vegetables [4]. Costs related to transportation, labour, refrigeration and storage as well as costs associated with losses [the cost of each kilogram of food ordered by the company that is not sold due to poor quality (decay, deficient storage, long transportation, etc.)] are added to the cost of food [4]. In short, First Nations individuals living in isolated areas are exposed to the high cost of foods as well as poor quality food products.

Furthermore, it may prove difficult for certain individuals to cook given the condition of the housing units. For comprehension purposes, it should be noted that in most

communities the lots as well as the houses belong to the Band Council. The community members rent their housing units from the Band Council, which is also responsible for the development and construction of new housing units. The lots and financial resources often being insufficient, the waiting list to obtain a house keeps getting longer and individuals tend to crowd into the existing houses. Moreover, a great many First Nations members living in remote communities live in improvised, poor quality and overcrowded homes.

3.4 Biological factors

3.4.1 Obesity, lipid profile and anthropometric measures

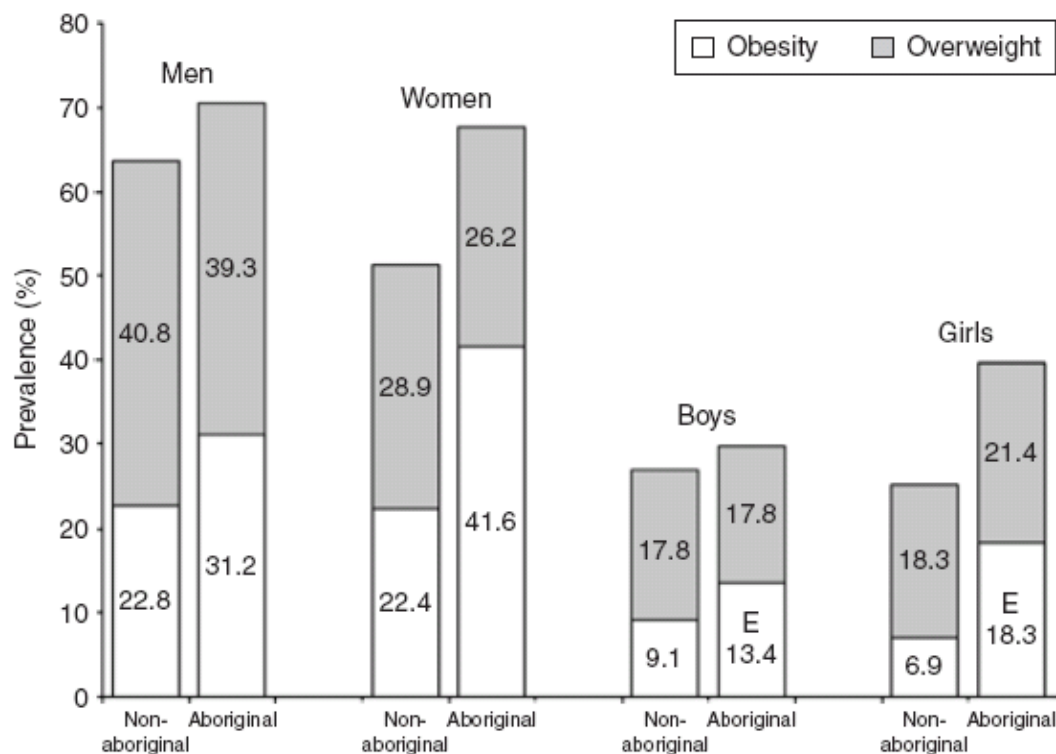
As previously exposed, the prevalence of T2D increases with obesity [1,2,5,12,15,37]. In fact, obesity is seemingly the most significant risk factor for diabetes [14]. Being obese during childhood [44], as well as the duration of obesity [2] are strong risk factors for T2D [2,44].

Obesity among First Nations individuals is located mainly at the abdominal level [2] and is characterized by a high waist/hip ratio (WHR) [11], body mass index (BMI) [14,43] and waist circumference (WC) [4,38]. These anthropometric measures are positively correlated with the increase of T2D prevalence [4]. There are as many overweight First Nations individuals as there are among the general population, but there are significantly more obese First Nations children, men and women than among the non-Aboriginal population [44].

In addition to being an important T2D risk factor, WC seems to be the best adiposity (percentage of fat in the body tissue) measurement for predicting T2D among First Nations members compared to the BMI [45] and the WHR [41]. Indeed, the WHR can be the same for a non-obese person and an obese person [37]. Furthermore, it is not effective for identifying individuals who are more at-risk of T2D among individuals suffering from obesity [46]. Regarding the BMI, the threshold among First Nations individuals should be different than that used for the general population [14]. In fact, the First Nations individuals with a BMI higher than 22 kg/m² have an increased risk of glucose intolerance and are also at risk of developing T2D and a CVD [39]. This would explain the great proportion of T2D in the 20 to 25 kg/m² BMI bracket among the Pima Indians compared to the general population [5].

The prevalence gaps between both genders and associated with being a First Nations member with regards to being overweight and obesity are presented in graph 3.1. Please keep in mind that this data only concerns Aborigines living off-reserve.

Graph 3.1: Overweight and obesity prevalence among adults (18-64 years old) and children (2-17 years old) according to gender and First Nation identity in Canada in 2004 (Canadian Community Health Survey 2.2: Nutrition)



E: coefficients of variation 16.6% and 33.3% (to be interpreted with caution).

Figure from: Katzmarzyk, P. T. *Obesity*. (Silver.Spring) 16, 184-190 (2008)

It can be observed in the graph that the First Nations individuals have a prevalence related to being overweight that is similar to that of the general population. However, there are significantly more First Nations children, men and women who are obese compared to the non-Aboriginal population (44). The women in particular are affected by obesity (nearly 42%).

According to the 2002 Regional Longitudinal Health Survey of the First Nations of the Quebec region, more than two-thirds of the adults interviewed were suffering from obesity or from being overweight. Moreover, nearly 28% of the men and 33% of the women were obese according to their body mass index (BMI). The BMI was calculated based on the height and weight as self-reported by the respondents, all living in a community (FNQLHSSC (2006), 2002 Regional Longitudinal Health Survey of the First Nations of the Quebec region, p. 73).

Several metabolic changes appear with the onset of obesity and contribute to the risk in terms of developing T2D: insulin resistance, hyperinsulinemia among youth, high concentration of glycosylated haemoglobin among senior citizens (11), increase in low density lipoproteins, triglycerides and HDL cholesterol (47) and changes in the muscle fibre (47).

Also, according to a study by McDermott and coll. (30;37], obesity is undergoing significant growth among women between the ages of 15 and 34 years (37).

3.4.2 The metabolic syndrome

The metabolic syndrome (MetS) is a group of factors that predispose to T2D and CVD [39]. Based on a consensus published in 2009 by the International Diabetes Federation (IDF), the American Heart Association (AHA) and the National Heart, Lung, and Blood Institute (NHLBI), the subjects are identified as presenting a metabolic syndrome when they have at least three out of the five following factors:

Definition of the Metabolic Syndrome (MetS), 2009

IDF/AHA/ NHLBI (2009)	
	3 of the 5 following criteria
High waist circumference	Ethno-centered threshold, using IDF 2005 thresholds for non-Europeans and leaving the choice between IDF and NCEP/ATP III thresholds for those of European descent
High triglycerides	> 1,5 g/L or treatment
Low HDLc	< 1.04 mmol/L: men < 1.29 mmol/L: women
High blood pressure (BP)	Systolic blood pressure > 130 mmHg and/or diastolic blood pressure > 85 mmHg or treatment
High fasting plasma glucose	≥ 5.6 mmol/L or treatment

Source: <http://www.theheart.org/article/1017913.do>

Out of the five elements allowing for a MetS diagnosis, the most present one is abdominal obesity, followed by HDL-cholesterol and hypertriglyceridemia [48]. According to the results of the study by Pollex and coll., 29.9% of Oji-Cree adults and 43.4% of those 35 years of age and up have a MetS [48]. Also, the MetS is more common among First Nations women (33.9%) than among First Nations men (24.6%). Among adult women, those with a MetS are significantly older than those without one [48]. Finally, three out of every ten Oji-Cree female adolescents who have a MetS are also diagnosed with T2D [48].

Conclusion

Obesity during childhood has severe consequences on health on a long-term basis by increasing, among other things, the risk of developing T2D. Smoking, alcohol consumption, diets that are high in sugar, fats and carbohydrates and a lack of physical activity also influence the development of T2D. The increase of T2D among the First Nations communities is also clearly linked to factors such as environmental changes related to the transition from a traditional lifestyle to a modern lifestyle and to genetic susceptibility [10]. The First Nations are often disproportionately affected by changes to their diet and lifestyle [40], regardless of their geographical location. In addition, the remote communities are often faced with the high costs of food.

It is possible to anticipate a future increase in T2D rates among the First Nations communities with a high prevalence of prediabetes [10]. In this regard, data concerning obesity, prediabetes and diabetes must be available for these communities. In order to comprehensively determine the problematic issue surrounding T2D among the First Nations individuals, it is necessary to carry out a study of the First Nations members' perception of T2D, the accessibility and availability of care, the prevention initiatives established, socio-economic inequities, the psychosocial influence of the stress factors, and the environmental aspects such as changes in eating habits and physical activity among various First Nations communities.

Chapter 4: Methodology

This fourth chapter presents the methodology used for the data collection as well as the one used for the data processing. Section 4.1 presents the communities selected for attaining the objectives of the Scan. The methodology used for the data collection process is divided into three parts: a questionnaire administered among the key players, a review of the medical files and environmental walks. These various data collection methods are described respectively in a detailed fashion in sections 4.2, 4.3 and 4.4. Section 4.5 addresses the issue of community consent, while section 4.6 details the method used for the processing of the data. Finally, section 4.7 presents the limitations of this study.

4.1 Selection of the participating Communities

From the very beginning, all of the First Nations communities were approached to take part in the study. Only those that returned their signed consent forms could be selected. Therefore, the Cree, Mohawk and Inuit Nations did not participate in this Scan. Moreover, the community selection process was carried out differently for each of the study's three components.

For the component regarding the administration of the questionnaire among the key players of the communities, all of the communities were invited to participate. All those that returned their signed consent forms were thus retained.

Regarding the components related to reviewing the medical files and the environmental walks, two selection criteria were retained in order to achieve a sampling that is representative of the communities. In fact, it was agreed that at least one community per Nation and one community per geographical isolation zone would be selected. Furthermore, the participating communities were targeted in accordance with their populations. Indeed, the communities selected had to have at least 100 individual medical files in their possession. The communities that could not provide this minimum number of active files were preserved in case a larger community from the same Nation and geographical isolation zone could not take part in the study.

The initial sampling therefore changed based on the answers received from the communities. First of all, the following pre-selection process was carried out:

Table 4.1: Selected and replacement communities for the review of the medical files and the environmental walks at the beginning of the project

Selected communities	Replacement communities	Geographic isolation zone	Nations
Wendake	X	1	Huron-Wendat
Kitigan Zibi	Lac-Simon	1	Algonquin
Manawan	Wemotaci	2	Atikamekw
Odanak	Wôlinak	1	Abenaki
Natashquan	X	3	Montagnais-Innu
Listuguj	Gesgapegiag	1	Mi'gmaq
Betsiamites	Essipit	1	Montagnais-Innu
Kawawachikamach	Unamen Shipu	4	Naskapi/Innu
Opitciwan	Matimekush (zone 4)	3	Atikamekw/Innu (4)
Eagle Village	Barriere Lake	2	Algonquin
Kahnawake	Kanesatake/Gesgapegiag	1	Mohawk/Mi'gmaq

Once the answers were received, two replacement communities were selected: Gesgapegiag and Matimekush. The list of communities visited for the environmental walks and the studying of the medical files is presented in table 4.2:

Table 4.2: Communities targeted for the review of medical files and environmental walks by geographic isolation zone.

Zone 1	Zone 2	Zone 3	Zone 4
Odanak	Manawan	Natashquan	Kawawachikamach
Wendake	Eagle Village		Matimekush
Kitigan Zibi			
Listuguj			
Gesgapegiag			

4.2 Questionnaires administered to the key players

Questionnaires were developed in order to collect information among a number of players working in the First Nations communities. The following subjects were addressed: prevention, promotion, screening, care and treatment, capacity-building, and the intervention capacity of the communities (funding, human resources, nutrition, physical activity, screening, care and treatment). In addition, the questionnaires

addressed the communities' needs in terms of the fight against diabetes, the resources used for fighting against diabetes as well as the repercussions on other programs. Finally, these questionnaires were a means of identifying the activities that are deemed the most effective in terms of fighting against diabetes. In order to reach the interveners, three different questionnaires were developed:

1. A questionnaire intended for the health directors and nurses

The questionnaire intended for the health directors and nurses included questions on diabetes-related activities that had taken place in the community, the intervention capacity, and the needs in terms of human, financial and material resources in order to fight efficiently against diabetes, the use of a traditional approach, best practices, and intervention priorities.

All the questionnaires were administered by phone. First of all, the health directors and nurses were contacted in order to set up an appointment based on their availability. Afterwards, they were contacted again for the purposes of conducting the interview. In order to be interviewed, the health director or the nurse had to be familiar with the diabetes-related activities that had been carried out over the course of the 2007/2008 fiscal year.

2. A questionnaire intended for the community health representatives (CHR)

Based on the answers received from the health directors and nurses, a questionnaire was developed for community health representatives. It addressed diabetes-related activities that had been held in the community, the intervention capacity, the use of a traditional approach in addition to the best intervention practices.

The procedure for making appointments and filling out the questionnaires was the same as the one used for the health directors and nurses.

3. A questionnaire for the nutritionists

A final questionnaire was designed specifically for the nutritionists. This questionnaire addressed the nutrition-related activities that had been held in the community, the intervention capacity, the access to fresh and diversified food, the needs in terms of nutrition and the use of a traditional approach.

Once again, the procedure for making appointments and filling out the questionnaire was the same as the one used for the two other groups that were approached.

All of the interviews were conducted between the months of October 2008 and December 2008.

Following the first interviews conducted with each of the three groups of interveners, the questionnaires were reviewed and improved.



4.3 Review of the medical files

For this component of the study, the medical files stored in the health centres were consulted in order to collect data, from each community, regarding the known number of individuals with diabetes and prediabetes.

The following equation allowed for determining the minimum number of files to be consulted in order to achieve a sampling that ensures proper representation:

$$\begin{aligned} N &= 1.96^2 \times (0.5 \times (1 - 0.5)) / 0.05^2 = 385 \\ 385 \times \text{sampling plan effect} &= 385 \times 2 = 770 \\ 770 / 10 \text{ communities} &= 77 \text{ files per community} \end{aligned}$$

In order to counter unforeseen elements, it was agreed that 100 files per community would be consulted. Therefore, a total of 1000 files, or 100 files for each of the 10 communities targeted, were selected in order to establish a database that allows for determining the known prevalence of diabetes and prediabetes according to the degree of geographic isolation of the communities. This part of the study was carried out between the months of November 2008 and February 2009.

The sample of the medical files was randomly determined, based either on the Band list or the indications given on the functioning of the health centre's active files. Indeed, some health centres organize their patient files by alphabetical order, while other health centres organize their files according to file opening date or even by date of birth.

The selection criteria for the medical files were as follows:

- The file had to be active⁵;
- The individual had to be aged over 6 years⁶;
- The individual had to reside in the community.

In situations where any of these criteria were not respected, a new file was randomly selected to replace it.

For each community, a random sampling was therefore taken. For each medical file, when possible, the data on the type of diabetes, its duration, age, gender, height, weight, waist circumference, hip circumference, blood pressure, HDL and LDL cholesterol and triglycerides was collected. The latest data available in the patient's file was retained in the context of this Scan. The choices related to these variables were based on what was done in the other studies and what can be obtained in the patient files of the community health centres. No nominative information was retained.

⁵ The person should have consulted a health centre professional three years prior to the scan.

⁶ Based on the literature, finding cases of children with type 2 diabetes is extremely rare before this age.

4.4 Environmental walks

The last part of the study, the environmental walks, allowed for gaining a better understanding of the communities' contexts and the infrastructures and services available. This constitutes considerable information since diabetes can be influenced by environmental factors such as access to sports infrastructures, food quality and available food services.

The environmental walk consisted in having a consultant, specifically hired for that purpose, complete a community questionnaire. The consultant had to walk in the community in order to take pictures, note the available infrastructures and collect information on the availability, quality and cost of certain foods. The questionnaire also included questions on the type of food services available and access to public transportation and sports infrastructures in the community. The environmental walks took place between the months of November 2008 and February 2009.

The choices of variables, particularly those regarding nutrition, were made in collaboration with a nutritionist from Health Canada - FNIH and the nutritionist of the FNQLHSSC. Furthermore, the community questionnaire was approved by the ADI Committee.

4.4.1 Selection and training of the consultants

The consultants hired for carrying out the environmental walks were members of the communities visited. They were recommended by an employee of the local health centre. A first contact was established with the consultants upon the arrival of the research agent in the community. Afterwards, the consultants were invited to a meeting where the procedures of the environmental walk were explained to them. The consultants, of which there were two per community, were therefore recruited and trained on site. Precise guidelines were transmitted to the consultants concerning the way to record prices, the photographs to take and the places to visit. The rationale behind hiring local consultants was based on the fact that people from the community know their environment better than anybody else from outside the community.

The consultants received a questionnaire and a digital camera after having signed the contract. They then left with the material and followed the instructions previously transmitted to them at the meeting. The photographs taken during the environmental walks allowed for contextualizing the community and its infrastructures while gaining an appreciation for the quality of the food available.

4.5 Consent of the communities

All of the communities of the First Nations of Quebec were invited to take part in the study.

In order to respect the First Nations of Quebec and Labrador Research Protocol, a consent form had to be signed by the Band Council and the Health Director of the community. Once the consent form was signed and returned to the FNQLHSSC, the phone interviews could start and the visits in the communities were planned.

All the data collected during the Scan remains confidential and was analyzed in such a manner as to ensure that individuals could not be identified. The data collected is kept at the FNQLHSSC and can only be accessed by the research agent responsible for the study.

4.6 Data processing

The descriptive analysis of the data collected was performed with the assistance of the SAS 9.0 and Excel software programs.

To conduct the various data analyses, certain guidelines were followed. Therefore, the threshold values used for blood pressure are those determined by the guidelines of the *Société Québécoise d'Hypertension Artérielle* (SQHA). For the values related to fasting plasma glucose, cholesterol, glycosylated haemoglobin and triglycerides, the guidelines of the Canadian Diabetes Association (CDA) were followed. In the context of this study, the statistical significance threshold used is 0.05 for all statistics. When the data is not significant from a statistical perspective, this information is mentioned.

