DIABETES among First Nations People

By Ellen Bobet for Health Canada

Table of Contents

Introduction

Diabetes Among First Nations People

Diabetes Among First Nations People uses data from the 1991 Aboriginal Peoples Survey (APS) conducted by Statistics Canada to describe the prevalence of diabetes among First Nations people in Canada, and how frequently people experience some of the health conditions that are either caused by diabetes or closely related with it. It also shows how respondents cope with their diabetes, both in terms of their lifestyle habits such as diet and exercise, and in terms of support from family, community, and the health care system. This type of information is useful for health care workers who are developing programs to prevent and manage diabetes and Diabetes Among First Nations People has been prepared with them in mind.

Organization of the Document

This document is divided into 4 sections.

- The first describes the prevalence of diabetes among First Nations people, and its demographic distribution.
- The next section focuses on the effect of diabetes on the individual, and looks at how frequently people experience some of the health problems that are associated with diabetes.
- The third section assembles the available information about how people are coping with their diabetes. It examines individual lifestyle habits that could increase the risk of complications, and those habits that are believed to be protective. It also considers some of the social factors that affect how people cope with diabetes, including use of health care services, whether peoples' special medical needs are covered by their health care plans, and how extensive their social support networks are.
- The final section of the paper briefly considers the impact of diabetes on the community, based on respondents' perceptions of how big a problem diabetes is in their community, and what they said should be done about it.

The Aboriginal Peoples Survey (APS)

The 1991 Aboriginal Peoples Survey asked questions on a variety of issues besides health, so it provides information not only about the overall prevalence of diabetes, but also about the lives and characteristics of the people who have this disease, and how they were coping with it at the time. The numbers for diabetes are based on answers to the question "Have you been told by a health care professional that you have

diabetes'?" This might include some cases of insulin-dependent (Type 1) diabetes, but research suggests that among First Nations people, Non-insulin-dependent diabetes mellitus (NIDDM) is by far the most common type. Because of the wording of the question, it is also possible that the figures include some cases of gestational diabetes.

Who Answered the Survey

The information presented in Diabetes Among First Nations People relates to people age fifteen and over who self-identified as North American Indian (this is likely to include some "non-status" people).

Readers should also be aware that the APS had problems with coverage, particularly for people living on-reserve. Two hundred and seventy-three communities refused the survey, with the result that roughly 55,000 potential respondents had no opportunity to be included in the sample. This represents about 18% of the population listed on the Indian Register. The number of people excluded in this way varied from province to province, ranging from none in Nova Scotia to a high of 34% in Ontario. In sum, the APS represents about 80% or more of the "registered Indian" population, but the information for specific provinces and groups (such as people living on-reserve) may be less complete. *(See appendix 1 for province-by-province figures).* The final sample for the APS contained 19,000 people who identified as "North American Indian", of whom 1,235 reported that they had diabetes.

Reading the Statistics

Estimates derived from a sample always have some *sampling variability* around them – that is, they are accurate "give or take" a certain percent. The figures shown in this paper follow the Statistics Canada guidelines for release: if the number might be "off" by more than a third of its own value it is deemed to be unreliable. For example, a survey reports that 40% of a sample has moose meat for lunch, but the sampling variability is high at plus or minus 50% of this figure. This means the actual percentage of moose meat eaters in this sample is between 20% and 60%. Therefore the estimate is not very useful. If the variability is between 16.5% and 33% of the figure's value, the note "caution: high sampling variability" has been added.

Where a difference in rates is described as "significant" this refers to *statistical* significance, and means that the difference is larger than would be expected by chance. In practical terms this means that the odds are at least 95% that the difference really exists in the population, and not just in the sample.

Key Findings from the APS

Prevalence and distribution of diabetes

- Diabetes rates among First Nations people are triple the Canadian average using age-standardized rates. 6.5% of First Nations people over the age of 15 report that they have been diagnosed with diabetes. Based on past research, it is believed that almost all of this is Non-insulin-dependent diabetes mellitus (NIDDM), as opposed to the insulin-dependent type.
- NIDDM appears to show itself at a young age among First Nations people: prevalence among people aged 30–39 is 5%, and rates increase with age thereafter.
- The prevalence of diabetes appears to be highest in the Ontario-Manitoba-Saskatchewan area, and lowest in British Columbia and the northern territories.
- First Nations people with diabetes tend to be over the age of 40, and to have lower income and education levels than people without diabetes.
- More women than men report being diagnosed with diabetes.

Health problems associated with diabetes

- People with diabetes rate their health much lower, and are more likely than others to report that they also have high blood pressure, heart disease, and vision problems.
- First Nations people with diabetes are more likely than their non-Aboriginal counterparts to report that they have hypertension or heart disease. In fact, even First Nations people without diabetes seem to be at higher-than-average risk of developing these conditions. Diabetes, hypertension, and heart disease share many of the same risk factors and they seem to be widespread throughout First Nations communities.

Coping with diabetes and its complications

- Many First Nations people with diabetes have lifestyle habits that put them at risk of developing complications. As a group, people with diabetes are more likely to be overweight, less likely to exercise, and just as likely as others their age to smoke cigarettes on a daily basis. However, they are somewhat less likely to drink alcohol.
- 97% of people with diabetes see a health care provider at least once a year. Most people see a doctor, and about half see a nurse. Smaller proportions report seeing CHRs or traditional healers.

- 92% of people with diabetes report that their health insurance covers their special medical needs.
- Almost everyone with diabetes has someone they could call on for help in the event of an emergency, usually their spouse, a family member, or a friend. Most would be able to call on three or more such people.

Community awareness of diabetes as a problem

- When asked about health problems in their community, about ⅓ of First Nations people identify diabetes, suggesting that awareness of the problem is high. Most of the people who think diabetes is a problem believe that either nutrition programs and nutrition awareness, or improved health care services are needed. Almost no-one identified a need for exercise programs or recreational facilities.

How to use this information

- People are aware of the role of diet and medication in controlling diabetes, but less aware of the benefits of exercise. Health workers may want to reinforce the importance of regular exercise as a means of preventing and managing diabetes in health education materials.
- Awareness of diabetes appears high, most people have seen a nurse or doctor about their diabetes and social support networks seem to be strong for people with this disease. This situation should support efforts at diabetes networking. Friends, family members and spouses might also be able to provide information and help for people to manage their diabetes, so health care workers may be well advised to encourage this type of informal networking.
- First Nations people with diabetes tend to be over the age of 40, and to have lower income and education levels than people without diabetes. These facts should be borne in mind when developing educational materials and intervention programs, particularly with reference to reading levels of print materials. This could mean an increased use of audio-visual materials and interpersonal contact in health education activities.
- Diabetes, hypertension, and heart disease share many of the same risk factors and they seem to be widespread throughout First Nations communities. Population-based prevention strategies that target all people may be the best approach.

Prevalence & Demographics

People with Diabetes

The reported prevalence of diabetes among First Nations people age 15 and over was 6.5%. This figure should be seen in light of three factors.

- First, diabetes rates vary greatly across the country; in some areas, particularly the North, the rates are lower than average, while elsewhere they are much higher. The national average is of course a composite of the low and high areas.
- Second, the figure is for all people age 15 and over. Most people do not develop NIDDM until age 30 or later. Thus, a rate that includes all adults, as this one does, will always be lower than one that focuses only on the older age groups (such as a rate for people 25 and older).
- Finally, this figure is self-reported diabetes, meaning that it includes those who have been diagnosed and are willing to report the diagnosis on a survey. Surveys provide quite accurate estimates of the prevalence of diagnosed diabetes,[1] but the numbers will nonetheless differ from those that might be gathered from screening or a review of health care records.

Comparisons with other studies of diabetes are complicated by the fact that each study tends to use its own age range – some look at prevalence among people over age 20, some among people 30+, and so forth. The only other Canada-wide study, in 1987, found diabetes rates ranging from 0.7% among Yukon Indians to 6.2% among Iroquoians in Eastern Canada, but this was for all ages rather than only people over 15.[2] Studies for comparable age groups suggest that the APS results are fairly typical. For instance, a study of people age 18+ in three B.C. communities in 1994 found rates of 2.8%–5.7%, using physical measures;[3] a review of case registries for people age 20+ in Ontario found a prevalence of 6.2%,[4] while another case registry study found a rate of 5.2% among James Bay Cree people over age 20.[5] In contrast, Delisle's screening study of two Algonquin communities in Quebec found much higher rates, ranging from 12–17% among people over 15 years of age,[6] while figures from health care records in Manitoba suggest higher rates than those reported to the APS.[7]

Using age-standardized* rates for comparison, the diabetes rates reported to the APS are three times those of the Canadian population as a whole. The age-standardized rates among First Nations people are roughly 8% for men, 11% for women, and 10% for both sexes

*Age-standardization is a statistical adjustment that allows for a more accurate comparison of disease rates between two populations when they have very different age structures. In this example, age-standardization compensates for the fact that the Canadian population has a much higher proportion of elderly people than the First Nations population, and hence has more people at risk for NIDDM. Figures for First Nations people were standardized to the 1994–95 population of Canada as reported on the National Population Health Survey using the direct method.