The data from the questionnaire intended for the health directors, nurses, nutritionists and community health representatives was analyzed in a descriptive manner. The data collected during the environmental walks was also analyzed in a descriptive manner and using tables subdivided according to the geographic isolation zone. Moreover, the data concerning the cost of food was calculated based on standardized quantities. As such, in the questionnaire the consultants were required to fill out, the cost had to be noted for a predetermined weight or volume.

All of the data collected through the review of the medical files was entered by the same individual - the FNQLHSSC research agent. The data was saved on a USB flash drive and could only be accessed by the research agent. This information was transferred to and stored at the FNQLHSSC. As mentioned previously, no nominative information was collected.

The data from the questionnaires intended for the nurses, health directors, nutritionists and community health representatives was entered by the research agent. The data was entered in such a way as to ensure that it is impossible to associate the respondent with his/her answers. The data collected during the community walks was re-entered progressively as the questionnaires were submitted to the research agent. Hard copies of the questionnaires exist and the only way to trace them back to the people who filled them out is by associating the number of the questionnaire with the number of the consultant's contract. However, these questionnaires only contain factual data on the communities.

4.7 Limitations of the study

4.7.1 Review of the medical files

No research can avoid bias and this one is no exception. First of all, the prevalence calculated based on the data collected from the medical files does not correspond with the actual prevalence of diabetes and prediabetes among the First Nations communities. In fact, it corresponds with the proportions of people with diabetes and prediabetes diagnosed by a physician and known by the health centres. In order to determine the actual prevalence, it would be necessary to carry out a systematic screening process across a sufficiently large sampling. In short, the prevalence figures obtained based on the collected data only represent the population who access the health centres of the selected communities.

This leads to another limitation of the study: the incapacity to generalize the results and compare them with those of other studies. Indeed, it is difficult to compare this type of data with other studies that have screened entire populations. This is particularly true given the fact that few studies have been conducted on diabetes and prediabetes among Aboriginal populations, let alone in Canada or Quebec.

Finally, a lot of data was missing in the medical files of the patients from the health centres. Little data was available concerning the population under 30 because consultations at the health centre are less frequent among this portion of the population. Furthermore, it has been noted that more women consult, which may be explained by the fact that women consult for pregnancies and to obtain birth control pills. Moreover, weight, height and waist circumference were missing among most medical files. In closing, the fact cannot be denied that in communities that are located in proximity to urban centres, a significant portion of the individuals consult elsewhere than at their community's health centre which once again increases the quantity of missing data.

4.7.2 Questionnaires administered among key players

A number of limitations had an impact on the process of carrying out the interviews with the interveners. First, staff turnover in communities resulted in a lot of individuals not being interviewed because they had just arrived in their position or had arrived after the determined period. Therefore, they did not know enough about the activities that had taken place. Furthermore, in some communities, some people did not show up at the time that had been convened. In other communities, calls were simply not returned.

Also, the results obtained through the interviews are subject to the biases related to social desirability and the memory of the respondents.

Chapter 5: Results I: Perception of health directors, nurses, nutritionists and community health representatives

This section of the report concerns the interviews conducted with the health directors, nurses, nutritionists and community health representatives (CHR). The results of the interviews are presented by geographic isolation zone. It should be kept in mind that the information collected concerns the 2007/2008 fiscal year. Furthermore, please note that no distinctions were taken into consideration between the communities with a health centre versus those with a nursing station for the analysis of the results.

Certain people who were interviewed held more than one function within their health centre at the time of the interview. In these types of situations, the person was interviewed only once. In other cases, an individual could work in more than one community simultaneously - this person was also interviewed only once.

The first section of the chapter presents the results obtained with all of the respondents. Afterwards, the results are presented for each geographic isolation zone. The activities and information were surveyed based on what was mentioned by the respondents. That being said, it is possible that the communities have carried out other activities that were omitted by the respondents over the course of the interviews.

5.1 Regional portrait

This section presents a general analysis of the results for all of the respondents, regardless of their geographic isolation zone.

5.1.1 Portrait of the respondents

A total of 25 interviews were conducted among interveners working in 15 communities: five interviews in zone 4, two interviews in zone 3, three interviews in zone 2 and 15 interviews in zone 1. Table 5.1 indicates the number of interviews conducted in each geographic isolation zone based on the respondents' occupation.

Table 5.1: Number of interviews conducted with the respondents according to their occupation and geographic isolation zone

	Zone 1	Zone 2	Zone 3	Zone 4 ⁷
Health directors	6	1	1	3
Nurses	4	1	1	2
Nutritionists	4	0	0	2
Community health representatives	1	1	0	0

⁷ A total of five interviews were conducted in zone 4. However some individuals had two occupations in their community.

5.1.2 Prevention, promotion, screening, care and treatment and capacity-building

Prevention

In terms of prevention regarding the activities offered, most of the communities organize collective kitchens. Some communities also organize sports activities and challenges. Moreover, prevention activities concerning diabetes-related complications for patients already diagnosed are carried out in different locations such as schools and community centres. To reach out to a maximum number of people, some communities organize conferences while others use the community radio to broadcast prevention messages.

Promotion

Various means are used for the purpose of providing prevention in the communities. These are generally carried out through posters and flyers or through local media such as the local newspaper or community radio when these are available in the community. Promotion activities are also performed during special events such as fairs or community activities (bingo, healthy breakfasts, etc.).

Screening

Diabetes screening is especially performed through capillary blood glucose monitoring during community meals or collective kitchens. A number of communities also organize mass screening or perform systematic screening when visiting a patient presenting risk factors or during medical visits among senior citizens.

Care and treatment

Concerning the range of services offered, most communities visited offer foot care and follow-up services intended for diabetics. However, the more the communities are isolated from the urban centres, the more access to certain health professionals (dentist, nutritionist, physician, and ophthalmologist) becomes difficult. One community that has access to a kinesiologist also offers follow-up related to physical activity.

Capacity-building

The training that the diabetes interveners working in the communities have access to are training sessions offered by professional associations, congresses (*Diabète Québec*), training provided by physicians, academic training on diabetes such as the training offered by Yellowquill College, training provided by Health Canada, training offered by hospitals in addition to alternative training such as traditional medicine.

5.1.3 Data on diabetes in the communities

Few communities possess data on the proportion of individuals with diabetes or prediabetes among their populations.

5.1.4 Intervention capacity

The intervention capacity of the communities related to diabetes in the areas of prevention, promotion, screening, care and treatment and capacity-building particularly depends on the language used by the community members, geographic isolation, community context and available resources.

5.1.5 Language and traditional culture

The results obtained through the interviews conducted demonstrate that few key interveners speak a First Nations language. However, some communities use the community radio for raising awareness on diabetes in the native language of the community.

For the aspects of prevention, promotion, screening, care and treatment and capacity-building, the traditional approaches are seldom used. Nonetheless, some of the interveners indicated that they were increasingly attempting to use traditional approaches during their prevention, promotion and screening activities.

5.1.6 Best practices and intervention priorities

Since the context of each community is unique, pooling the best practices and intervention priorities of the communities is a difficult endeavour. Therefore, at the end of each of the sections related to each geographic isolation zone, the best practices and intervention priorities that were raised by the key interveners interviewed are presented.

5.2 Zone 1 - Communities located near an urban centre

The analysis of the data collected in zone 1 will be performed differently than the analysis of the data obtained in the other geographical isolation zones because the number of respondents (fifteen) is much higher. The results will be analyzed from the point of view of two groups of stakeholders: on one hand the points of view of nurses, CHRs and health directors will be analyzed, and on the other hand the points of view of the nutritionists will be analyzed. For the other studied zones, the results will be presented globally.

5.2.1 Portrait of respondents

In zone 1, the following individuals were interviewed: one community health representative working in the field for less than a year, four nutritionists who have held their positions for more than five years and six health directors of which four had held this position for more than five years, one for less than a year and one for one to three years. Finally, four nurses were interviewed of which three had held their positions for more than five years (10, 14 and 17 years) and one for three years. These interveners came from five different communities.

5.2.2 Prevention, promotion, screening, care and treatment and capacity-building

Prevention

With regards to prevention, the nurses, health directors and CHRs indicated that the following activities had been held in their communities during the year 2007/2008: presentations in schools, physical activity groups (walks, sports etc.), meetings for those with diabetes and prediabetes, presentations by the dentist, healthy breakfasts and meals, collective kitchens, visits in the businesses, activities organized by a kinesiologist and meetings with a podiatrist or other foot care specialists.

Nutritionists mentioned the following activities in the context of prevention: collective kitchens where people learn the basics of healthy eating and during which screening tests are sometimes conducted, healthy cooking classes, healthy eating activities in early childhood centres and with senior citizens, conferences on healthy eating and conferences where an individual with diabetes and complications (retinopathy, nephropathy, neuropathy, amputation, cardiovascular diseases) offers a personal account. During the healthy cooking classes, some nutritionists mentioned providing information on how to read labels. Furthermore, among the activities proposed, some nutritionists organize marathons and sports activities.

Nutritionists had to evaluate the participation in these activities on a nil⁸ to very good scale (nil, average, good, very good). Thus, 25% of the respondents deemed the participation as being average while 75% of them deemed it to be good.

Promotion

The nurses, health directors and CHRs all mentioned various promotion activities that had been held in their communities, such as the distribution of brochures on healthy eating and physical activity. Some communities held health fairs or produced bulletins into which they included trivia games on health. While some communities put up posters on screening or visited businesses in order to distribute information, others used the community radio and local newspapers. Finally, one community carried out promotion during bingo activities.

According to the interviews conducted, few nutritionists indicated that they carried out promotion. However, it was mentioned that in some communities, nutrition promotion is performed through the community radio and the local newspaper.

Screening

Nurses, health directors and CHRs indicated that part of the screening is carried out in a joint fashion along with other activities such as during healthy breakfasts or when patients visit the health centre for influenza. Some communities commence performing screening tests among the children in grade three directly at the school and among senior citizens during home visits. That being said, some communities indicated that

⁸ In the context of this research, the choice “nil” means “none”.

they do not conduct any specific structured screening activities but that they instead provide it on an individual basis when the patients consult.

However, most of the screening is done through blood glucose tests.

While half the nutritionists integrate screening during activities they organize, the other half does not include them. However, it was mentioned by many nutritionists that the nurses also organize screening activities.

Care and treatment

The care and treatment provided by the health centres in communities located in zone 1 are mainly foot care, wound care, home care for senior citizens, follow-up with the nutritionists and individual follow-up. One of the questioned interveners did however indicate that people in his community do not have access to foot care anymore because the associated budgets have not been renewed. Furthermore, no respondents indicated that the members of their communities had access to specialized eye care (ophthalmology or optometry).

Capacity-building

A number of nurses, health directors and CHRs mentioned participating in the training on diabetes offered by Yellowquill College and in the training offered by Health Canada. Others mentioned participating in the symposium organized by *Diabète Québec* or attending training sessions offered by the *Ordre des infirmières du Québec*. Some also participate in training on traditional medicine. Furthermore, in some communities, the physician occasionally offers training to the other interveners. Intervenors from one community also indicated that they planned on implementing a certificate for training educators on diabetes-related care.

The nutritionists also mentioned having access to various training. Moreover, some of them offer training on diabetes and eating habits to people with diabetes and pregnant women.

5.2.3 Data on diabetes in the communities

Overall, 80% of the respondents in zone 1 indicated that they do not have data on diabetes and prediabetes in their communities. Also, very few of them are able to estimate the number of people with diabetes or prediabetes within their populations.

5.2.4 Intervention capacity

Table 5.2 presents the perceptions of the interveners in zone 1 concerning their community's intervention capacity with respect to a number of parameters related to diabetes.



Table 5.2: Perception of the intervention capacity of the communities in zone 1 with respect to certain diabetes-related parameters (N=15).

	Nil	Average	Good	Very good
Financial resources	13%	47%	40%	0%
Human resources	13%	47%	27%	13%
Nutrition	0%	53%	33%	13%
Physical activity	27%	27%	36%	9%
Screening	9%	18%	64%	9%
Prevention	0%	36%	55%	9%
Promotion	0%	27%	64%	9%
Treatment	0%	27%	64%	9%
Training	0%	55%	45%	0%
*Cost of food	0%	0%	100%	0%
*Quality of fresh food	25%	25%	25%	25%
*Quality of frozen food	0%	25%	50%	25%
*Variety of food	25%	25%	0%	50%

* Questions present only in the questionnaire intended for nutritionists (N=4)

The intervention capacity of the community is deemed average or good by over 80% of the respondents in terms of screening, prevention, promotion, care and treatment, training, financial resources and human resources. With respect to physical activity, more than one quarter of the respondents deemed that their community has no intervention capacity in this regard.

Concerning eating habits, all the nutritionists interviewed in zone 1 believe that their community has a good capacity for intervening on the price associated with foods. However, they are equally divided (25%) among the nil, average, good and very good categories with regards to the capacity to intervene on the quality of fresh food. Concerning the quality of frozen food, 25% consider it to be average, 50% good and 25% very good. Finally, half of the nutritionists deemed that there is no capacity for intervention with respect to the variety of the available foods or that this capacity is average while the other half mentioned that their community's intervention capacity in this regard is very good.

In order to fight more effectively against diabetes, nutritionists consider that the main needs concerning nutrition are to increase the variety of food, their freshness and their accessibility. The other elements that were mentioned are food security and the need to increase prevention budgets as well as the communication methods and human resources. Furthermore, some nutritionists indicated that it is not normal for soft drinks to be cheaper than milk. They also added that advertisements for chips and soft drinks should be reduced in favour of healthy food. The nutritionists interviewed deplored the fact that in order to benefit from the delivery system and food proximity, food purchases in some communities for the most part take place in a convenience store. Unfortunately, fruits and vegetables are rarely available and diversified in these stores.

To enhance the fight against diabetes and render the activities effective, the nutritionists suggested increasing the human resources within the health centres, among

other things. In fact, some of them have a lot of patients to work with and have very little time, or none at all, to organize nutrition-related activities. Furthermore, a nurse must be available to conduct screening tests during the activities they organize.

Another constraint raised deals with the fact that it is difficult for the personnel working in the communities to carry out activities while targeting the individuals who have the greatest needs. Indeed, some communities in close proximity to provincial borders do not have access to data on the number of diabetics in their communities because people access care in hospitals of the neighbouring province.

As for the health directors, nurses and CHRs, they mentioned the need to increase current financial and human resources in order to accentuate prevention and promotion because, for the time being, human resources are concentrated on individuals who have already been diagnosed. The communities are aware that they need more time to get organized and structured to address the growing needs of their members.

5.2.5 Language and culturally-adapted services

Among the nurses, health directors and CHRs, nine out of eleven interveners indicated that no interveners speak the First Nations language of their communities. In the two other communities, between one and seven people speak the local Aboriginal language fluently. There are also nine out of eleven interveners who indicated that they are unable to organize activities related to the ADI program in the First Nations language of their communities even if in one of these communities, over 90% of the individuals speak the Aboriginal language. Furthermore, only four respondents indicated that they were using the community radio in the language of their First Nation for the purpose of performing prevention and promotion.

Only 25% of the nutritionists can use a First Nations language. The same proportion (25%) indicated that they were able to carry out ADI program activities in their community's local language. Furthermore, three-quarters (75%) of the nutritionists integrate a traditional approach into their activities. For example, prevention with a traditional approach is provided through berry-picking activities during which the benefits of traditional foods are highlighted. They also use the community radio to perform prevention, promotion or to invite people to participate in the various activities.

In short, when it comes to prevention and promotion, 40% of the interveners use a traditional approach. An example of promotion using a traditional approach is the use of the community radio in the Nation's traditional language. In terms of screening activities, care and treatment and training, the proportions of the interveners using a traditional approach are 30%, 50% and 20% respectively.

5.2.6 Best practices for reaching the population and intervention priorities

Concerning the use of the services offered in connection with diabetes, the proportion of people who use the services varies from one community to another. In some communities, they are used by people who are sick and in others they are not used at all or used very little. Moreover, some communities experience difficulties associated with reaching individuals or motivating them to participate in the activities.



In addition, regarding the best practices carried out in zone 1, these include diabetes educational initiatives, prevention and activities with children in schools, walks, nutrition bingo, biannual community suppers and screening workshops in the businesses. Community activities such as berry-picking and pow-wows are also identified as being effective activities.

The intervention priorities of the communities in zone 1, from the most commonly raised to the least commonly raised, are as follows:

- 1) Diabetes, obesity and physical activity, raised by eight respondents out of ten (8/10);
- 2) Alcohol, drug and gambling addictions (5/10);
- 3) The health of the senior citizens, the need to develop infrastructures for them, as well as services accessible in their language; chronic diseases (cancer, heart disease, hypertension); family support and maternal health; the organization and quality of the services offered as well as access to resources to provide these services; and mental health problems (4/10);
- 4) Prevention in all areas (3/10);
- 5) Palliative care services (2/10);
- 6) Suicide; family violence; social housing; the population's well-being, and the identification of major health problems in the community (1/10).

A respondent raised other priorities that he deemed as being important. This respondent insisted that it is important to reach out to men over 30 years of age to discuss healthy lifestyle habits with them. He also mentioned that it would be necessary to obtain sports infrastructures and develop public transportation so that the senior citizens can participate in the activities that are held in the evenings. Also according to this worker, a call system should be implemented for diabetic patients to ensure follow-up and tools should be developed to inform the clientele on various pathologies (hypertension, hypercholesterolemia, diabetes, etc.).

5.3 Zone 2 - Remote communities

The data analysis in zone 2 is carried out as follows: the results of the interviews were analyzed globally rather than separately, like for zone 1, because there were fewer respondents.

5.3.1 Portrait of the respondents

A nurse, a health director and a community health representative all accepted to answer the questionnaire in zone 2. They all had over five years of experience in their positions in the communities. These three interveners represented two communities.

5.3.2 Prevention, promotion, screening, care and treatment and capacity-building

The prevention activities held among the communities in zone 2 are as follows: breakfasts for diabetics every three months, regular follow-up of diabetics on a quarterly basis with glycaemia control to prevent complications, clinics, physical activities (community walks and challenges), healthy breakfasts and a nutrition day. The respondents evaluated the participation in these activities as being good (the choices of answer were nil, average, good and very good).

Concerning promotion activities, a small newspaper on health including recipes is distributed on a monthly basis to diabetics in one community. Promotion activities are also performed in the context of a health fair held every year. Posters and brochures promoting health are also available in a stand at the health centre.

In terms of screening, the activities organized are mainly biannual mass screening clinics where individuals have their blood pressure and glycaemia tested. Screening tests are also performed during community breakfasts.