FIGURE 1

People with Diabetes

People who have been told by a health professional that they have diabetes (can include gestational diabetes in some cases).

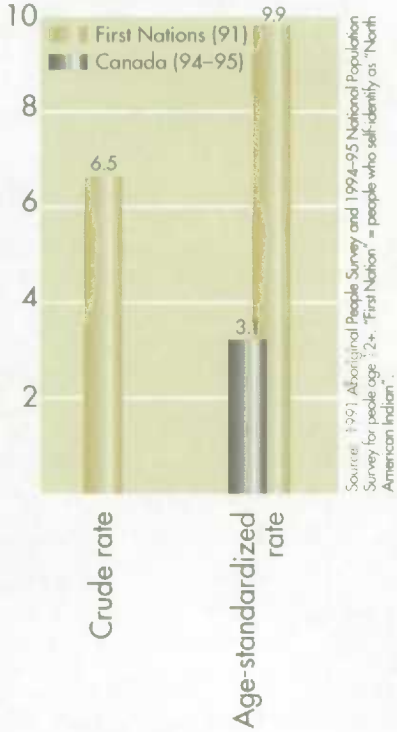
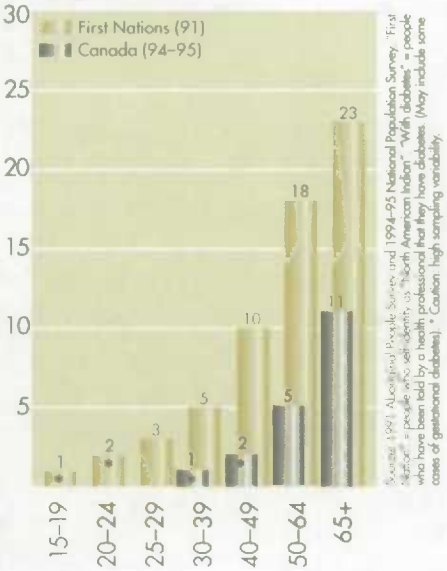


FIGURE 2

Diabetes by age group

Percentage with diabetes



combined. This compares to 3.1% for Canada as a whole, as reported to the National Population Health Survey in 1994. *(See figure 1.)*

These results support many existing research studies which have recorded higher rates of diabetes among First Nations people. Death rates from diabetes among First Nations people have been found to be at least double the national average in both Canada[8] and the United States,[9] while the national survey carried out by Young and others estimated that prevalence rates among people living on-reserve were from 2–5 times the national average in most areas, with the exception of B.C. and the North.[10]

Age distribution

Rates for First Nations people are 5% in the 30–39 year old group, and then rise steadily with age, to 22.8% of those age 65+. There is no sign of the "survivor" effect documented by some studies; that is, lower rates of diabetes among people over age 65. Not surprisingly, people with diabetes as a group are older than average: 70% of the adults with diabetes were age 40+, as compared to 28% of those without diabetes.

It has been suggested that the age of onset of diabetes is lower among First Nations people than in the general Canadian population.[11] A comparison with the figures for the total Canadian population suggests that this may be the case. By age 30–39, 5% of First Nations people have diabetes, whereas the figure for Canadians of this age is less than 1%. This difference is statistically significant. Although recent reports suggest that the age of onset is dropping,[12] and that increasing numbers of children are now being diagnosed with NIDDM, the majority of people with diabetes are still over the age of 40. *(See figure 2.)*

Gender distribution

About ⅔ of the people with diabetes are women. The prevalence rate among men is 5.3%, while for women it is 7.6%. These higher numbers of women reflect other research studies to date, although the difference is less pronounced than in studies of individual communities, some of which have found diabetes rates among women that are double those observed for men. The tendency for women's rates to be higher is observed in most age groups, although at younger ages some of the difference may be caused by gestational diabetes rather than differences in NIDDM. This gender difference is not observed in the Canadian population as a whole, where diabetes rates among men and women are similar.[13]

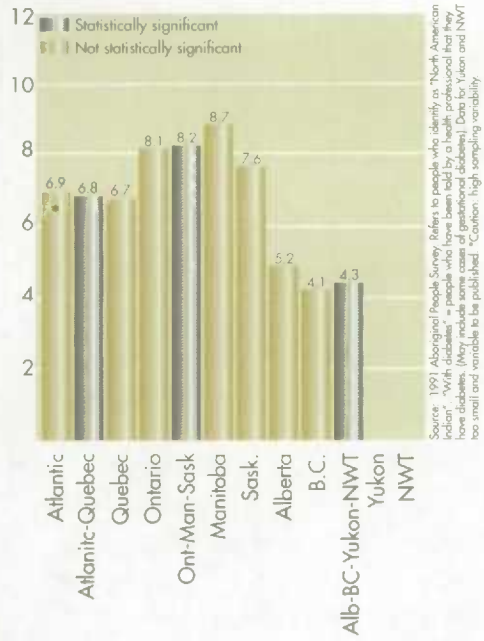
Geographic distribution

The APS data suggest that diabetes rates are lowest in the north and west, and highest in the Ontario-Manitoba-Saskatchewan area. Due to

FIGURE 3

Percentage of people with diabetes by region

Percentage of First Nations people with diabetes, by region.

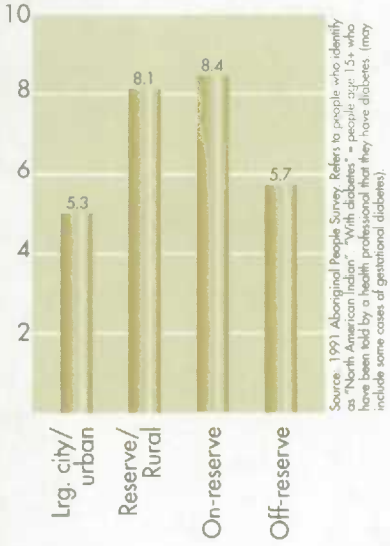


Source: 1991 Aboriginal People Survey. Refers to people who identify as "North American Indian". "With diabetes" = people who have been told by a health professional that they have diabetes. (May include some cases of gestational diabetes). Data for Yukon and NWT too small and variable to be published. *Caution: high sampling variability.

FIGURE 4

Diabetes by area of residence

Percentage of First Nations People 1991 with diabetes.



Source: 1991 Aboriginal People Survey. Refers to people who identify as "North American Indian". "With diabetes" = people age 15+ who have been told by a health professional that they have diabetes. (may include some cases of gestational diabetes).

small sample size, data for some of the provinces had to be combined in order to make the numbers statistically meaningful. The combined rate for the Ontario-Manitoba-Saskatchewan area was 8.2%, which was significantly higher than the 6.8% reported for Quebec and the Atlantic provinces. The lowest rate (4.3%) was observed for the combined area Alberta-B.C.-Yukon-NWT. These findings are somewhat different from those of the 1987 national study by Young and others. Although both studies found that rates are lower in B.C. and the North, the 1987 study found the highest rates in eastern Canada, rather than in Manitoba and its neighbouring provinces. *(See figure 3.)*

Urban/rural differences and on/off-reserve differences

The APS is the first survey to produce country-wide data about diabetes for people living both on and off-reserve. An unexpected finding is that rates of diabetes are significantly higher among people living on-reserve than off-reserve (8.4% vs 5.7%). This is not simply because reserves have higher proportions of elderly people; the difference is there even when the figures are age-standardized.* A similar pattern is seen when comparing rural to urban areas: diabetes rates are significantly higher among people living in rural areas and reserves, as compared to those in urban areas and large cities (rural=8.1%, urban = 5.3%). These results are surprising, given that most researchers believe that higher diabetes rates are associated with a more "western" lifestyle and increased urbanization. Previous studies of reserves and communities have suggested higher rates in southern communities, although none were able to compare to the off-reserve population.[14] The findings suggest a need to further investigate the differences between rural and urban communities in terms of risk factors for diabetes, and in terms of the types of intervention programs that are available to help people prevent and manage diabetes. *(See figure 4.)*

Income and education

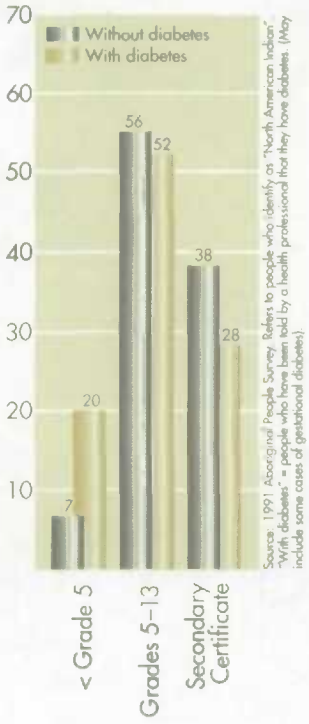
Models of the factors that determine health suggest that income and social status are the most important influences on a population's health. Also, health status tends to improve with educational level. It is believed that this is because education helps to provide income and job security, and also because it gives a person a sense of control over his/her life circumstances.[15] Because of these relationships, it seemed worth investigating the education and income levels of people with diabetes. As a group, First Nations people with diabetes have less formal education and lower incomes than those without diabetes: they are significantly

*For this and following age-standardized comparisons between First Nations People with or without diabetes, figures were standardized to the total North America Indian population as reported to the APS.