Treatment activities are carried out on a regular basis, such as foot care, consultations with a dentist and access to a nutritionist. However, it was reported by a respondent that the physician is present only once every three months and the optometrist or ophthalmologist are only present once a year.

In terms of capacity-building, there is very little of it in the zone 2 communities. However, the interveners take part in training activities offered by Health Canada and a few workshops on diabetes are provided to the staff. It is to be noted that few training sessions are provided in English.

5.3.3 Data on diabetes in the communities

The prevalence of diabetes in zone 2 is estimated at 13% by the respondents. Only a limited amount of data is available based on age and gender for type 2 diabetes and prediabetes.

5.3.4 Intervention capacity

Table 5.3 presents the responses provided by the interveners interviewed concerning the diabetes-related intervention capacity in the zone 2 communities. This data represents the perceptions of the nurses, health directors and CHRs who participated in the interviews.



Table 5.3: Perception of the intervention capacity of the communities in zone 2 with respect to certain diabetes-related parameters (N=3).

	Nil	Average	Good	Very good
Financial resources	0%	67%	33%	0%
Human resources	0%	33%	67%	0%
Nutrition	0%	100%	0%	0%
Physical activity	0%	100%	0%	0%
Screening	0%	0%	67%	33%
Prevention	0%	33%	67%	0%
Promotion	0%	0%	100%	0%
Treatment	0%	33%	67%	0%
Training	0%	33%	67%	0%

The diabetes-related intervention capacity of the communities is considered as mainly being good for human resources (67%), screening (67%), prevention (67%), promotion (100%) care and treatment (67%) and training (67%). The intervention capacity is mainly evaluated as average for financial resources (67%), nutrition (100%) and physical activity (100%).

The most mentioned needs mainly concern financial resources that do not allow for being fully effective in terms of prevention and promotion. For example, some communities could afford to hire a nutritionist if they were provided with a slightly higher budget. Furthermore, additional funding could be used to acquire the equipment necessary for practicing physical activity and mass screening, which is currently limited due to the high cost.

Other needs have been raised concerning the human resources of the health centres. The respondents reported a lack of training and limited access to physicians and specialists such as optometrists, ophthalmologists, endocrinologists, etc. Furthermore, training on nutrition for First Nations members would be essential to improving the intervention capacity.

5.3.5 Language and culturally-adapted services

All the people interviewed indicated that they could not hold activities associated with the ADI program in their community's traditional language. Moreover, the traditional approach is not used in any of the areas concerning screening, treatment and training. However, one person did mention using it occasionally in the context of prevention and promotion activities. Another fact to be noted is that community radio services are not available in all communities, meaning that this means cannot be used by certain interveners as a communication method for performing prevention and promotion.

5.3.6 Best practices for reaching the population and intervention priorities

The best practices mentioned by the interveners in zone 2 are as follows: biannual diabetes screening, regular follow-up, education among newly diagnosed individuals

with diabetes and health fairs where a significant portion of the population is seen and screened for diabetes. It was also mentioned that between 50% and 75% of diabetics use the infrastructures that are at their disposal.

The prevention priorities in zone 2 are:

- Fostering a healthy lifestyle;
- Immunization;
- Prenatal health and maternal health;
- Addictions;
- Clinic;
- The community's well-being.

5.4 Zone 3 - Semi-isolated communities

The data analysis in zone 3 is conducted in the following manner: the results obtained during the interviews are analyzed globally and not separately, as with zone 1, since the sampling of respondents is small.

5.4.1 Portrait of the respondents

In zone 3, interviews were conducted with one health director and one nurse from one community. Their work experience in the community is between three to five years for one of them and over five years for the other.

5.4.2 Prevention, promotion, screening, care and treatment and capacity-Building

Diabetes prevention in zone 3 is mainly performed through community radio segments, videos on diabetes in the waiting room at the health centre, community meals, meetings for the senior citizens and information provided on gestational diabetes. Moreover, a nurse is assigned to nutrition who performs prevention at school.

As far as promotion goes, it is generally carried out through the community radio.

With respect to screening, it is carried out on a punctual basis when people come to the health centre and once a year with the community health representative.

Concerning the diabetes-related care, the diabetics are seen on a regular basis. Every Wednesday, "Diabetic Clinics" are held for individuals suffering from diabetes and hypertension. A foot care specialist is also present three weeks per year and an ophthalmologist is present three days per year.

In terms of capacity-building, the interveners have access to the training on eating habits that is provided by the nutritionists in the Early Childhood Centres and over the community radio. Moreover, some interveners mentioned having participated in training on diabetes offered by *Hôpital Laval*, located in Quebec City.

5.4.3 Data on diabetes in the community

The interveners who were interviewed had no data on the number of prediabetics and type 1 and type 2 diabetics in their communities. However, they estimated that there are between 0 and 3 people with type 1 diabetes and that the prevalence of type 2 diabetes is approximately 35% to 40%.

5.4.4 Intervention capacity

Regarding the intervention capacity of the communities with respect to diabetes, nine aspects were analyzed. The data presented in table 5.4 represents the perceptions of two interveners.

Table 5.4: Perception of the intervention capacity of the communities in zone 3 with respect to certain diabetes-related parameters (N=2)

	Nil	Average	Good	Very good
Financial resources	50%	0%	0%	50%
Human resources	50%	50%	0%	0%
Nutrition	50%	0%	50%	0%
Physical activity	100%	0%	0%	0%
Screening	50%	0%	50%	0%
Prevention	0%	100%	0%	0%
Promotion	0%	100%	0%	0%
Treatment	0%	50%	50%	0%
Training	0%	100%	0%	0%

The intervention capacity in terms of funding was evaluated as being non-existent by one person while the other deemed it to be very good. The respondents perceived that their community had no intervention capacity in terms of human resources (50%) or an average capacity (50%) in this regard. The intervention capacity concerning nutrition was evaluated as nil (50%) or good (50%) and the intervention capacity concerning physical activity was evaluated as being nil by both respondents. The intervention capacity in terms of prevention, promotion and capacity-building was judged as being average (100%); in terms of care and treatment it was deemed average (50%) or good (50%) and for screening it was deemed nil (50%) or good (50%). When the intervention capacity is evaluated as being nil, it means that the respondent considers that his/her community does not have the human and financial resources or facilities required to intervene.

According to both respondents, there are pressing needs in terms of human resources. Indeed, there is a need for a full-time nurse assigned exclusively to diabetes, training for the other nurses to update their knowledge, as well as for the increased presence of an ophthalmologist or optometrist and a foot care specialist. Furthermore, the presence of a physical activity specialist as well as a mental health resource to support diabetics and their families would provide a significant contribution. It was also mentioned that, occasionally, interveners stemming from other health sectors (NNADAP agents, CHRs or social services workers for mental health) have to be used to conduct activities in association with the fight against diabetes, which means that they have to set aside their main duties.

Needs were also mentioned on a financial level in order to establish a complete diabetes-specialized team and develop a special program to that effect.

5.4.5 Language and culturally-adapted services

According to the health director and the nurse interviewed, some of the interveners are fluent in the community's native language such as the community health representative. However, the more specialized individuals such as the nurses, physicians and other specialists stemming primarily from outside the communities do not speak the native language. In zone 3, the activities related to the ADI program can be proposed in the First Nations language. Moreover, the community radio which uses the native language is used for performing promotion and prevention.

In the zone 3 communities, the traditional approach is sometimes used for performing prevention and promotion. However, most of the time, this is not the case. Regarding screening, care and treatment and capacity-building, the traditional approach is never used.

5.4.6 Best practices for reaching the community and intervention priorities

The respondents mentioned off-reserve camps intended for diabetics on the territory (in the forest) as the best practice for reaching the population. Indeed, it seems very effective for promoting a healthy lifestyle.

In zone 3, the most important priorities or needs in terms of intervention are the following:

- 1) Helping people become independent with regards to their hygiene;
- 2) Increasing the promotion, awareness and funding for diabetes;
- 3) Facilitating access to sports centres;
- 4) Increasing the consumption of healthy food and reducing access to restaurants which serve food with low nutritional value;
- 5) Improving maternal and child health care; and



- 6) Improving the care provided in homes.

5.5 Zone 4 - Isolated communities

The data analysis in zone 4 is conducted as follows: the results of the interviews conducted with the nutritionists, nurses and health directors are analyzed globally rather than individually as with zone 1, since there were fewer respondents.

5.5.1 Portrait of the respondents

In zone 4, five interviews were conducted. Since an individual can have more than one function in a community, responses were collected from the equivalent of three health directors, two nurses and two nutritionists stemming from four different communities. Among the people interviewed, 86% of them had been in their positions in their respective communities for over five years and 14% of them for over two years.

5.5.2 Prevention, promotion, screening, care and treatment and capacity-building

Several prevention activities were carried out among the four communities in zone 4. Among these activities are health walks to raise awareness on diabetes, education for patients, prevention related to foot care, the availability of the arena every second Saturday for parent-child activities and health snacks, as well as activities proposed at the gymnasium of the health centre. Moreover, during International Diabetes Day, prevention and awareness activities are organized at the school: a walk with the teachers and parents and a sports competition. Prevention meetings are also organized at the centre for men with issues related to alcoholism and family problems. One community mentioned having tried group meetings for prevention as well as self-help groups, but these did not work because people did not want to publicly show they had diabetes. Awareness is also done through shows on the community radio addressing diabetes-related issues such as gestational diabetes and the utilization of a glucometer.

Promotion is mainly carried out through community radio shows and homemade posters on nutrition. In one of the communities, posters were designed to indicate the business hours of the health centre and in another one, people who enrolled at the fitness centre were given their first month for free.

Concerning screening, one community in zone 4 organizes volleyball tournaments during which screening is done for vital signs and glycaemia among those ages 18 years and over. At the health centre of one of these communities, random glycaemia controls are performed among people struggling with obesity or with other risk factors. One community also carries out screening at the school with the help of the community health nurse. As is recommended, babies are screened at birth and women must be tested for gestational diabetes.

Concerning care and treatment, in all the communities in which an intervener was interviewed, patients with diabetes have access to follow-up regarding the use of a glucometer and foot care. However, one of these communities has no access to this type of care due to a lack of training among the interveners. Other care and treatment available in one or several communities in zone 4 are: clinical follow-up including an electrocardiogram (ECG) and a lipid profile, the visit of an ophthalmologist twice a year as well as access to a nutritionist and a kinesiologist at the sports centre. Furthermore, one health centre uses “KARDEX” to ensure the follow-up of its patients (this allows for monitoring who needs to see which specialist, when the appointment is anticipated as well as the last dates of consultation with each of the specialists providing the patient with care).

A significant portion of the respondents indicated that they do not have access to training on diabetes for themselves and their colleagues. The main reasons raised are the fact that they are hired only as consultants, being in a remote location, not being able to leave their position for a long period of time and the costs associated with attending are too high. One person mentioned attending the symposium organized by Health Canada since the associated costs were covered for one participant per community and the information could be shared with the colleagues afterwards. In another community, the physician provides one hour of training to the nursing staff every second week. A solution proposed to compensate for the remoteness factor is to increase the availability of training offered via videoconferencing.

5.5.3 Data on diabetes in the communities

Health centres have very limited data on the number of people with diabetes and prediabetes. Some respondents indicated knowing 70 people who are affected, but no intervener provided a specific percentage. Some of them could however mention the number of known files for diabetic patients or even break this data down according to age and gender. However, this does not represent the actual proportion of diabetics in the community.

5.5.4 Intervention capacity

Table 5.5 presents the intervention capacity of the communities in zone 4 for a number of parameters concerning diabetes according to the interveners interviewed.



Table 5.5: Perception of the intervention capacity of the communities in zone 4 with respect to certain diabetes-related parameters (N=7)

	Nil	Average	Good	Very good
Financial resources	71%	0%	29%	0%
Human resources	71%	0%	29%	0%
Nutrition	100%	0%	0%	0%
Physical activity	43%	0%	43%	14%
Screening	20%	20%	0%	60%
Prevention	0%	40%	20%	40%
Promotion	0%	60%	0%	40%
Treatment	0%	20%	60%	20%
Training	40%	20%	40%	0%
*Cost of food	100%	0%	0%	0%
*Quality of fresh food	100%	0%	0%	0%
*Quality of frozen food	100%	0%	0%	0%
*Variety of food	0%	100%	0%	0%

* Questions included only in the questionnaire intended for nutritionists

In zone 4, the intervention capacity concerning diabetes is considered mainly as being nil for the financial resources (71%), human resources (71%), nutrition (100%), the cost of food (100%), the quality of fresh food (100%) and the quality of frozen food (100%). The capacity related to food variety is considered average (100%). In terms of the diabetes-related intervention capacity regarding physical activity, it is considered as being nil by 43% of the respondents, good by 43% and very good by 14%.

Regarding screening, the intervention capacity is estimated as being nil by 20% of respondents, average by 20% and very good by 60%. In terms of prevention, the intervention capacity is considered as being average by 40% of the respondents and the others consider it as being good (20%) or very good (40%). Concerning promotion, 60% of the individuals interviewed indicated that their community's intervention capacity is average and the others evaluated it as being very good (40%). The intervention capacity for care and treatment is estimated as being average by 20% of respondents, while the others evaluated it as being good (60%) or very good (20%). Finally, the capacity for intervening in the area of training seems to be completely lacking according to 40% of the respondents, average according to 20% of them and good according to 40% of them.

The suggestions made by the respondents concerning nutrition are related to fostering the variety and availability of healthy food in the grocery stores and improving the transportation and costs associated with food. In order to ensure that intervention concerning nutrition is more effective, there should also be more training on diabetes and access to the equipment necessary for holding workshops. The cost of food is also problematic and the nutritionists should try to adapt their interventions and workshops with healthy but affordable foods, which is not always easy to do. Another problem identified by the respondents is related to substance addictions.

Other needs were mentioned by the health directors and nurses interviewed such as a diabetes clinic where all the services necessary would be available: a nurse specialized in diabetes, foot care services, ophthalmologist, nutritionist and kinesiologist. According to the respondents, the transportation costs associated with cardiovascular complications and hypertension should not be part of the budget allocated for the diabetes program. Also, all the respondents mentioned the lack of financial and human resources (full-time physician, nutritionists, nurses and other specialists) and some raised the problems associated with accessing quality food at an affordable price.

5.5.5 Language and culturally-adapted services

All of the respondents in zone 4 mentioned not being able to propose activities in relation to the ADI program in their community's First Nations language. However, 20% of them were using a traditional approach for screening and 10% were doing the same for prevention and promotion. On the other hand, 80% were not using a traditional approach for screening and 90% were not using it for prevention or promotion either. None of the respondents use a traditional approach for capacity-building or for care and treatment.

Most of the communities use the community radio to perform diabetes prevention and promotion. However, the messages broadcasted through the community radio are not always in the native language. This greatly depends on the capacity of the interveners to master the First Nations language or on the number of residents in the community who still use the language.

5.5.6 Best practices for reaching the population and intervention priorities

Most diabetics who live in zone 4 use the infrastructures that are at their disposal. A significant portion of the population is reached through the programs broadcasted by the community radio station. According to the respondents, incentives such as gifts influence the participation of the population in the activities.

The activities with the best results are the community walk, awareness activities on the diabetes-related complications, physical activity, bingos on healthy food and personal accounts by people with diabetes presented in the context of prevention week. One community mentioned that one of their greatest successes was having a gymnasium. Diabetes screening at the elementary school, the arena and winter slides were mentioned by another community as being their best activities.

The intervention priorities raised by the interveners in zone 4 communities are, in decreasing order:

- 1) Problems related to addictions issues (alcohol, cigarettes, drugs);
- 2) Problems related to diabetes, eating habits and physical activity;
- 3) The lack of human resources.

The other priorities that were mentioned once each but are no less important are medication compliance problems, the need to increase parenting skills, entrepreneurship and level of education, the need to reduce violence, day care centres, youth protection (child placement), the environment and, finally, suicide.

5.6 Summary

The main highlights resulting from the interviews are the lack of personnel and insufficient financial resources.

The answers obtained demonstrate that the communities perform a lot of prevention and promotion interventions and that the activities proposed are diversified. However, according to the respondents, there could be more of these types of activities if more resources were available. On the other hand, there are not a lot of screening activities carried out and the tests are usually carried out based on blood glucose tests. Most of the screening is carried out on an individual basis when people show up for their appointment at the health centre.

As for the nutritionists, they try to hold as many activities as possible. However, it is important to keep in mind that many communities do not have access to a nutritionist and that others only have access to a nutritionist for one or two days per week. Given the little time they have, they must primarily focus on their appointments with patients who are already ill and cannot invest themselves in prevention and promotion activities.

Individuals living in the communities usually have access to care and treatment on a regular basis when they are located in zone 1. However, the accessibility to certain specializations such as ophthalmology, nephrology and dental care is sometimes very limited in zones 3 and 4.

Finally, most communities offer training to diabetic patients. With regards to the personnel, most of the interveners have access to training on diabetes and nutrition. However, the more the community is isolated, the more difficult it is for nurses, nutritionists and CHRS to access this training because it is more difficult and costly for them to travel. Also, English-speaking communities in Quebec have very little access to training in their language.

Chapter 6: Results II: Statistics on diabetes and prediabetes in the First Nations communities

This chapter presents the statistical data collected through the review of the medical files provided by ten communities. However, a few statistics on diabetes that were collected during the First Nations Regional Longitudinal Health Survey (FNRLHS) of 2002 are also presented [75]. This data stems from a population survey based on self-declaration, but still allows for a gaining a brief appreciation for the evolution of diabetes in the communities according to the geographic isolation zones.

First of all, the key concepts are defined in order to gain a good understanding of this chapter.

6.1 Definition of key concepts

Systolic and diastolic blood pressure

Blood pressure is the pressure the blood applies on the artery walls. The two values used to express this pressure represent the systolic blood pressure (maxima) and the diastolic blood pressure (minima). Normally, the blood pressure should not exceed 140/90 millimetres of mercury (mmHg). However, among patients with diabetes or nephropathy (kidney failure), it should not exceed 130/80 mmHg. High blood pressure is diagnosed when the blood pressure values remain high on a permanent basis [49].