FIGURE 5

Amount of formal education

Percentage of First Nations people, by whether or not they have diabetes.



more likely to have less than a grade 5 education, and are also more likely to be below Statistics Canada's "low income cut-off" line. Most of the difference in education levels is due to the generally older age of the diabetic group: 70% of them are over age 40, and older First Nations people tend to have less formal education. However, the differences in income between the two groups persist even using age-standardized figures.

These results do not entirely agree with the determinants of health models, because although income seems to be related to diabetes, education level does not. Irrespective of whether or not education affects a person's risk of developing diabetes, however, the low education levels of the diabetic group suggest that written materials will not be very useful for teaching people how to manage their diabetes. Prevention and control programs might need to consider options such as targeting messages to the entire family, relying on methods other than the written word, or ensuring that resource materials are properly adapted to their target audience. *(See figure 5.)*

Summary:

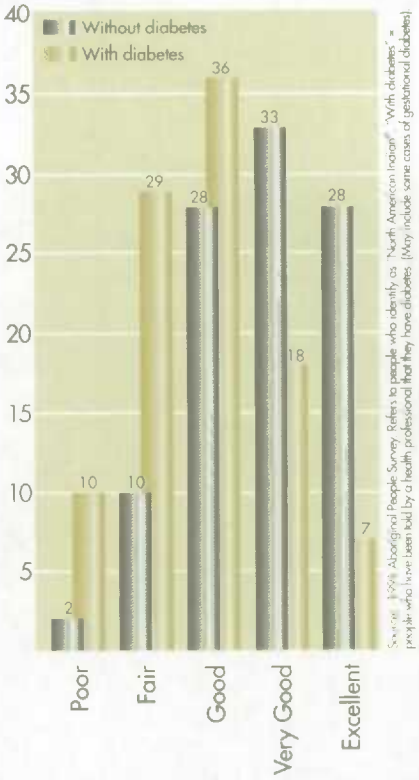
- Age-standardized rates of diabetes among First Nations people are triple the Canadian average. Prevalence rises noticeably after age 40, and continues to rise with increasing age.
- Rates are about ⅓ higher among women than men; it is not clear how much of this is "real" difference, and how much might be the result of gestational diabetes or of under-diagnosis of diabetes among men.[16]
- Diabetes rates as reported to APS are highest in Ontario, Manitoba, and Saskatchewan, and lower in B.C. and the north.
- Prevalence of diabetes appears to be higher on-reserve, and in rural as opposed to urban areas.
- People with diabetes tend to have lower income and education than non-diabetics, a finding that is partly related to the older age of most people with diabetes, but that is of great significance for health-promotion planners when targeting education programs.

Impact on the Individual:
Complications and Health Problems

FIGURE 6

Diabetes and self-rated health

Percentage of First Nations people, by whether or not they have diabetes, who felt, compared with other people their age, that their health was...



Source: 1999 Aboriginal Peoples Survey. Refers to people who identify as "North American Indian". "With diabetes" = people who have been told by a health professional that they have diabetes. (May include some cases of gestational diabetes)

Diabetes accelerates other chronic conditions, and is associated with a series of diseases many of which can be life-threatening. Complications associated with diabetes include atherosclerosis (hardening of the arteries), neuropathy (disease of the nervous system), and an increased risk of infections. These in turn contribute to a long list of conditions including:

- heart disease
- stroke
- visual disorders including cataracts, glaucoma, corneal disease and retinopathy (damaged blood vessel in the retina)
- kidney and pelvic disease
- impotence
- decreased sensation in the lower limbs
- complications of pregnancy
- foot infections that can progress to skin ulcers and gangrene and eventually require amputation.

In addition, many people with diabetes also have hypertension, which is in itself a risk factor for heart and cerebrovascular disease, and accelerates the progression of conditions such as retinopathy.

This section considers how diabetes affects people, in terms of their perceptions of their own health, and in terms of their risk of developing some of the other health problems that are commonly associated with diabetes; the next section focuses on how well people are managing their diabetes so as to reduce the risk of such complications.

Self-rated health

Diabetes has a very clear effect on how people rate their health: only 25% of people with diabetes say that their health is very good or excellent as compared to other people their age, as compared to 60% of those without diabetes. *(See figure 6.)*

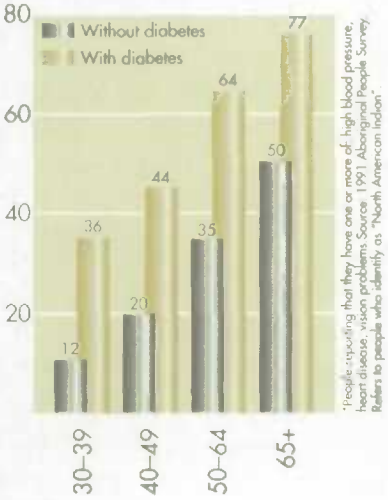
Presence of one or more conditions associated with diabetes

The APS provided information on three of the conditions that are frequently associated with diabetes: hypertension, heart disease, and vision problems. As expected, the figures show that people with diabetes are much more likely than others to experience one or more of these problems. Although few people under age 30 report any complications, 36% of the people age 30–39 with diabetes report having at least one of

FIGURE 7

Presence of one or more complications, First Nations*

Percentage of First Nations adults with complications, by age and whether or not they have diabetes.



these problems. This proportion rises with age, to 77% of those age 65 and over. *(See figure 7.)*

Anecdotal reports and some research studies suggest that First Nations people tend to develop the complications of diabetes at a younger age than non-Aboriginal Canadians. For this reason, it was considered worth comparing the First Nations and total Canadian populations in terms of the age at which complications appear. Although the APS questions were not identical to those used on surveys of the total population, they were similar, and it was therefore possible to construct a roughly comparable measure of "associated conditions" based on whether the person reported having one or more of: heart disease, hypertension, or vision problems.* A comparison of the First Nations and Canadian populations on this measure suggests two important conclusions:

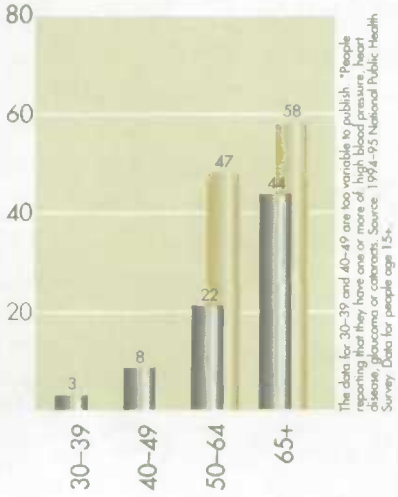
- Among the people who have diabetes, First Nations people are far more likely than other Canadians to report having one or more of the associated conditions.
- Some of these health problems are reported much more frequently even by First Nations people who do not have diabetes.

This suggests that the risk factors for these conditions are widespread throughout the First Nations population. *(See figure 8.)*

FIGURE 8

Presence of one or more complications, Canada*

Percentage of Canadian adults with complications, by age and whether or not they have diabetes.



High Blood Pressure

The prevalence of high blood pressure or hypertension is far higher among First Nations people with diabetes: 43% as compared to just 10% of those without diabetes. Even using age-standardized figures, people with diabetes are still three times as likely as others to have hypertension. Past research has shown that hypertension and diabetes are strongly related, although it is not clear whether one causes the other, or whether both diabetes and hypertension are the result of some third factor.[17] Regardless of cause, hypertension is an added risk factor for the coronary heart disease, kidney disease, and retinopathy associated with diabetes. *(See figure 9.)*

Fairly equal proportions of men and women report having high blood pressure, whether or not they have diabetes. This finding is surprising. Since men generally have higher rates of heart disease than women, it was expected that they would also have a greater prevalence of hypertension. However, the same pattern has also been repeatedly observed

*First Nations people were counted as having an "associated condition" if they reported high blood pressure, heart disease, or inability to clearly see print and faces, even with glasses. The comparable measure for Canadians in general counted anyone who reported having high blood pressure, heart disease, glaucoma or cataracts.

FIGURE 9

Percentage of First Nations adults with high blood pressure

By age group and whether or not they have diabetes.