HDL and LDL cholesterol

Cholesterol is one of the fats that the blood contains. The body uses it to create membranes for its cells, vitamin D and certain hormones. Cholesterol does not dissolve in the blood; it is carried by the lipoproteins. LDL cholesterol (low density lipoproteins) is known as the “bad” cholesterol. As for HDL cholesterol (high density lipoproteins), it is known as the “good” cholesterol. [50]

LDL cholesterol

When the concentration of LDL cholesterol in the blood is too high, it can accumulate on the inner walls of the arteries. Along with other substances that are present in the blood, an accumulation of solid deposits, called atheroma formation, occurs and renders the artery less flexible. This process of forming an atheroma build-up, which takes place over several years, is known as atherosclerosis. When the coronary arteries, which feed the cardiac muscle, are affected and become clogged, the result can be a heart attack [50]. There is no single threshold defining LDL cholesterol levels that are too high. In fact, the limit threshold for an individual is determined by a set of factors predicting this person’s level of risk related to cardiovascular diseases. However, among diabetics, the primary target in terms of LDL cholesterol is under 2.0 mmol/L [9].

HDL cholesterol

Approximately one quarter to one third of the blood cholesterol is carried by the high-density lipoproteins. An HDL cholesterol level that is too low increases the risks of cardiovascular diseases. High-density lipoproteins carry the bad cholesterol from the arteries to the liver and remove the excess cholesterol from the build-up that progressively forms on the artery walls [50]. The Canadian diabetes guidelines (2008) do not provide a single threshold to be reached with respect to HDL cholesterol. However, these guidelines recommend that the ratio between the total cholesterol and the HDL cholesterol (TBC/C-HDL ratio) be lower than 4.0 as a secondary objective once the LDL cholesterol is normalized [9].

Triglycerides

Triglycerides constitute the majority of the food lipids and the lipids that are stored by the body in the adipose tissue. A high level of triglycerides may be caused by being overweight, obesity, physical inactivity, smoking, excessive use of alcohol or a diet that is high in carbohydrates. Hypertriglyceridemia is associated with an increase in coronary risk [50]. There is no precise objective for the triglyceride rate among diabetics, but generally-speaking, a rate that is lower than 1.5 mmol/l is considered to be optimal, since below this threshold, few metabolic anomalies are observed [9].

6.2 Profile of the individuals of the sampling derived from the study of the medical files

Table 6.1 presents the ages, fasting glucose, blood pressure and lipid profiles for all of the subjects who were studied (1000 people) in the context of this Scan according to geographic isolation zone. It is important to keep in mind that during the review of the medical files, only the last value recorded in the file was retained. Furthermore, for approximately half of the files selected, several research parameters were not present.

Table 6.1: Age, fasting glucose, blood pressure and lipid profile for all of the subjects from the sampling of medical files, for both men and women, according to geographic isolation zone.

	Zone 1 (N=500)			Zone 2 (N= 200)			Zone 3 (N=100)			Zone 4 (N=200)		
	A $\pm$ D	Md	N	A $\pm$ D	Md	N	A $\pm$ D	Md	N	M $\pm$ ET	Md	N
Age	48 $\pm$ 21	48	500	47 $\pm$ 18	46	200	34 $\pm$ 17	37	100	37 $\pm$ 16	36	200
FG (mmol/L)	6,0 $\pm$ 2,1	5,5	246	6,7 $\pm$ 2,6	5,7	101	6,9 $\pm$ 3,5	5,7	61	6,2 $\pm$ 2,3	5,5	130
SBP (mm Hg)	128 $\pm$ 18	130	245	135 $\pm$ 21	132,5	108	127 $\pm$ 19	126	83	130 $\pm$ 18	126,5	108
DBP (mm Hg)	76 $\pm$ 12	78	245	81 $\pm$ 13	80	108	74 $\pm$ 12	76	83	76 $\pm$ 11	75,5	108
TBC (mmol/L)	4,9 $\pm$ 1,2	4,8	219	4,8 $\pm$ 1,1	4,7	103	4,4 $\pm$ 0,9	4,4	38	4,6 $\pm$ 0,9	4,4	80
C-HDL (mmol/L)	1,2 $\pm$ 0,4	1,2	217	1,1 $\pm$ 0,3	1,1	101	1,1 $\pm$ 0,3	1,0	39	1,2 $\pm$ 0,3	1,2	80
C-LDL (mmol/L)	2,8 $\pm$ 0,9	2,8	215	2,7 $\pm$ 1,0	2,6	98	2,6 $\pm$ 0,6	2,7	39	2,6 $\pm$ 0,8	2,6	80
TG (mmol/L)	1,8 $\pm$ 1,3	1,6	219	2,0 $\pm$ 1,2	1,8	100	1,5 $\pm$ 0,6	1,4	37	1,7 $\pm$ 0,8	1,6	78

A: Average; D: Deviations; Md: Median

FG: fasting glucose; SBP: systolic blood pressure; DBP: diastolic blood pressure; TBC: total blood cholesterol; C-HDL: high density lipoproteins; C-LDL: low density lipoproteins; TG: triglycerides

Various observations can be made based on the previous table. First of all, it is important to underline that by taking into consideration the averages and deviations obtained, no significant statistical differences can be reported between the individuals of the four zones of geographic isolation for each of the parameters studied. However, observations regarding all of the zones together can be made. Nonetheless, it is important to note that the indicators are only reported for the individuals for which these measurements appear in the file and do not represent the average for the entire group. In fact, since these examinations are mainly carried out among the individuals who are at-risk, it is probable that the averages and medians presented above overestimate the actual risk that is present in the sampling and the population that it represents.

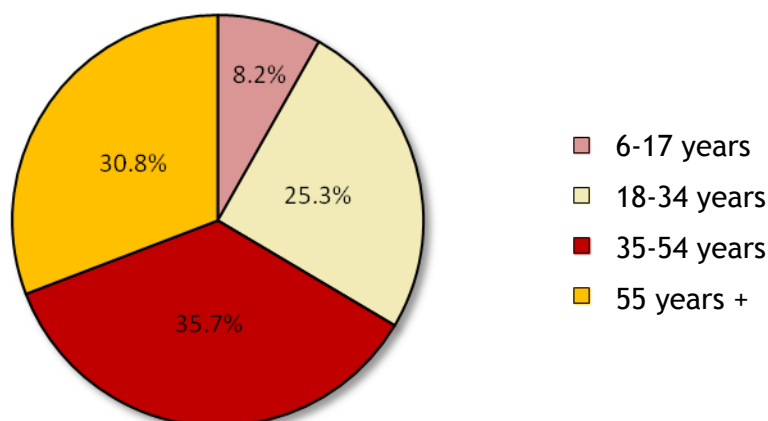
In regards to fasting glucose, it has been observed that the averages and medians of the four zones are situated under the threshold for diabetes which is set at 7.0 mmol/L. However, the fasting glucose averages obtained for zones 2, 3 and 4 are situated in the interval that is associated with prediabetes (6.1-6.9 mmol/L).

With respect to the blood pressure values, the Canadian guidelines on diabetes recommend a maximum blood pressure of 130/80 mmhg [9]. Upon reading the colligated values, the observation is made that the averages and medians of the four zones are situated at the limits of this threshold. Yet, the large deviations calculated demonstrate that many individuals from the sampling highly exceed the recommended values.

As indicated previously, the maximum target value for LDL cholesterol is 2.0 mmol/L. It is therefore noted that this value is on average exceeded for all of the geographic isolation zones. This same observation can be made regarding the triglyceride rates recorded in the medical files.

Figure 6.1 allows for gaining an appreciation for the breakdown of the individuals among the various age groups. We can therefore observe that more than 65% of the subjects of the sampling are 35 years of age and up. Also, only 8.2% of the sampling is composed of youth under 18 years of age. It must be underlined again that one of the selection criteria for the files was that the individual had to be at least six years of age. As for the distribution according to gender, 58.9% of our sampling is composed of women compared to 41.1% of our sampling which is composed of men.

Figure 6.1: Breakdown of all of the individuals of the sampling derived from the review of the medical files by age group.



6.3 Known proportions of diabetics and prediabetics in the health centres of the selected communities

Before explaining the data regarding the proportions of diabetics and prediabetics found among our sampling, the following is data derived from the RHS (2002). This data will serve as a basis for comparison for the proportions obtained in the context of this Scan.

6.3.1 Data derived from the RHS (2002)

Table 6.2 is based on the RHS data (2002), which was collected among the members of the First Nations of Quebec. The data is colligated according to the geographic isolation zone. The respondents had to indicate during the questionnaire if they had been diagnosed as diabetic in the past. This item of the Survey's questionnaire encompassed all of the types of diabetes (type1, type 2 and gestational).

Table 6.2: Proportions of self-declared diabetic and non-diabetic adults according to geographic isolation zone, RHS (2002)*.

Zone	Responds having declared being diabetic (%)	Responds having declared not being diabetic (%)	Don't know /Refuse (%)
Zone 1	13.3	85.6	1.1
Zone 2	9.4	88.3	2.2
Zone 3	17.3	82.3	0.4
Zone 4	11.1	87.3	1.6

* The number totals do not come out to 100% due to rounding off.

In 2002, according to the data derived from the RHS, 13.3% of the individuals more than 18 years of age in zone 1 indicated that they had diabetes. In zone 2, 9.4% maintained they were diabetic, as did 17.3% of the individuals interviewed in zone 3 and 11.1% of the individuals in zone 4.

Across all of the geographic isolation zones, the rate of self-declared diabetes was 14.5% and 12.5% among the men and 16.4% among the women respectively [66].

6.3.2 Individuals of the sampling of medical files diagnosed as being diabetic by a physician

When studying the medical files, various information was derived from the consulted files. Among this data, two data items allowed for determining the proportion of diabetics and prediabetics: the presence of a diabetes diagnosis by a physician and the presence of a prediabetes diagnosis validated by a physician.

As explained in the methodology, the last fasting glucose value was also derived from the medical files. However, this data cannot be used for determining the proportion of diabetics and prediabetics in our sampling. In fact, no other parameter extracted from the medical files allows us to determine whether or not the individual was receiving treatment during the measurement. Taking this variable into consideration for assuming a diagnosis could lead to underestimating or even overestimating in a considerable manner the proportion of diabetics and prediabetics in the communities. It is for this reason that the data and calculations reported in this chapter are based on the presence in the medical file of a diagnosis that is validated by a physician.

The following table (6.3) allows for gaining an appreciation for the proportion of diabetics (types 1 and 2) diagnosed by a physician for each of the four geographic isolation zones.

Table 6.3: Number of individuals among the sampling of medical files diagnosed as being diabetic by a physician according to the geographic isolation zone.

	Zone 1 (N=500)		Zone 2 (N=200)		Zone 3 (N=100)		Zone 4 (N=200)		TOTAL (N=1000)	
	N	%	N	%	N	%	N	%	N	%
No. type 1 diabetes diagnoses	1	0,2	0	0	0	0	0	0	1	0.1
No. type 2 diabetes diagnoses	72	14.4	44	22.0	20	20.0	26	13.0	162	16.2

In light of the previous table, we can observe that a single individual from the sampling had a type 1 diabetes diagnosis in his/her medical file. Since the purpose of this research is mainly to establish the portrait of type 2 diabetes in the First Nations communities, for the purposes of this chapter, this person will be included in the group

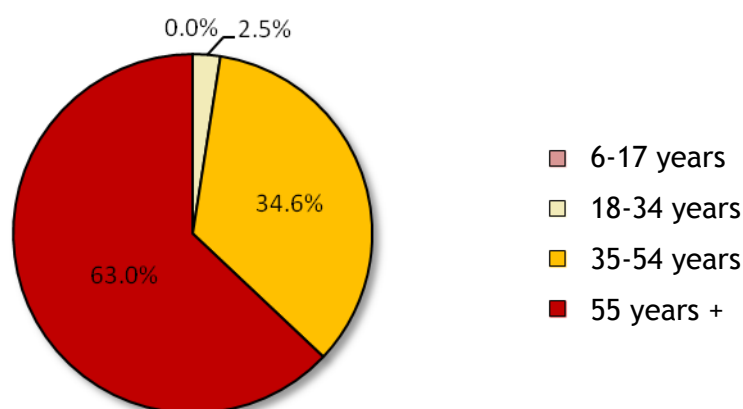
of non-diabetics, composed of individuals who have not been diagnosed with type 2 diabetes or prediabetics.

With respect to type 2 diabetes, 162 individuals representing 16.2% of the sampling obtained this diagnosis. Zone 2 is the one in which the highest amount of individuals presented the pathology (22.0%) while zone 4 is the one in which the least amount of diagnoses (13.0%) were identified during the review of the medical files.

Compared to the data derived from the RHS (2002), the observation has been made that for zones 1, 3 and 4, the data obtained by reviewing the medical files for the most part reflects the RHS data. Indeed, the proportions of diabetics in zones 1, 3 and 4 are comparable in both studies. Globally-speaking, the proportions are a bit higher in the sampling of files when compared to the survey in which diabetes was self-declared. This could partially be explained by the fact that the denominator in the review of the medical files is composed of individuals having consulted during the past three years rather than the general population. However, during the RHS, all types of diabetes were taken into consideration and were not differentiated for this item of the questionnaire. However, with respect to zone 2, a large difference regarding the proportion of diabetics was observed: 9.4% of the individuals for the RHS compared to 22.0% of the individuals in the context of this Scan. Certain hypotheses can be made in order to explain this difference: a tendency among many respondents not to declare their diabetic status during the Survey or a significant increase in the number of screening tests performed in this zone between the years 2002 and 2008 due to enhanced awareness among the interveners regarding this disease or increased access to screening. The current information does not allow for confirming or invalidating these hypotheses.

Figure 6.2 presents the breakdown according to the ages of the individuals diagnosed with type 2 diabetes in the sampling. Therefore, figure 6.2 indicates that the majority of the diabetics are in the 55 years and over age group (63.0%). Furthermore, no diagnosed diabetic is under 18 years of age. As for the breakdown according to gender, 56.2% of the diabetics of the sampling are women compared to 43.8% among the men. These last proportions are in line with what is found in the literature, as outlined in chapter 3.

Figure 6.2: Breakdown of the diabetic population derived from the review of the medical files by age group.



6.3.3 Individuals from the sampling of medical files diagnosed as being prediabetic by a physician

Regarding the proportion of individuals diagnosed as being prediabetic by a physician, a total of 138 people, representing 13.8% of the sampling, presented this diagnosis (see table 6.4). Keep in mind that in the context of this Scan, glucose intolerance and abnormal fasting glucose are both considered as being states of prediabetes.

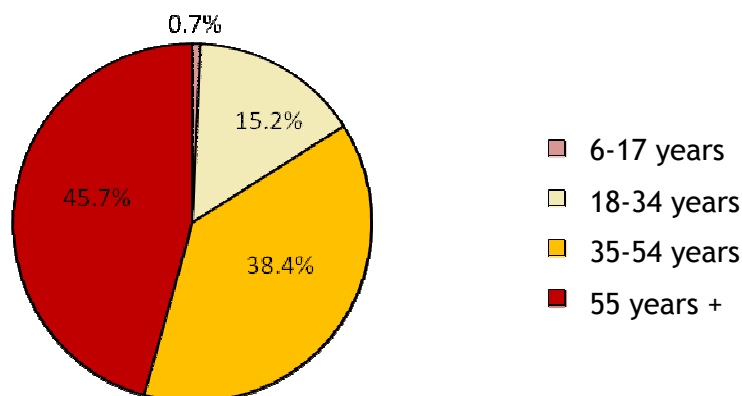
Table 6.4: Number of individuals from the sampling of medical files diagnosed as being prediabetic by a physician according to the geographic isolation zone.

	Zone 1 (N=500)		Zone 2 (N=200)		Zone 3 (N=100)		Zone 4 (N=200)		TOTAL (N=1000)	
	N	%	N	%	N	%	N	%	N	%
No. prediabetes diagnoses	64	12.8	29	14,5	11	11.0	34	17.0	138	13.8

Geographic isolation zone 4 is the one in which the highest proportion of medical files contained a note regarding prediabetes (17.0%). For the three other zones, rates varying between 11.0% and 14.5% were noted. As indicated in the literature, prediabetes is a significant precursor for diabetes. In fact, it corresponds with a potential pool of diabetics if no preventive measures are undertaken.

The breakdown of prediabetics in the sampling according to age is presented in figure 6.3. It was noted that, compared to diabetics, there are more prediabetics in the 18-34 and 35-54 years age groups. In terms of gender, a similar breakdown was observed among diabetics and prediabetics. Thus, 58.7% of the prediabetics are women and 41.3% are men.

Figure 6.3: Breakdown of the prediabetic population of the sampling derived from the review of the medical files by age group.



In summary, the statistics reported thanks to the review of the medical files reveal to us that 30% of the individuals of the sampling have been diagnosed with type 2 diabetes or prediabetes by a physician. The limitations of this Scan, as indicated in chapter 4, do not allow us to extend the proportions obtained to all First Nations. However, these values represent an estimate of the rates that are found in the communities of the First Nations of Quebec and can serve as a guide for the interveners in their actions related to the fight against diabetes, for example, by allowing for the identification of certain clientele that are more at-risk.

The next section will attempt to shed some light on the differences that can be noted between the three groups of individuals that can be extracted from the sampling: the type 2 diabetics, prediabetics and non-diabetics.

6.4 Comparisons between the diabetics, prediabetics and non-diabetics derived from the sampling of medical files

The three groups of individuals extracted from our sampling will be compared here on three different levels: 1) age, fasting glucose and lipid profile; 2) the proportion of hypertension diagnoses among the three groups; and 3) the recorded glycosylated haemoglobin values.

6.4.1 Age, fasting glucose and lipid profile

Table 6.5 outlines certain parameters derived from the medical files that allow for comparing the three groups of our sampling: the type 2 diabetics diagnosed by a physician, the diagnosed prediabetics and the individuals presenting neither of these two diagnoses in their medical files.

Table 6.5: Comparison of the characteristics of the type 2 diabetics, prediabetics and non-diabetics of the sampling across all geographic isolation zones.