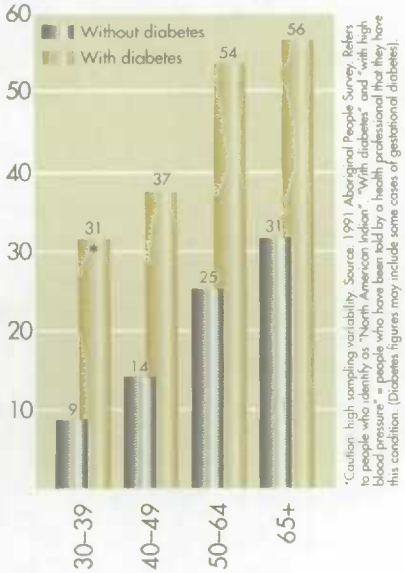
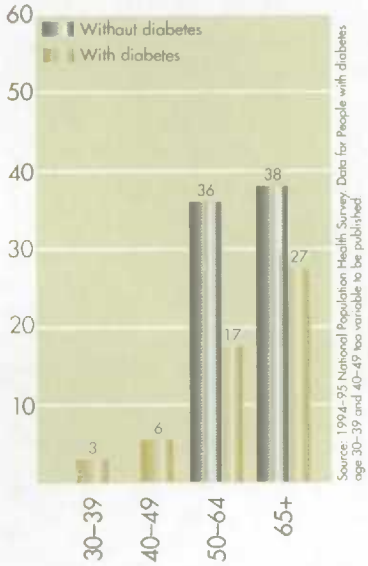


FIGURE 10

Percentage of Canadian adults with high blood pressure

By age group and whether or not they have diabetes.



in health surveys of the non-Aboriginal population, and may be due to under-reporting and/or under-diagnosis of hypertension among men.[18]

The difference between the rates of hypertension reported by First Nations people and those reported by Canadians in general on the National Population Health Survey is striking: diabetic or not, First Nations people are more likely to report having hypertension. For the non-diabetic population, these differences become less pronounced with age so that after age 65, roughly similar proportions of First Nations and other Canadian people report having hypertension. Among people with diabetes, however, the differences between the First Nations and Canadian populations persist at all ages. *(See figure 10.)*

Heart disease

Predictably, people with diabetes are also far more likely to report that they have heart disease. This holds true even when using age-standardized figures to compensate for the fact that both diabetes and heart disease are associated with increasing age. Among people over age 40, those with diabetes are twice as likely as those without (28% vs 13%) to report having heart disease. Men with diabetes are more likely than women to report heart disease, while the numbers for non-diabetic men and women are similar. These results differ from those reported in studies by Montour and others, in which the presence of diabetes appeared to decrease women's natural protection against heart disease. *(See figure 11.)*

First Nations people with diabetes are more likely than non-Aboriginal diabetics to report that they have heart disease. A worrying finding is that this seems to hold true even at young ages; this supports anecdotal reports that First Nations people are developing the complications of diabetes at a younger age than others. As well, even First Nations people without diabetes are more likely than other Canadians to report that they have heart disease.

This pattern is in distinct contrast to historical trends: until recently, studies have generally found low rates of heart diseases among Native peoples, even if they have diabetes. It is, however, consistent with recent trends in First Nations mortality rates from circulatory disease (which now exceed the national average), and with a study at Kahnawake that documented extremely high rates of ischemic heart disease, which affects the blood supply to the heart, among people with diabetes.[19] *(See figure 12.)*

Vision

The APS contained two questions about vision problems: the first asked respondents if they could see print on a page, with glasses if they normally use them. The second asked whether they could see faces

FIGURE 11

Percentage of First Nations adults with heart disease

By age group and whether or not they have diabetes.

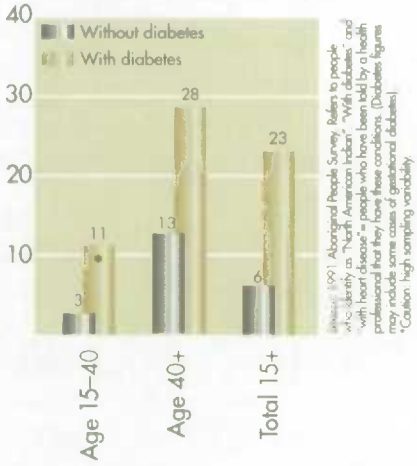
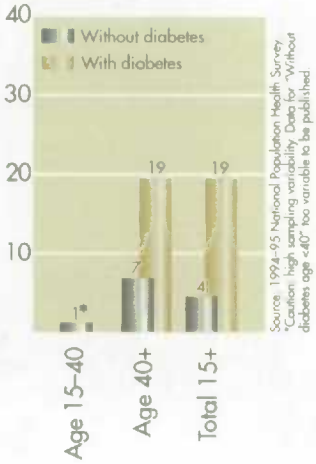


FIGURE 12

Percentage of Canadian adults with heart disease

By age group and whether or not they have diabetes.



across the room (again with glasses if they used them). For purposes of the present analysis, people who could see neither print nor faces were considered to have a vision problem. 8.9% of respondents reported a problem. To some extent, this is due to the older age of most diabetics, since vision problems also relate to age. Even controlling for age, however, people with diabetes are somewhat more likely than others to report vision problems.