	Individuals with a type 2 diabetes diagnosis (N=162)			Individuals with a prediabetes diagnosis (N=138)			Individuals without a type 2 diabetes or prediabetes diagnosis (N=700)		
	A ± D	Md	N	A ± D	Md	N	A ± D	Md	N
Age	59 ± 13	60	162	54 ± 18	52	138	39 ± 19	37	700
FG (mmol/L)	9.5 ± 3,4	8,6	125	6.1 ± 0,4	6.0	137	5.0 ± 0.5	5.0	276
SBP (mmhg)	137 ± 18	138	110	135 ± 18	133	103	125 ± 18	124	331
DBP (mmhg)	79 ± 13	80	110	80 ± 11	80	103	75 ± 12	76	331
TBC (mmol/L)	4.5 ± 1,1	4.4	127	4.7 ± 0,9	4.6	108	4.9 ± 1.2	5.0	205
C-HDL (mmol/L)	1.1 ± 0,3	1.0	126	1.2 ± 0,4	1.1	109	1.3 ± 0.3	1.0	202
C-LDL (mmol/L)	2.5 ± 0,9	2.5	122	2.7 ± 0,8	2.7	108	2.9 ± 0.9	3.0	201
TG (mmol/L)	2.2 ± 1,4	1.7	122	1.8 ± 0,8	1.7	110	1.6 ± 1.1	1.0	202

A: Average; D: Deviations; Md: Median

FG: fasting glucose; SBP: systolic blood pressure; DBP: diastolic blood pressure; TBC: total blood cholesterol; C-HDL: high density lipoproteins; C-LDL: low density lipoproteins; TG: triglycerides

The first observation that can be made based on this table is that the data on these various parameters was not available among all of the subjects from the sampling. However, it was observed that the files of the diabetic and prediabetic individuals contained more data than those of the non-diabetic people. For example, a fasting glucose value was available in 77.2% of the diabetic files, in 99.3% of the prediabetic files and in only 39.4% of the non-diabetic files. Similar tendencies were observed for the other parameters collected from the files. This leads us to believe that the diabetic and prediabetic individuals of the First Nations communities are subjected to more medical testing and closer monitoring regarding their state of health than the undiagnosed individuals as recommended by the Canadian Diabetes Association [9].

Regarding the values for each of these parameters, once again, no statistically significant differences can be identified while taking into consideration the averages and deviations obtained.

With respect to age, it was observed that the non-diabetics are seemingly younger than the individuals in the two other groups. The fasting glucose values also differ and follow a tendency that could be expected. Thus, the medians and averages of the fasting glucose values are situated beyond the diabetes threshold among diabetics (7.0 mmol/L), at the limits of the values determining a prediabetic state among prediabetics (6.1-6.9 mmol/L) and under the prediabetes threshold among the non-diabetic individuals of the sampling.

Regarding the various rates related to blood cholesterol, the differences between the values obtained for the three groups are once again insignificant. The observation of the medians and averages nonetheless demonstrates that a large proportion of the subjects of the sampling have a value that exceeds the limit threshold recommended by the Canadian diabetes guidelines (2.0 mmol/L). However, the diabetics presented an average and median value that is lower than the two other groups of the sampling. No information allows us for the time being to explain this result, but it is possible that it stems from the fact that the care provided is generally more thorough among diabetics for whom the targets to be reached and the treatment thresholds are more severe than among those who are less at-risk.

Finally, regarding triglycerides, it has been observed that the diabetics and prediabetics obtain slightly higher values than non-diabetics and that their values exceed the optimal threshold (1.5 mmol/L).

6.4.2 Hypertension (or high blood pressure)

Hypertension is a disease that is often associated with diabetes. The presence of hypertension highly increases the risk for micro and macrovascular complications [9]. In the context of this Scan, 176 hypertension diagnoses were identified in the medical files. Among the diabetics, 62 hypertension diagnoses were identified which means that 38.3% of the diagnosed diabetics of our sampling also received a diagnosis for hypertension from a physician. Among prediabetics, 29.7% of them also had hypertension and 10.4% of the non-diabetics had hypertension.

According to the guidelines of the Canadian Diabetes Association (2008), it is essential to measure the blood pressure of the diabetics during each of their medical visits [9]. Regarding the diabetic population of the sampling, a blood pressure measurement was found in the files of 67.9% of the individuals.

6.4.3 Glycosylated haemoglobin (HbA1c)

The glycosylated haemoglobin (HbA1c) is an indicator of the effectiveness of the treatment for diabetes. This should be measured every three to six months when the glycaemic objectives of the patient are not attained or when a patient is subjected to new treatment [9]. Even though this measurement is not currently recommended for the screening of diabetes since it is not standardized [9], the data colligated in table 6.6 seemingly indicates that it is used for this purpose among a lower percentage of non-diabetics. Indeed, HbA1c values were found in the files of prediabetic and non-diabetic patients.

Table 6.6: Presence of a HbA1c value in the files of the diabetics, prediabetics and non-diabetics from the sampling of medical files according to geographic isolation zone.

	Zone 1		Zone 2		Zone 3		Zone 4		TOTAL	
	N	%	N	%	N	%	N	%	N	%
Diabetics	42	58.3	38	86.4	19	95.0	23	88.5	122	75.3
Prediabetics	20	31.3	9	31.0	2	18.2	20	58.8	51	27.0
Non-diabetics	13	3.6	6	4.7	6	8.7	26	18.6	51	7.3
Total	75	15.0	53	26.5	27	27.0	69	34.5	224	22.4

In the sampling, a HbA1c value was colligated among 224 individuals (22.4% of the sampling). As was hoped, values were recorded in a high proportion of the files of the diabetic subjects (75.3%) and a lesser proportion in the files of the two other groups of the study. While in zones 2, 3 and 4 a glycosylated haemoglobin value is available in 86% to 95% of the diabetes cases in our sampling, in zone 1, only 58% of the files contain this indicator. It is possible that individuals who reside in this less geographically-isolated zone consult less or are followed-up on for their diabetes in a neighbouring town.

Table 6.7 outlines the averages, deviations and medians of the HbA1c values for the diabetics, prediabetics and non-diabetics of the sampling.

Table 6.7: HbA1c values among diabetics, prediabetics and non-diabetics among the sampling of medical files according to geographic isolation zone.

	Zone 1		Zone 2		Zone 3		Zone 4	
	A ± D (%)	Md (%)	A ± D (%)	Md (%)	A ± D (%)	Md (%)	A ± D (%)	Md (%)
Diabetics	8,1 ± 1,9	7,7	8,2 ± 1,9	7,8	8,3 ± 1,9	7,6	8,0 ± 2,4	6,9
Prediabetics	6,4 ± 0,6	6,4	6,2 ± 0,5	6,0	6,6 ± 1,1	6,6	6,1 ± 0,6	5,9
Non-diabetics	6,2 ± 1,7	5,7	6,1 ± 0,5	6,0	6,2 ± 0,5	6,1	5,6 ± 0,5	5,5

According to the guidelines of the Canadian Diabetes Association (2008), an HbA1c value exceeding 7% would be associated with a higher risk of micro and macrovascular complications.

Nonetheless, various studies suggest that there is an ongoing connection between the HbA1c and the risk for complications and that there is no threshold under which the risks for complications can be completely discounted [9].

Upon reading table 6.7, it can be noted that the diagnosed diabetics from the sampling present higher HbA1c values than the prediabetics and non-diabetics across all the geographic isolation zones.

Globally-speaking, for all of the zones, the HbA1c average is situated at 8.1% (SD: 2.0) and the median is situated at 7.6%. According to the aforementioned guidelines, the diabetics from the sampling are situated beyond the recommended threshold (7.0%) and the majority of the cases can therefore be considered as being at a high risk of developing micro and macrovascular complications. With respect to the prediabetics, their average is situated at 6.2% (SD: 0.6) while those of the non-diabetics is situated at 5.9% (SD: 1.0). These two groups can thus be considered as being at a low risk for complications.

6.5 Summary

The study of the medical files allowed for determining, through the use of a sampling of 1000 people, proportions of diabetics and prediabetics for each of the geographic isolation zones.

In terms of type 2 diabetes, 16.2% of the sampling presented this diagnosis which was validated by a physician. The highest proportion of diabetics was observed in zone 2, while the lowest proportion was found in zone 4. A study of the medical files also allowed for making the observation that the majority of the diabetics were more than 55 years of age. Also, the majority of the diabetic population of our sampling is comprised of women.

With respect to prediabetes, 13.8% of the individuals of our sampling received this diagnosis. Zone 4 is the zone in which the most prediabetic individuals were reported. As for the prediabetic population, the majority of the prediabetics are women. However, there are more prediabetic individuals in the 18-34 years and 35-54 years age groups.

Finally, the comparison between the three groups of the study (diabetics, prediabetics and non-diabetics) allowed for distinguishing certain tendencies even though they are not significant from a statistical standpoint. Thus, it seems that the diabetics of the sampling are older, that their fasting glucose and triglyceride rates are higher and that they have higher blood pressure rates than the individuals of the two other groups. Furthermore, the median of the glycosylated haemoglobin values collected from the files of the diabetics indicates that the majority of the cases have a less than optimal control of their glycaemia, which is associated with an increased risk for micro and macrovascular complications.

Chapter 7: Results III: Environmental Walks

Chapter 7 presents the data obtained during the environmental walks during which the consultants had to note the accessibility and quality of certain foods, services and infrastructures in their respective communities. This chapter addresses the data obtained regarding the accessibility, cost, and quality of food. Furthermore, it presents the facts collected on access to public transportation, various services and sports equipment. Finally, the proximity of certain stores and the types of restaurants in the communities comprise the other subjects addressed in this chapter.

7.1 Accessibility and types of food stores frequented

This sub-section of chapter 7 focuses on the various places where it is possible to purchase food products in the First Nations communities. Addressed here are the types of food stores frequented by the First Nations members, the distance between these food stores and the health centre, the geographic location of these stores (inside or outside of the community), as well as the advertisement in these places.

Table 7.1 presents the places where the First Nations community members usually purchase their food products.

Table 7.1: Places usually frequented by the individuals in First Nations communities for the purchase of food products according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Supermarket/grocery store	60%	100%	100%	100%
Group of small businesses joined together under the same roof	20%	0%	0%	0%
Small specialized shops (fruit shop, cheese shop...)	20%	0%	0%	0%

The community members in zones 2, 3 and 4 usually purchase their food in a grocery store. In zone 1, 20% of the people do their grocery shopping in small stores that are joined under the same roof and 20% purchase food in small specialized shops.

Table 7.2 presents the types of businesses available for the purchase of food in each geographical isolation zone.

Table 7.2: Types of businesses in which food can be purchased according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Supermarket/grocery store	90%	100%	100%	0%
General store	10%	50%	100%	100%
Fruit and vegetable shop	10%	0%	0%	0%
Outdoor market	0%	0%	0%	0%
Butcher shop	10%	0%	0%	0%
Bakery	10%	0%	0%	0%

In zone 1, 90% of the communities have access to a grocery store and 10% have access to a general store. Furthermore, 10% also have access to a specialized fruit and vegetable shop (e.g. Jardin Mobile), a butcher shop and a bakery. In zone 2, all the communities have access to a grocery store and half of them also have access to a general store. In zone 3, all the communities have access to a grocery store and a general store. In zone 4, the only accessible place where individuals can purchase food products is the general store that is present in all the communities.

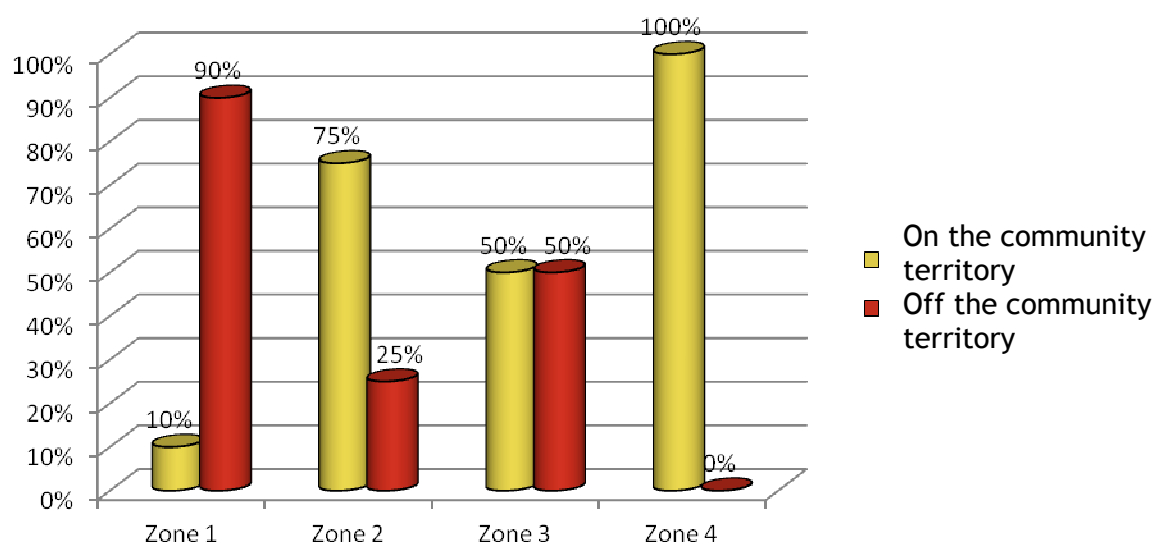
Table 7.3 presents the distance between the grocery store or the most frequented food store and the health centre⁹ for each geographic isolation zone. Table 7.1 outlines the locations of the grocery stores - either inside or outside of the community.

Table 7.3: Distance between the community health centre and the grocery store or food shop according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
< 1km	0%	75%	50%	75%
1 to 3.99 km	60%	0%	50%	25%
4 to 7.99 km	20%	0%	0%	0%
8 to 15 km	20%	25%	0%	0%

⁹ The choice of the health centre as a point of reference was made based on the two following factors: first, it was the starting point for the consultants and, second, all the communities visited had a health centre or nursing station on their territory.

Graph 7.1: Proportion of grocery stores on and off community according to the geographic isolation zone.



In zone 1, for 60% of the communities, the distance between the grocery store and the health centre is 1 to 4 km, for 20% the distance is 4 to 8 km and for the last 20% the distance is 8 to 15 km. It should be noted that 90% of the grocery stores in zone 1 are located off community.

In zone 2, in 75% of the cases, the grocery store is located in the community and less than one kilometre from the health centre and 25% of the grocery stores are outside of the community, at a distance of 8 to 15 km.

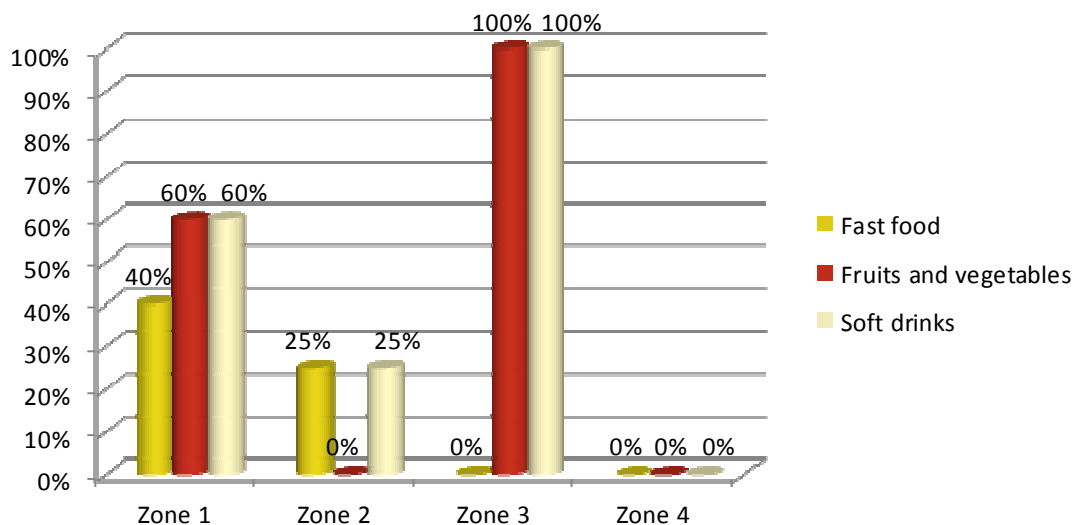
In zone 3, half of the grocery stores are located in a community and less than one kilometre from the health centre and the other half are located outside of the community and at a distance of 1 to 3 km.

In zone 4, 75% of the grocery stores are located in a perimeter less than one kilometre from the health centre and 25% of them are located 1 to 4 km from it. All the grocery stores in zone 4 are located in the communities.

7.1.1 Presence of advertisements and vending machines

Graph 7.2 presents the proportion of communities that have advertisements promoting fast food, fruits and vegetables and soft drinks that can be seen from outside the store where people usually purchase their food products. An example of advertisement targeting healthy eating habits, involving fruits and vegetables for example, could be the 0-5-30 program developed by the *Ministère de la Santé et des Services sociaux du Québec*.

Graph 7.2 Proportion of the communities with advertisements promoting fast food, fruits and vegetables and soft drinks that can be seen from outside the grocery store.



Advertisements promoting junk food that can be seen from outside the grocery store can be found in 40% of the communities in zone 1 and in 25% of the communities in zone 2.

Outside of the grocery stores, advertisements for fruits and vegetables are posted in 60% of the communities in zone 1 and in all the communities in zone 3.

Advertisements promoting soft drinks are present in 60% of the communities in zone 1, in 25% of the communities in zone 2 and in all of the communities in zone 3.

In zone 4, no advertisements can be seen from outside the grocery stores.

Table 7.4 presents the proportion of schools that have vending machines for soft drinks according to the geographic isolation zone.

Table 7.4: Proportion of the communities with vending machines for soft drinks in their schools according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Vending machine(s) for soft drinks at school	20%	0%	0%	0%

According to the data obtained, 20% of the communities in zone 1 have vending machines for soft drinks in their schools. None of the communities in the three other zones have them.

7.2 The cost of food

In light of the information obtained, it is possible to state that the cost of food varies according to the level of geographic isolation of the communities. Tables 7.5 to 7.10 address the cost of food in the various food groups. These tables are organized in such a way as to present, first of all, the cost of each item for each of the geographic isolation zones. The second half of the table shows the cost difference for each item compared to the price of the same item in the reference zone. The reference zone here is zone 1 since the cost of food is similar to the costs in an urban setting. It is important to keep in mind that the choices of foods were made by two nutritionists and that this list of foods does not represent a standard grocery cart for a family.

Table 7.5 presents the cost of the items in the *Grain Products* food group according to the geographic isolation zone.

Table 7.5: Cost of the items of the *Grain Products* food group according to the geographic isolation zone and the cost differences with the reference zone (zone 1).

	Cost in each zone				Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 2	Zone 3	Zone 4
White flour (1 kg)	\$1.86	\$1.84	\$1.93	\$7.32	-\$0.02	\$0.07	\$5.46
Whole wheat flour (1 kg)	\$2.21	\$2.49	\$3.65	\$3.89	\$0.28	\$1.44	\$1.68
Whole wheat bread (1)	\$2.80	\$2.89	\$2.69	\$3.09	\$0.09	-\$0.11	\$0.29
Rolled oats (1 kg)	\$3.00	\$2.29	\$10.29	\$5.32	-\$0.71	\$7.29	\$2.32

The cost of white flour is higher in zone 4 than in the other geographic isolation zones. The cost of whole wheat flour increases with the level of geographic isolation, while the cost of whole wheat bread is similar in all zones. The cost of a kilogram of rolled oats in zone 3 is two and a half times as high as in zones 1 and 4, while the cost is twice that of the reference zone.

Table 7.6 presents the cost of the items in the *Meat and Alternatives* food group according to the geographic isolation zone.

Table 7.6: Cost of the items in the *Meat and Alternatives* food group according to the geographic isolation zone and cost differences with the reference zone (zone 1).

	Cost in each zone				Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 2	Zone 3	Zone 4
Eggs (12 medium)	\$2.64	\$2.94	\$3.24	\$4.22	\$0.30	\$0.60	\$1.58
Chicken breast (1 kg)	\$10.54	\$9.16	\$8.17	\$18.69	-\$1.38	-\$2.37	\$8.15
Canned salmon (213 g)	\$2.31	\$2.72	\$3.04	\$2.37	\$0.41	\$0.73	\$0.06
Peanut butter without added salt/sugar (500 g)	\$3.78	\$3.96	\$4.02	\$5.25	\$0.18	\$0.24	\$1.47
Ground beef (1 kg)	\$7.71	\$5.85	\$9.28	\$12.29	-\$1.86	\$1.57	\$4.58

The cost of meat and alternatives increases with the geographic isolation in most cases. For example, the cost of eggs increases by \$0.30 from zone 1 to zone 2 and by another \$0.30 from zone 2 to zone 3. However, the increase between zone 3 and zone 4 is \$1.00. The cost of eggs in zone 4 is therefore 60% higher than in zone 1.

A kilogram of chicken breast is less expensive in zone 2 and in zone 3, when compared to zone 1. However, the cost difference between zone 4 and the other geographic isolation zones is nearly double.

The cost of canned salmon is slightly higher in zones 2 and 3 when compared to zone 1. However, there is practically no difference between the price advertised in zone 1 and the price in zone 4.

The difference regarding the cost of peanut butter with no added salt/sugar in zones 2 and 3, compared to zone 1, is not very significant: less than \$0.25. Nonetheless, a cost difference of \$1.47 between zone 4 and zone 1 is noted to the detriment of zone 4.

Finally, the cost of ground beef varies quite a bit between the four zones: \$1.86 less in zone 2, compared to zone 1 and \$1.57 more in zone 3. Once again, the price difference is greater in zone 4: \$4.58 more than in the zone of reference.

To summarize, in the *Meat and Alternatives* category, all the food items on the list cost a lot more in the zone 4 communities, except for canned salmon. With regards to zones 2 and 3, when compared to zone 1, the cost difference is not significant.

Table 7.7 presents the cost of the items in the *Milk and Alternatives* food group according to the geographic isolation zone.

Table 7.7: Cost of the items in the *Milk and Alternatives* food group according to the geographic isolation zone and cost differences with the reference zone (zone 1).

	Cost in each zone				Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 2	Zone 3	Zone 4
Cheddar cheese (454 g)	\$6.39	\$7.65	\$7.70	\$11.38	\$1.26	\$1.31	\$4.99
2% Milk (2 L)	\$3.46	\$3.67	\$4.24	\$4.40	\$0.21	\$0.78	\$0.94
Yogurt (650 g)	\$3.42	\$3.99	\$3.79	\$4.46	\$0.57	\$0.37	\$1.04

As opposed to the cost of meat which varies quite a lot from one geographic isolation zone to the other, the cost of dairy products increases proportionally with the level of geographic isolation. Cheddar cheese is the item with the greatest price increase based on isolation, starting from an increase of slightly over \$1.25 between zone 1 and zones 2 and 3 to a \$5 increase between zone 1 and zone 4, which is nearly double the price for the same quantity.

The cost of milk and yogurt also increases with geographic isolation, up to a difference of approximately \$1.00 between zone 1 and zone 4 to the determinant of zone 4.

In short, once again, the total cost of dairy products is clearly higher in zone 4, when compared to the other geographic isolation zones.

Table 7.8 presents the cost of certain foods contained in the *fruits* category based on the geographic isolation zone.

Table 7.8: Cost of the items in the *fruits* food group according to the geographic isolation zone and the cost differences with the reference zone (zone 1).

	Cost in each zone				Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 2	Zone 3	Zone 4
Oasis juice (1 carton)	\$1.83	\$3.18	\$2.07	\$3.11	\$1.35	\$0.24	\$1.28
Frozen juice (1 can)	\$1.59	\$1.92	\$1.29	\$1.69	\$0.33	-\$0.30	\$0.10
Frozen berries (300 g)	\$3.05	\$3.25	\$2.80	\$6.15	\$0.20	-\$0.25	\$3.10
Bananas (1 kg)	\$1.75	\$1.84	\$2.89	\$4.79	\$0.09	\$1.14	\$3.04
Tomatoes (1 kg)	\$6.21	\$5.27	\$3.49	\$7.69	-\$0.94	-\$2.72	\$1.48
Apples (1 kg)	\$3.07	\$2.44	\$1.83	\$4.02	-\$0.63	-\$1.24	\$0.95
Oranges (1 kg)	\$3.30	\$4.45	\$3.49	\$3.52	\$1.15	\$0.19	\$0.22

A few cost differences can be noted between zone 2 and zone 1. For example, the price of a carton of Oasis juice and a kilogram of oranges is significantly higher in zone 2. However, the price of apples and tomatoes is lower in this zone.

In zone 3, the cost of bananas is more than one and a half times higher than in zone 1. However, the price of apples and tomatoes is considerably lower in zone 3 than in zone 1.

Finally, in zone 4, all the prices without exception are higher than those in zone 1. The cost of frozen berries as well as the cost of bananas is more than twice the cost found in zone 1. A kilogram of tomatoes and a carton of Oasis juice cost at least \$1.28 more in this zone. Finally, in zone 4, the cost of a kilogram of apples is 1.25 times that of the cost found in zone 1.

To summarize, practically all foods are more expensive in zone 4 than in zone 1. However, in zones 2 and 3, the prices for certain items can be lower than those found in zone 1.

Table 7.9 presents the cost of certain foods in the *vegetables* category according to the geographic isolation zone.

Table 7.9: Cost of the items in the *Vegetables* food group according to the geographic isolation zone and the cost differences with the reference zone (zone 1).

	Cost in each zone					Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4		Zone 2	Zone 3	Zone 4
Carrots (1 kg)	\$1.83	\$2.19	\$1.44	\$1.76		\$0.36	-\$0.39	-\$0.07
Cabbage (1)	\$1.66	\$3.26	\$2.40	\$4.05		\$1.60	\$0.74	\$2.39
Sweet potatoes (1 kg)	\$3.60	\$3.28	N/A	N/A		-\$0.32	N/A	N/A
Spinach (1 bag)	\$2.69	\$2.83	N/A	N/A		\$0.14	N/A	N/A
Frozen vegetables (750 g)	\$3.40	\$3.12	\$8.75	\$6.70		-\$0.28	\$5.35	\$3.30
Canned tomatoes (1 can)	\$1.36	\$1.90	\$1.67	\$2.97		\$0.54	\$0.31	\$1.61

N/A: Non-available

In certain zones, more specifically in zones 3 and 4, some vegetables (sweet potatoes and spinach) were unavailable.

Regarding the price of cabbage in zone 2, it is twice as high as the price found in zone 1. A can of tomatoes is also more expensive in this zone. As for the other food items in this category in zone 2, some are more expensive by a few cents while others are less expensive by a few cents.

In zone 3, the cost of frozen vegetables is more than twice the cost found in zone 1. Furthermore, cabbage costs nearly one and a half times more in zone 3 than in the reference zone.

Finally, in zone 4, cabbage, frozen vegetables and canned tomatoes cost twice as much as in zone 1. Only carrots are at a price similar to that of zone 1.

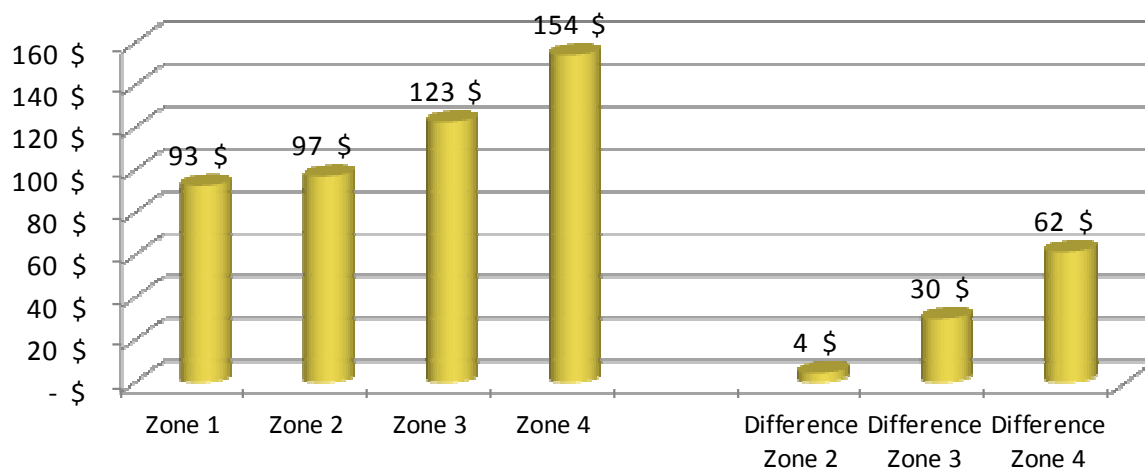
Table 7.10 presents the cost of *fats and oils* such as olive oil and canola oil according to the geographic isolation zone.

Table 7.10: Cost of the items used as *fats and oils* according to the geographic isolation zone and cost differences with the reference zone (zone 1).

	Cost in each zone				Differences with zone 1		
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 2	Zone 3	Zone 4
Olive oil (1L)	\$10.06	\$9.66	\$21.04	\$19.54	-\$0.40	\$10.98	\$9.48
Canola oil (1L)	\$3.57	\$5.30	\$7.54	\$5.75	\$1.73	\$3.97	\$2.18

The cost of olive oil is the same in zone 1 and in zone 2. However, it is twice the cost in zones 3 and 4. As for canola oil when compared to zone 1, it is approximately \$2 more in zones 2 and 4 and costs more than twice as much in zone 3.

Graph 7.3 presents the total costs for all of the food included in the list of items presented in tables 7.5 to 7.10. The total cost of these items does not in any way represent the cost of a grocery cart for a family nor does it reflect the consumer price index. This total is simply the sum of the costs demonstrating the differences that exist between the various geographic isolation zones.

Graph 7.3: Cumulative costs for the list of food products studied according to the geographic isolation zone and the cost differences with the reference zone (zone 1).

The first four columns present the total cost of the food for each of the four zones. The first observation is that the total cost of the foods increases with the level of isolation of the communities, despite the fact that some food items cost less in certain zones compared to the reference zone. In summary, when adding up the cost of all the food items, the cost is \$4.43 more in zone 2, \$29.94 more in zone 3 and, finally, \$61.62 more in zone 4, when compared with zone 1 where the total cost of the food items is \$92.80.

In short, in zone 4, the total cost of food is 1.66 times higher than in the reference zone.

7.3 Accessibility of fruits and vegetables

The differences observed in the cost of food between the geographic isolation zones are interesting to analyze, but the accessibility and variety of the food were also considered in the context of the Scan. This section of chapter 7 addresses the accessibility and quality of food according to the geographic isolation zone of the First Nations communities.

Table 7.11 presents the accessibility of a list of fruits in the grocery stores of the communities for each of the geographic isolation zones.



Table 7.11: Proportions of grocery stores in the First Nations communities that have each of the selected fruits according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Apple	100%	100%	100%	100%
Pear	90%	50%	100%	50%
Orange	100%	100%	100%	100%
Grapefruit	100%	25%	50%	50%
Lemon	100%	75%	50%	50%
Banana	100%	100%	100%	50%
Mango	90%	25%	0%	100%
Dates	90%	25%	0%	25%
Kiwi	90%	75%	50%	75%
Pineapple	100%	25%	0%	50%
Peach	60%	75%	0%	50%
Plum	90%	75%	50%	50%
Nectarine	90%	0%	0%	0%
Apricot	20%	0%	0%	50%
Watermelon	80%	50%	0%	50%
Honeydew melon	90%	75%	0%	75%
Cantaloupe	100%	75%	0%	50%
Grapes	100%	75%	100%	50%
Raspberries	100%	25%	50%	0%
Avocado	80%	0%	0%	50%
Strawberries	90%	75%	100%	50%
Cherries	60%	25%	0%	0%
Other berries	80%	25%	0%	0%

In zone 1, almost all the fruits were available in all the grocery stores of these communities. Only apricots and cherries were less available and that is probably due to the season during which the environmental walk was carried out.

In zone 2, only apples, bananas and oranges were available in all the grocery stores. Three-quarters (75%) of the grocery stores in zone 2 had lemons, kiwis, peaches, plums, honeydew melons, cantaloupes, grapes and strawberries. Half of the grocery stores had pears and watermelon. All the other fruits were not accessible or only available in 25% of the grocery stores.

In zone 3, all the grocery stores had apples, pears, oranges, bananas, grapes and strawberries. Half of the grocery stores offered lemons, kiwis, plums, raspberries and

grapefruits. However, more than half of the fruits listed in table 7.11 were not available in the grocery stores in zone 3.

In zone 4, the grocery stores held apples, oranges and mangos. 75% of them had kiwis and watermelon. Only half of the grocery stores had pears, grapefruits, lemons, bananas, pineapple, peaches, plums, apricots, watermelon, cantaloupe, grapes, avocados and strawberries. All the other fruits were not available except for dates which were available in one quarter of the grocery stores.

Table 7.12 presents the accessibility of a list of selected vegetables in the grocery stores of the communities for each geographic isolation zone.

Table 7.12: Proportions of grocery stores in the communities that have each of the selected vegetables according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Carrots	100%	100%	100%	100%
Broccoli	100%	75%	0%	50%
Beets	50%	25%	0%	0%
Cauliflower	100%	75%	50%	50%
Brussels sprouts	90%	25%	0%	50%
Green beans	100%	25%	0%	0%
Peas	90%	50%	50%	0%
Zucchini	100%	25%	0%	0%
Squash	80%	25%	0%	0%
Fresh asparagus	90%	25%	0%	0%
Eggplant	75%	0%	0%	0%
Mushrooms	100%	100%	100%	75%
Corn	90%	25%	0%	50%
Pepper	100%	100%	100%	100%
Cucumber	100%	100%	50%	100%
Salad	100%	100%	100%	100%
Tomato	100%	100%	100%	50%
Celery	100%	100%	100%	50%
Cabbage	100%	50%	100%	100%
Spinach	100%	25%	50%	0%
Onion	100%	100%	100%	100%
Leek	90%	25%	0%	50%
Turnips	80%	25%	0%	50%
Parsnip	90%	0%	0%	0%
Radish	100%	75%	0%	0%

In zone 1, all the vegetables on the list were available in almost all the grocery stores. Beets and eggplant were slightly less available, but that is probably due to the season during which the environmental walk was carried out.

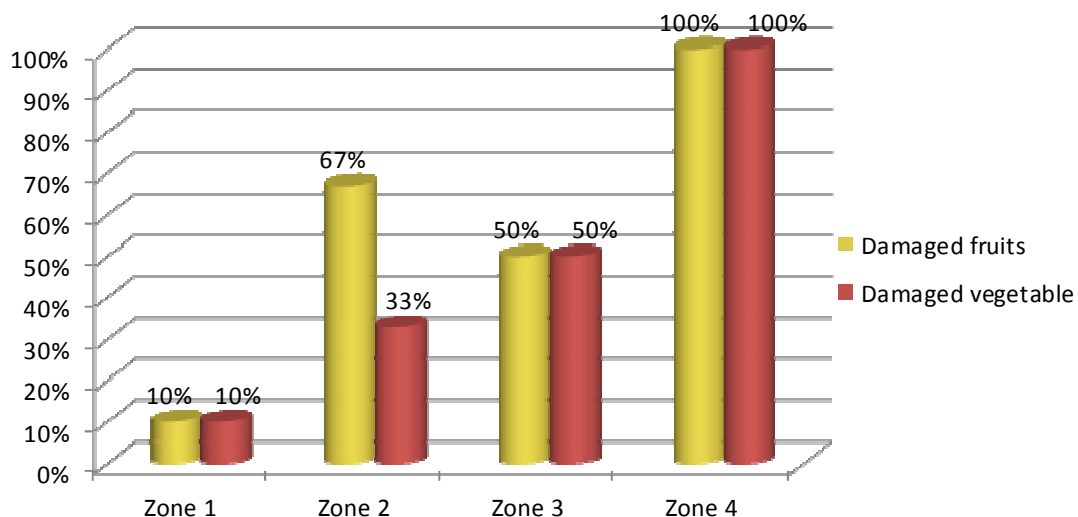
In zone 2, only eight varieties of vegetables (carrots, mushrooms, pepper, cucumber, salad, tomato, celery and onion) out of the list of 25 were available in all the grocery stores. More than half of the vegetables were available in less than half of the grocery stores.

In zone 3, out of the list of 25 vegetables, eight were available in all of the grocery stores. However, more than half of the vegetables were not available in any grocery store. As for cauliflower, zucchinis, cucumbers and spinach, these were available in half of the grocery stores visited.

In zone 4, only six varieties of vegetables were available in all the grocery stores (carrots, pepper, cucumber, salad, cabbage and onion). Mushrooms were available in 75% of the grocery stores, eight vegetables were available in 50% of the grocery stores and ten vegetables were not available in any grocery store in this zone.

Graph 7.4 presents the proportion of grocery stores in the communities that hold damaged fruits and vegetables according to the geographic isolation zone. Fruits and vegetables were considered damaged when 3 or more of each variety were withered or rotten.

Graph 7.4: Quality of the fruits and vegetables that were accessible in the grocery stores of the communities according to the geographic isolation zone.



In zone 1, fruits and vegetables were damaged in 10% of the grocery stores. In zone 2, fruits were damaged in 67% of the grocery stores and vegetables were damaged in 33% of them. In zone 3, fruits and vegetables were damaged in half of the grocery stores. Finally, in zone 4, fruits and vegetables were damaged in all of the grocery stores.

7.4 Accessibility of the infrastructures and services

Public transportation can influence access to food. In some communities, the existing grocery stores are obsolete and the choices available are very limited. However, a few kilometres away by vehicle, it is possible to access grocery stores where good quality and diversified food is sold. This section focuses on public transportation and its frequency. Access to various services and the infrastructures available in the communities are also addressed.

Table 7.13 presents the public transportation available in each geographic isolation zone.

Table 7.13: Types of public transportation available according to the geographic isolation zone.

	Presence of public transportation	Types of available public transportation		
		Train	Bus	Community taxi
Zone 1	90%	0%	50%	90%
Zone 2	50%	0%	0%	50%
Zone 3	0%	0%	0%	0%
Zone 4	100%	100%	0%	0%

In zone 1, 90% of the communities have access to public transportation. 50% of them have access to a bus service and 90% have access to community taxis.

In zone 2, half of the communities have access to community taxis, which is the only public transportation mode available.

In zone 3, no public transportation is available.

In zone 4, a train links the two communities that took part in the environmental walks to a neighbouring town and represents the only available means of public transportation.

Table 7.14 presents the frequency at which the public transportation previously listed is available according to the geographic isolation zone.

Table 7.14: Frequency of the public transportation according to the geographic isolation zone.

Frequency per day	Zone 1	Zone 2	Zone 3	Zone 4
≥ 2 times/hour	20%	0%	0%	0%
2-4 times/day	10%	0%	0%	0%
Once/day	30%	0%	0%	50%
< Once/day	10%	0%	0%	50%
Non applicable	30%	100%	100%	0%

In zone 1, in 20% of the communities with accessible public transportation, the service is available more than twice per hour. In 10% of the cases, public transportation is available two to four times per day, in 30% of cases only once per day and in 10% of cases, less than once per day.

In zones 2 and 3, the frequency of public transportation cannot be calculated because no type of transportation serves the communities in this zone or because they are only served by community taxis. In zone 4, in 50% of the communities, public transportation is available once per day and in the other half less than once per day.

Table 7.15 presents the access related to the various resources in terms of facilities and infrastructures in each geographic isolation zone.

Table 7.15: Access to the facilities and infrastructures in the communities according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Restaurant where eating seated is available	70%	100%	0%	50%
Restaurant where eating seated is not available	40%	50%	0%	0%
Fitness centre	50%	0%	0%	100%
Community centre	90%	50%	0%	50%
Park	80%	25%	0%	100%
Sports field	60%	25%	100%	50%
Health centre	90%	100%	100%	100%
School	80%	50%	100%	100%
Pharmacy	20%	0%	0%	0%
Community garden	40%	0%	0%	0%

All the communities have a health centre. All the communities in zone 4 and 50% of the communities in zone 1 have access to a fitness centre. In zones 3 and 4, all the communities have a school on their territory. However, in zones 1 and 2, some

communities located near a town do not have a school on their territory and therefore access a school outside their community. A pharmacy is accessible in only 20% of the communities in zone 1. All of the communities in zones 1, 3 and 4 have sports fields, compared to only 25% of the communities in zone 2.

Community centres are not available in all the communities. They exist in 50% of the communities in zones 2 and 4, in none of the communities in zone 3 and in 90% of the communities in zone 1. Finally, only 40% of the communities in zone 1 have a community garden.

Table 7.16 presents the various sports equipment available in the communities according to the geographic isolation zone.

Table 7.16: Access to sports equipment in the communities according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Basketball	50%	50%	50%	0%
Soccer	40%	100%	0%	0%
Volleyball	40%	50%	100%	0%
Skateboard park	50%	0%	0%	0%
Sports centre	30%	0%	0%	50%
Trails	40%	0%	0%	0%
Ice rink	40%	50%	100%	0%
Baseball	20%	0%	0%	50%
Access to school gymnasium ¹⁰	90%	100%	100%	100%

All the communities in zones 2, 3 and 4 and 90% of the communities in zone 1 have access to their school's gymnasium. Half of the communities in zone 1 have a skateboard park.

All the communities have at least one sports field (volleyball, soccer, ice rink, gymnasium, sports centre, etc.). Furthermore, only 40% of the communities in zone 1 have access to safe trails to go on hikes and none of the communities in the other zones has access to this type of infrastructure.

7.5 Restaurant services available in the communities

The type of restaurant frequented by the population can influence the occurrence of obesity and diabetes. For example, a difference would probably be observed between a community where the only restaurants available offer only junk food and another community where restaurants offering more healthy choices are also accessible. The

¹⁰ This applies only when there is a school on the community's territory.

consultants hired for the environmental walks therefore had to document the restaurants available among the communities.

Table 7.17 presents the types of restaurants and certain of their characteristics identified by the consultants according to the geographic isolation zone.

Table 7.17: Types and characteristics of the restaurants identified according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Restaurant offering complete service	80%	25%	100%	50%
Fast food restaurant	30%	50%	0%	100%
Snack bar	0%	50%	0%	0%
Healthy option offered in the menu	60%	50%	0%	0%
Salad or vegetables offered	100%	0%	100%	50%
Buffet	10%	0%	0%	0%
Possibility of large-sizing portions	10%	0%	100%	50%

Table 7.18 presents the location of the restaurant identified by the consultant according to the geographic isolation zone.

Table 7.18: Location of the restaurant identified according to the geographic isolation zone.

	Zone 1	Zone 2	Zone 3	Zone 4
Inside the community	60%	100%	0%	50%
Outside the community	40%	0%	100%	50%

In zone 1, 60% of the communities have a restaurant in the community. 80% have access to a restaurant offering complete service and 30% have access to fast food restaurants. Among all the restaurants identified, 60% offer a healthy option, all of them have a choice of salad or vegetables, and 10% offer the possibility of large-sizing portions.

In zone 2, the restaurants are all located in the communities. A quarter of these offer complete service. Half of the restaurants offer fast food and the other half are snack bar-type restaurants. Half of the restaurants identified by the consultants in zone 2 offer a healthy option and none of these restaurants offer salads or the possibility of large-sizing portions.

In zone 3, all the restaurants are located outside the communities. They all offer complete service, a choice of salads and the possibility of larger portions.

In zone 4, all the communities have a fast food restaurant and half of the restaurants offer complete service. Half of the restaurants offer salad or vegetables and the possibility of large-sizing portions.

7.6 Summary

The environmental walks carried out in the First Nations communities enabled a collection of information that allows for a better understanding of the dietary context associated with each of the four geographic isolation zones.

First of all, the cost of food increases according to the degree of geographic isolation of the First Nations communities. As such, food products cost nearly twice as much in zone 4 compared to zone 1. Even though laws regulate the cost of certain food products such as milk and eggs, the prices of these products increase proportionally with the remoteness of the communities. It can also be noted that the reduction of the diversity and quality of food increases as the distance grows between communities and urban centres. Zone 3 is the geographic isolation zone where the communities have the lowest food variety, closely followed by the communities in zone 4. Furthermore, the quality of the fruits and vegetables offered in zone 4 is clearly lacking.

Concerning the stores where it is possible to purchase food, the First Nations living in zone 4 only have access to food sold in their community, while individuals in other zones have the possibility of purchasing food outside their community. However, some communities must drive nearly 80 km to access the supermarket of the closest town, which involves transportation costs that are sometimes high. In light of this information, it would be interesting to explore community methods for food storage.

On another topic, advertisement aiming to promote soft drinks is present in some communities that were visited. This is particularly evident in the communities located in geographic isolation zones 1 and 3.

Finally, access to public transportation is limited for most communities. For example, in zone 1, only a few communities can access neighbouring towns by way of public transportation. In zone 2, public transportation consists of community taxis, and in zones 3 and 4, there is no public transportation available in the communities.

Chapter 8: Discussion

The *Scan on Diabetes Among Non-Agreement First Nations Communities of Quebec* was designed in order to achieve three objectives: 1) determining the known proportion of diabetics and prediabetics in the First Nations communities per geographic isolation zone; 2) identifying the needs associated with type 2 diabetes among the communities in terms of prevention, promotion, screening, care and treatment and capacity-building; 3) studying the environmental factors fostering the development of diabetes among the communities. Before addressing the results associated with each of these objectives, a brief portrait is provided for each zone.

8.1 Results of the Scan for each of the geographic isolation zones

With the assistance of the three methodological components fostered in the framework of this Scan, the review of the medical files, the interviews with the key players and the environmental walks, it is possible to establish a portrait of diabetes for each of the geographic isolation zones.

In zone 1, access to care and treatment is regular and the First Nations individuals have access to a range of specialists, including a nutritionist. They also have access to grocery stores that are located in neighbouring towns offering them food that are of good quality, diversified and reasonably priced. Furthermore, regarding the health centre personnel, training sessions on nutrition and diabetes are available on a regular basis. The communities located in this zone also have access, for the most part, to public transportation services. In accordance with these environmental conditions, the known proportions of diabetics and prediabetics among the First Nations in this zone are among the lowest of the four geographic isolation zones.

For the First Nations residing in zone 2, access to certain specialists, such as a nutritionist, is sometimes limited. The cost of food is similar to the cost in zone 1, however, food diversity is a bit more limited and the quality of certain fruits and vegetables is not optimal. The First Nations in zone 2 can perform their grocery shopping in grocery stores located outside of their communities. However, there are often costs associated with transportation. While some communities are served by community taxis, the communities in zone 2 as a whole do not have access to public transportation. With respect to medical personnel, they generally have access to training on nutrition and diabetes. On the other hand, the known proportions of diabetics and prediabetics obtained in the sampling are among the highest.

For the communities in zone 3, access to certain specialties such as ophthalmology, nephrology, and dental care is sometimes very limited while access to a nutritionist is often non-existent. Training that is offered to the personnel working in the health centres is uncommon. As for access to food, it seems that the quality is qualified as being fair for about half of the fruits and vegetables sold. Furthermore, the foods

provided are not very diversified and the food costs are nearly one-third more than the food sold in zone 1. The individuals in this zone do have the possibility of running their errands outside of the community. However, the costs involved to reach the nearest town can be quite significant and no public transportation is available. Among the communities located in zone 3, the known proportion of diabetics is the highest while the proportion of prediabetics is the lowest among the four zones.

Finally, in zone 4, access to several specialties is also very limited. The interveners have access to very little training mainly because of the high associated costs. The foods are not very diversified and their costs are high - nearly double the costs in zone 1 - while their quality is often mediocre. The First Nations residing in zone 4 only have access to food that is sold within their communities and no public transportation is available. Despite these environmental conditions which are considered unfavourable, in zone 4, fewer diabetics were identified than in the three other zones. However, the proportion of prediabetics is higher.

8.2 Known proportions of diabetics and prediabetics among the communities

The realization of this Scan allowed for making an estimate regarding the known proportion of diabetics and prediabetics in the communities of the First Nations of Quebec. Therefore, in light of the data derived from our sampling, we estimate the known proportion of diabetics among the First Nations of Quebec at 16.2% and the proportion of prediabetics at 13.8%. As mentioned in the chapter focused on the methodology, the review of the medical files is limited by the fact that it only represents individuals who consult the health centres of their communities. The data presented must therefore be used with precaution and are only estimates of the real proportions found in the communities.

One of the first elements that can be observed through the collected data is that there are notable differences between the genders. The majority of the diabetics and prediabetics from our sampling are mainly women (56.2% of the diabetics and 58.7% of the prediabetics).

Age is another factor that was studied in the framework of the Scan which was identified during the analysis as being associated with the development of diabetes. Therefore, the highest proportions of diabetes and prediabetes were found among those ages 55 years and up. Among diabetics, 63% of them were over 55 years of age and 34.6% were between the ages of 35 and 54 years. Moreover, no identified diabetic was less than 17 years of age. With respect to prediabetics, nearly 46% were over 55 years of age. However, more prediabetics than diabetics were identified among the 18-34 years and 35-54 years age groups. The presence of prediabetes among the youth supports the need to take action among this age group, both in terms of primary prevention and screening.

Lastly, regarding the influence of geographic isolation on the rates of diabetes and prediabetes, significant differences were noted between each of the four zones that were studied. In this regard, the proportion of prediabetics in our sampling varies

between 11% and 17% depending on the geographic isolation zone and the proportion of diabetics varies between 13% and 22%. The highest proportions of diabetes were observed in zones 2 and 3 while the highest proportion of prediabetes was observed in zone 4. When taking these results into consideration, the situation observed in the communities that were studied through the review of the medical files is a cause for concern, since the addition of the proportions of diabetics and prediabetics corresponds to approximately one-third of the population.

It is recognized that having been prediabetic in the past, even if only for a short period of time, increases vulnerability to type 2 diabetes [42;53]. It is therefore possible to anticipate the conversion of the prediabetics into diabetics over the course of the upcoming years [54]. A study was in fact conducted focused on the transitions between the various stages of glycaemia among the Pima Indians. This study by Weyer and coll. demonstrated that the average time to go from a normal postprandial glucose tolerance stage to glucose intolerance is approximately 1.8 years among the Pima Indians while going from glucose intolerance to diabetes takes 3.3 years among this same population [55]. Therefore, prediabetes must especially be considered as being a risk factor for diabetes [56].

In short, since prediabetes is one of the main risk factors for diabetes and significant rates of diabetes were observed in the First Nations communities, it is essential to take action in order to decrease the appearance of prediabetes and prevent its evolution into diabetes. To that end, various health promotion and prevention activities can be fostered. In fact, in certain communities, intervention programs aiming for the modification of lifestyles (nutrition and physical activity) have demonstrated their effectiveness in terms of decreasing the prevalence of prediabetes [49].

Other than the primary prevention activities, it is essential to foster diabetes screening in the communities, especially those located in isolated regions [57]. Once diagnosed, the prediabetic or diabetic individual must be taken care of. Therefore, according to the 2008 Guidelines of the CDA, a structured lifestyle modification program including moderate weight loss and regular physical activity must be implemented in order to reduce the risk of type 2 diabetes among those presenting GI and IFG. Furthermore, depending on the presence of GI, IFG or cardiovascular disease, medicated treatment could be advisable.

Among diabetic patients, a regular follow-up is needed and includes controlling the glycosylated haemoglobin (HbA1c) and blood pressure while ensuring follow-up regarding the lipid profile. Among the diabetics identified in the context of this Scan, a HbA1c value was identified in three out of four files. The HbA1c is a good indicator regarding the effectiveness of treatment and must be measured every three months when the glycaemic objectives are not reached and when adapting the diabetes treatment. When the glycaemic objectives are systematically reached, the HbA1c can be monitored every six months [9].

Blood pressure measurements were only included in the files of 110 patients out of 162 (68%). And yet, among diabetic individuals, it is necessary to proceed, on a regular basis (meaning at every diabetes-related consultation), with hypertension screening and, when the SBP is high, it is necessary to administer an energetic treatment aiming

to achieve the targeted SBP in order to reduce the risk for micro and macrovascular complications [9].

Regarding the lipid profile, it was present in approximately three out of every four diabetic files. And yet, according to the recommendations of the Canadian Diabetes Association, it is necessary to determine the fasting lipid profile (Total blood cholesterol (TBC), C-HDL, TG and C-LDL calculation) when diabetes is diagnosed, and then at intervals of three years afterwards, in accordance with the clinical indications. The tests must be performed more frequently among those receiving treatment against dyslipidemia.

8.2.1 Comparison between the diabetes rates obtained through the Scan with those of the Cree Nations and Inuit

A comparison between the results obtained in this portrait and those estimated among the Cree and Inuit allows for making observations regarding the prevalence of diabetes and prediabetes among these groups. Considering that the approval process turned out to take longer than the set timelines for recruiting communities, the diabetes scan was not extended to the Cree and Inuit populations. The results obtained through the Scan are therefore being compared with results that already existed. To that end, the Cree Board of Health and Social Services of James Bay transmitted data, while for the Inuit, data that was available in literature was used. It is important to take into consideration the fact that this data must be compared with caution and only for indicative purposes, since the methodology employed for collecting the data was different depending on the setting being studied, which can lead to estimations that are difficult to compare. Furthermore, the threshold values employed for determining the presence of diabetes and glucose intolerance are not the same ones. In the context of this Scan, the most recent guidelines of the Canadian Diabetes Association were employed.

Among the Cree, the estimated adjusted prevalence of diabetes is at 20.3% among the men and 30.4% among the women, for a total of 25.5% [59]. Among the Inuit, in 2004, the prevalence of diabetes was lower than the prevalence found among the non-Aboriginal population. In fact, the prevalence of diabetes was 3.0% among the men (18-74 years) and 6.6% among the women (18-74 years), for a total of 4.8%, and the glucose intolerance rates were respectively 3.2% among the men and 3.7% among the women, for a total of 3.4% [60]. Despite rates that are lower than those of the non-Aboriginal population, an increase in the diabetes rate among the Inuit has been observed; in 1991, the self-declared rates of diabetes among the Inuit of Canada was 1.9% [61].

In comparison with this data, the known proportions of diabetics and prediabetics obtained in the context of this Scan are lower than those among the Cree, yet higher than those found among the Inuit. However, compared to the estimates among the Cree and Inuit Nations, the women from our sampling presented a higher prevalence of diabetes than the men.

8.3 Needs identified by the interveners of the communities in relation with type 2 diabetes

The needs of the interveners working in the First Nations communities in terms of prevention, promotion, screening, care and treatment and capacity-building were identified through the interviews that were conducted over the telephone. The following section attempts to analyze in a transversal manner the feedback obtained.

First of all, the observation was made that numerous prevention and promotion activities are proposed to the First Nations communities in all of the geographic isolation zones and these activities are diversified. However, according to the respondents, the available financial and human resources are insufficient for addressing all of the needs in terms of prevention and promotion among diabetics, prediabetics and other individuals who are considered to be at-risk. An increase in the available resources would enable the interveners to offer more activities for reaching out to a greater proportion of the population.

Access to a nutritionist can genuinely make a difference in terms of diabetes prevention as well as for the follow-up associated with the diagnosed individuals. As seen in the portrait established for each of the zones, other than the members in zone 1, few individuals have access to a nutritionist on a regular basis. Moreover, the communities that are isolated from urban centres also have a hard time obtaining the services of an ophthalmologist, physician or dentist. The care and treatment available for diabetics is therefore limited and would deserve, once again, to have more resources devoted in these areas.

Regarding the screening offer, the information collected indicated that individual or mass screening activities are carried out in numerous communities. Several communities integrate screening activities into other events such as community breakfasts or health festivals. However, the majority of screening is carried out in a punctual manner when patients visit the health centre rather than systematically among all of the individuals presenting risk factors that are associated with diabetes. Furthermore, the screening is most often conducted in a capillary manner. This method is no longer the recommended method, since, as previously demonstrated, it can lead to an over-estimation of the number of cases. The information collected demonstrated to us the importance of promoting the screening of diabetes among the communities.

With respect to capacity-building among the community interveners, pressing needs were also identified. The medical personnel of the communities that are located in proximity to towns have easy access to diabetes training. However, the greater the level of geographic isolation, the more limited access to these types of training becomes. In fact, it is important to consider that in addition to the great distance separating them from the locations where these types of training are provided, the health professionals are also forced to neglect their duties for longer periods of time if they wish to participate in these training sessions and conferences.

Still in terms of capacity-building, it has been noted that the majority of the health centres that were visited possessed little in the way of data on the elements that can

help them in terms of identifying the patients who are at-risk of metabolic problems. For example, very little information is recorded in the medical files regarding waist-circumference, hip circumference, size, weight, etc. And yet, these anthropometric indicators are recognized as being predictors of type 2 diabetes and other metabolic disorders [3;45;62;63].

8.3.1 The use of culturally-adapted practices

The provision of care to diabetic patients in the Aboriginal context requires a certain amount of flexibility on behalf of the interveners from a cultural perspective. In the First Nations communities, diabetes must be addressed as a community issue while in urban centres and among general practices, diabetes is more often studied in an individual manner: the individual and his/her environment and lifestyle [64;75]. For this reason, the interventions and research that unfolds in the Aboriginal context must take place in accordance with an approach that is adapted to the community realities.

The interviews conducted among the key interveners demonstrate however that the majority of the interveners who were questioned do not speak the First Nations language of the community in which they are working. Moreover, the majority of the interveners have little recourse to traditional approaches for screening, care provision or the treatment of diabetics. Other than a few occasional activities such as berry-picking, the only form of traditional approach that is frequently reported in the interviews is the use of the community radio for performing prevention and promotion related to diabetes in the traditional language of the First Nation. It was thus observed that very little in the way of prevention or promotion is carried out through a traditional approach and that screening, care and treatment and capacity-building are never or seldom performed in such a way as to integrate a traditional approach.

In this regard, research determined that poor metabolic control among Aboriginal patients is often due to a lack of resources and culturally-inappropriate approaches rather than to a lack of observance on behalf of the patients [56]. It is therefore important to ensure that the health services provided by non-Aboriginal people are culturally-acceptable for the First Nations.

8.4 Environmental factors influencing the development of type 2 diabetes

The environmental walks took place in ten First Nations communities over the course of the years 2008 and 2009, which allowed for gaining an understanding of the environmental factors affecting the communities that can have an impact on the development of diabetes. The factors studied here concern the available infrastructures that allow for practicing physical activity, the cost and diversity of the available food, the goods offered by grocery stores and restaurant services and well as the presence of public transportation among the communities.

Regarding the possibilities related to performing physical activity among the First Nations communities studied, it has been noted that all of the communities offer at least one area that is set up for sports activities. Furthermore, practically all of the communities offer access to their school's gymnasium when this type of infrastructure is available. Nonetheless, it was observed that the number of sports that can be practiced in the installations anticipated for these purposes decreases in accordance with the geographic isolation of the communities.

Another considerable factor related to the development of diabetes is the availability of healthy and diversified foods as well as their costs. By consulting the literature on this subject, it is possible to observe that the cost of a grocery cart can vary to the point of being doubled according to geographic isolation [66]. These results are similar to what was found in the communities of the First Nations of Quebec since the data collected during the environmental walks demonstrates to us that the cost of food increases proportionally to the geographic isolation of the communities visited. For a list of food items, in no way representing the Consumer Price Index, the total cost comes out to \$93 in zone 1, \$97 in zone 2, \$123 in zone 3 and \$154 in zone 4. Also, it was observed that the quality of the fruits and vegetables as well as their diversity also decreases in accordance with the degree of isolation. In fact, during the visits among the communities, it was noted that all of the grocery stores in zone 4 offered their clients damaged fruits and vegetables.

In the same vein, the accessibility and proximity of the grocery stores are considered factors that can influence the development of diabetes within a population. In the context of this Scan, it was observed that the accessibility and proximity of the grocery stores depend on the level of geographic isolation of the communities. The communities that are located near urban centres therefore have more choices related to acquiring food than the isolated communities. In addition, these communities are forced to deal with considerable costs related to transportation in order to have access to stores offering a wider selection of food choices. Access to food stores is also difficult for some communities because of the fact that no public transportation is available. In fact, public transportation is only available in a few communities located in zone 1. However, a few communities have established community taxis in order to address this shortcoming.

A last environmental factor regarding food that can have an influence on the prevalence of diabetes is the restaurant services that are accessible to a population. The results obtained during environmental walks address the fact that the restaurant services that are located within the First Nations communities that were visited or in proximity to these communities mainly offer junk foods.

Considering all of this information, not only is it necessary to be effective in terms of diabetes prevention, but it is also important to consider being effective in the prevention of prediabetes by promoting healthy eating habits and the practice of physical activity. If modifying lifestyles prevents the development of type 2 diabetes among subjects presenting glucose intolerance [67], it can also prevent the development of glucose intolerance among individuals presenting risk factors such as being overweight, for example. As noted in this Scan, even if fitness centres are not available in all of the communities, they are all equipped with at least one infrastructure

facilitating the practice of physical activities such as access to a school gymnasium, a skating rink, a basketball court, etc. In the future, it will be important to focus on the importance of the investments made in this regard as well as the hiring of physical activity specialists and the involvement of young leaders within the communities in order to promote these infrastructures and facilitate them. Furthermore, access to a nutritionist could contribute to improving eating habits among the First Nations who are at-risk of prediabetes and diabetes.

In light of the results presented in this Scan on Diabetes Among Non-Agreement First Nations Communities of Quebec, it seems obvious that a multitude of actions must be undertaken in order to improve the situation. It also seems necessary that these actions address many focus areas in terms of intervention. The following chapter will explain the various recommendations made in this regard.

Chapter 9: Recommendations

Based on the results of the *Scan on Diabetes Among Non-Agreement First Nations Communities of Quebec*, several recommendations can be made to fight more effectively against diabetes in the communities. These recommendations can be divided into four themes: 1) Promotion of the use of a traditional approach, 2) Availability of human, financial and material resources necessary for the prevention of diabetes, 3) Reinforcement of the prevention of diabetes, glucose intolerance and their screening in the communities, and lastly 4) Access to healthy and diversified food.

1- Promotion of the use of a traditional approach

- The literature consulted as well as the interveners interviewed indicate that many services and activities offered in the First Nations communities are not culturally-adapted. Considering this, it is recommended that:
 - A reflection be carried out regarding what an adapted intervention could be with the population and the interveners;
 - The interveners integrate a cultural component that is adapted to their communities when carrying out prevention, promotion, screening, care and treatment activities;
 - The use of traditional know-how and life skills should guide all the actions undertaken by communities to improve the diabetes situation among the First Nations of Quebec.

2- Availability of the human, financial and material resources necessary for the prevention and treatment of diabetes

- Given the number of diabetics and prediabetics (individuals who are at risk of becoming diabetics), the costs generated by the disease and the required care, the growth of this disease in the communities, the limited and insufficient financial resources of the communities and the fiduciary responsibility of the Federal Government towards First Nations, it is recommended that:
 - The First Nations communities obtain adequate financial resources that reflect their needs in terms of prevention, screening and treatment of diabetes.
- Access to health professionals is sometimes limited in certain communities. Health professionals include: physicians, nurses, community health representatives, nutritionists, kinesiologists and any other professional who can play a role in the prevention or treatment of diabetes. As such, so that services offered correspond to the realities of the communities, it is recommended that:
 - All the people affected by prediabetes or diabetes, regardless of their degree of geographical isolation, be able to access the services of health professionals on a regular basis;
 - Community authorities be informed of the diabetes issue in order for them to allocate the necessary resources to fight against the disease and streamline their actions in the context of a multisectorial approach that focuses on the promotion of healthy lifestyle habits;

- Health professionals are assigned to the prevention of diabetes among at-risk individuals as well as those in need of support to improve their lifestyle habits.
- Considering that access to infrastructures facilitating physical activity is sometimes limited in some communities, it is recommended that:
 - Focus be directed towards the importance of adequate and inviting sports infrastructures in all communities that are accessible to the population;
 - Priority be given to investments in leisure infrastructures;
 - Physical activity specialists such as kinesiologists be recruited in the communities to promote physical activity;
 - The local leaders/youth/interveners get involved in the organization of physical activities in the community.
- Considering that training is not always accessible for health centre employees among geographically-isolated communities and that it sometimes targets only health professionals, it is recommended that:
 - Training be accessible through videoconferencing or other technologies in both official languages;
 - Training be encouraged and capacity-building be continued among non-professional Aboriginal professionals working in the health centres (e.g. Yellowquill training). This may have positive impacts such as enhancing and diversifying prevention activities in the communities and ensuring a greater number of quality and culturally-adapted interventions. Also, this would allow professionals (nurses, nutritionists, etc.) to focus more on their respective fields of expertise.

3- Reinforcement of the prevention of diabetes, prediabetes and their screening in the communities

- Considering that some communities carry out few diabetes prevention activities and that increasing prevention can genuinely reduce the prevalence of diabetes in communities on a long-term basis, it is recommended that:
 - Communities focus on effective prevention interventions that meet the needs of the various clienteles (children, women, pregnant women, adults, senior citizens, etc.);
 - Prevention tools be developed in order to support prevention among certain groups in the population that are more at-risk;
 - Particular attention be given to the prevention of prediabetes, which is a disease in itself and inevitably leads to diabetes if no prevention measures are undertaken.
- Considering that potentially many diabetics and prediabetics are not aware of their condition, it is recommended that:
 - Diabetes screening be carried out in accordance with the recommendations of the Canadian Diabetes Association in all the communities.

- Considering that the communities have little or no data regarding their prediabetic and diabetic populations, it is recommended that:
 - The health centres develop electronic registries of their prediabetic and diabetic clienteles for surveillance purposes.

4- Improving access to healthy, diversified and traditional food

- Considering that access to healthy food at an affordable price is more limited as the level of geographic isolation increases and that traditional food is considered to be an excellent alternative to a diet composed of processed food, it is recommended that:
 - A joint action strategy be developed between the federal, provincial and First Nations governments to fight against this problematic issue and foster access to quality fruits and vegetables, at an affordable price, in the most remote communities;
 - The integration of traditional food (game, fish, seafood, etc.) be increased in the collective kitchens;
 - Community freezers be set up and community hunting be encouraged while sharing the bounties resulting from this activity;
 - Specific teaching focused on traditional food culture be included in the elementary school program;
 - The interveners be made aware regarding the importance of elders transmitting their knowledge to youth related to the traditional diet;
 - A traditional pantry be promoted among all age groups.

Chapter 10: Conclusion

This *Scan on Diabetes Among Non-Agreement First Nations Communities of Quebec* enables us to make the observation that the First Nations communities, regardless of their degree of geographic isolation, are faced with considerable problems related to prediabetes and diabetes. Also, this research supported the idea that geographical isolation from the large urban centres causes additional difficulties for the communities with respect to fighting against diabetes such as access to health professionals or even healthy, diversified and affordable food.

The Diabetes Scan allowed for, among other things, making an estimate regarding the prevalence of prediabetes and diabetes among the First Nations of Quebec. Thus, the proportions identified are higher than those observed in the general population with a known diabetes proportion of 16.2% and a known prediabetes proportion attaining 13.8% of the individuals. Factors such as age, gender and geographic isolation were targeted as being associated with the development of diabetes. As for the known proportion of diabetics, it should be noted that the proportion of diabetic women is higher than the proportion of diabetic men and that the oldest individuals from the sampling (55 years and up) are the most at-risk.

Globally, in all of the communities among the four geographic isolation zones, prevention and promotion activities are provided to the population. However, there could be more of these activities and the interveners interviewed agree on the fact that there is a lack of human and financial resources to act more effectively. On the other hand, few screening activities are carried out and most of the screening is done through capillary tests when the patients consult their health centres. Concerning the nutrition-related activities, the majority of the nutritionists seem to have little time to perform prevention, promotion and other activities related to diabetes. They generally focus on patients who are already diagnosed. The practice of traditional approaches by the interveners working in the communities also seemed to be seldom integrated into the service offer.

Regarding nutrition, a difficulty was noted among certain First Nations communities related to accessing food that is both varied and affordable. Geographic isolation can be perceived here as being a factor hindering the adoption and maintenance of healthy eating habits. The food services offered by restaurants within the communities are not very diversified and the presence of many fast food restaurants has been noted. However, a good proportion of restaurants located in the communities do in fact propose healthy alternatives.

Regarding the practice of physical activity, all of the communities that took part in the environmental walks have at least one location for practicing a sports activity on their territory. The community members therefore have access to their school's gymnasium, ice rinks, soccer fields, volley-ball and basketball courts, etc. Once again, the level of geographic isolation of the communities limits their available sports infrastructures.

The diabetes scan that was carried out therefore allowed for establishing a general portrait of diabetes and prediabetes in the First Nations of Quebec communities. The following section presents possibilities related to future research projects that could allow for going a little further in terms of this portrait and understanding the causes and risk factors aggravating this health problem in the communities.

10.1 Course of thought for future research

Lots of research projects have been carried out regarding diabetes, but few of them have focused on diabetes and prediabetes among the First Nations of Quebec. Many risk factors, causes and potential complications among this population therefore remain to be explored. An overview of the research possibilities is presented here.

First of all, while keeping in mind that the rates of HDL and LDL cholesterol are the most significant independent predictors associated with the incidence of cardiovascular diseases among the First Nations [68], it could be interesting to monitor these parameters more closely among diabetic patients.

In subsequent studies, gestational diabetes should be investigated in a more in-depth manner. In fact, even though Aboriginal women are more predisposed to gestational diabetes than women among the non-Aboriginal population [69], there is very little available in terms of data on this subject or on the transformation of gestational diabetes into type 2 diabetes - a very prevalent phenomenon among Aboriginal women [70]. This information is precious since it is recognized that glycaemia during pregnancy has an impact on baby weight and diabetes among children [71;72].

A third research avenue involves the exploration of various models of medical services related to diabetes that have demonstrated their effectiveness. For example, the effectiveness of the clinical services in terms of managing diabetes has improved among certain Aboriginal communities in Australia through national quality insurance program models for the services intended for Aboriginal people [73;75]. It could be interesting to study in a more in-depth manner these various models while studying the feasibility of implementing them in the context of the communities of the First Nations of Quebec.

Finally, in order to properly determine the determinants of type 2 diabetes in the First Nations of Quebec communities, it would be important to pursue with studying the following factors: the diabetes-related perception among the First Nations, the accessibility and availability of care, the role of prevention, the social health inequalities, the psychosocial role of the stress factors as well as the environmental aspects such as diet changes and physical activity.

The *Scan on Diabetes Among First Nations Communities of Quebec* allowed us to update the alarming proportions of people who are affected by this disease, the problems and shortcomings experienced by the interveners in order to act effectively and certain risk factors fostering the appearance and maintenance of diabetes in the communities. In light of this information, the First Nations must make the fight against diabetes a priority. In this regard, the communities had already targeted the fight against diabetes

and obesity in the 2007-2017 First Nations Health and Social Services Blueprint, Closing the Gaps, Accelerating Change..., as being an intervention priority at the top of the list in order to reduce the disparities between the First Nations members and the general populations of Quebec and Canada. To that end, the communities must receive the support required and this support must stem from all levels - local, regional and national alike. It is essential to develop effective strategies in order to overcome this public health problem within the communities.

As recognized in the literature, prevention remains the formula to be favoured in order to attempt to diminish the prevalence of diabetes and prediabetes among this population. It is therefore necessary to ensure that the preventive strategies that will be developed are directly connected with the risk factors that affect this population in particular (obesity, a sedentary lifestyle, poor eating habits, etc.). Furthermore, these actions must be focused on the development of protection factors among the communities, such as the development of healthy lifestyles, and should ensure that the population is more involved in the efforts made.

We hope that the results of this study will enable the decision-makers to better identify the needs and problems surrounding diabetes in the First Nations communities. Therefore, in collaboration with the First Nations members, we will be better able to determine the culturally-adapted actions to be undertaken while taking into consideration the distinct geographical contexts in order to reduce the incidence of diabetes among the members of the First Nations of Quebec.



Annexe: Activities and best practices

Various activities can be organised in the First Nations communities in order to fight effectively against diabetes. The First Nations of Quebec and Labrador Health and Social Services Commission developed two activities aiming to promote healthy lifestyles: the Kirano Project and the school nutrition program entitled *On the path of health*.

The Kirano Project

Kirano is an eight-week project that was established with the objective of fostering the adoption of healthy lifestyles through nutrition and a healthy way of life. These two components are inseparable in order to obtain optimal results. The success of this initiative is mainly based on the personalization of the intervention. The participants are supervised on an almost daily basis by qualified and motivational trainers and nutritionists.

The nutrition component enables the participants to get together once per week for a session supervised by a person with expertise related to nutrition. These workshops aim to provide theoretical and practical notions to the participants. A large portion of the time takes place in the kitchen to practice the notions learned.

The physical activity component occupies a significant portion of the schedule of the participants. It is composed of four physical training sessions per week, including one weekend activity. The training sessions have an average duration of 90 minutes and target both the cardiovascular and muscular components. The main goal of this component is to improve the state of health of the participants, while also demonstrating the great diversity that exists related to practicing physical activity.

Therefore, at the conclusion of the project's eight weeks, the graduates are in better shape, have a better understanding of their bodies and have great ideas related to the ways that they can take in order to maintain these good habits.

The school nutrition program: *On the path of health*

The school nutrition program entitled *On the path of health* is an initiative by the FNQLHSSC aiming to support the communities in the prevention of obesity and diabetes among youth. The school nutrition program is adapted to the children in the First Nations elementary schools and targets the promotion of healthy eating habits among children through the realization of nutrition workshops. Even though the program is child-oriented, this program also aims to increase awareness among the parents as to the importance of eating well.

The program includes four objectives which are promoting traditional foods, fostering appreciation for the taste of nutritional foods, developing cooking skills and skills related to making healthy food choices and learning to recognize the signs of hunger and satiety. The program is made up of 28 workshops, composed of four workshops per grade level starting from kindergarten all the way to grade six. The workshops are composed of a theoretical and practical portion on the benefits of healthy nutrition and various

awareness activities such as games, cooking workshops, creation activities, food samplings and others.

Local activities and best practices

Locally, the First Nations communities organize a wide range of activities targeting the prevention of diabetes and obesity and the promotion of healthy lifestyles. The following list highlights a few community-based initiatives that were reported by the interveners who were interviewed in the context of this Scan:

- Collective kitchens
- Food product label reading activities
- Discussion breakfasts
- Health fairs and other thematic days
- The broadcasting of community radio programs
- Training workshops provided to the population on subjects such as preparing healthy lunchboxes
- Conferences during which diabetics are encouraged to provide testimonials
- Respite sessions in the forest for diabetics
- Parent-child activities such as skating sessions at the arena
- Friendly sports competitions of all kinds
- Etc.

More information on the Kirano and *On the path of health* programs as well as ideas on activities that can be organized in communities can be obtained from the personnel of the FNQLHSSC.

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