Summary

This section has focused on three questions:

- Within the First Nations population, to what extent does having diabetes raise a person's risk for some of the related conditions such as hypertension, heart disease, and vision problems, as compared to someone who does not have diabetes?
- How does this risk compare to that of a non-Aboriginal person with diabetes?
- How do the First Nations and total Canadian populations compare in terms of risk for these diseases, even in the absence of diabetes?

The results suggest that:

- First Nations people with diabetes are at higher risk of hypertension, heart disease, and vision problems than their non-diabetic counterparts, and rate their overall health much lower.
- Compared to non-Aboriginals, First Nations people with diabetes are more likely to report having an associated condition, and these associated conditions seem to be manifesting at a younger age.
- These conditions seem to be more prevalent in First Nations people than in non-Aboriginal Canadians, whether or not the person has diabetes.

The large differences in risk between people with diabetes and those without have serious implications in terms of peoples' need for health care services. It is tempting to interpret the results as evidence that people are having difficulty controlling their blood sugars; however, such interpretations should be made very cautiously, since of the three conditions examined here, only vision problems are definitely linked to blood sugar levels.[20] Also, the finding that even First Nations people without diabetes report high rates of hypertension and heart disease suggests that what may be needed are broadly-based prevention programs that address the risk factors in the population at large.

Coping with diabetes

This section looks at how people cope with having diabetes. It is divided into two main parts:

- Lifestyle habits. This looks at questions such as: Are people with diabetes changing their lifestyle habits, so as to reduce the risk of complications? Are people who live a more "traditional" lifestyle at less risk of diabetes?
- Outside support. This looks at what help is available for a person with diabetes from their family, community, and the health care system.

Lifestyle factors such as weight, diet and exercise affect blood sugar control. This in turn affects a person's risk of developing complications in the future. Tight control of blood sugars can help to prevent many complications (such as infections, kidney disease, and visual disorders) or at least delay their onset and severity. The APS included a few questions on lifestyle habits, although none of the questions go into great depth. In addition to knowing about lifestyle habits, it is important to know if people with diabetes are receiving regular care, counselling, and support, and whether their special health care needs are being met.

Lifestyle habits

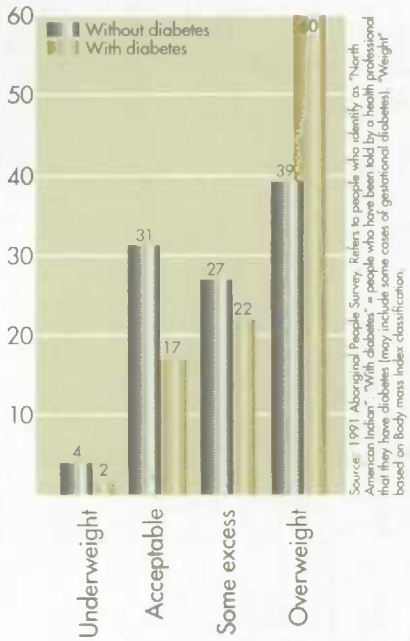
Weight

Obesity contributes to the development of complications, because it tends to lower the number of insulin receptors in the target tissues. The APS results show that people with diabetes are about twice as likely as non-diabetics to be overweight,[21] even allowing for the fact that those with diabetes tend to be older: half or more are seriously overweight, as compared to 27% of people without diabetes. From a cross-sectional survey such as this one, it is impossible to say whether the obesity contributed to the development of the diabetes, whether it is a reaction to the insulin that many diabetics must take, or whether both the obesity and the diabetes are the result of some underlying cause.[22] What is clear is that many people with diabetes are overweight, and that this can increase their risk of complications by making it harder for them to achieve glycemic control. *(See figure 13.)*

FIGURE 13

Diabetes and weight

Percentage of First Nations population age 40+, by whether or not they have diabetes.



Physical activity

Physical activity is important in diabetes prevention and control because it affects weight, and also has independent effects on the number of insulin receptor sites in the muscle.[23] The APS data show that 33.2% of people who have diabetes participate in sports, games, dance or recreational activities, as compared to 56% of people without diabetes. This difference is only partly explained by the larger number of elderly

FIGURE 14

People who participate in sports, games or recreational activities

Percentage of First Nations people, by whether or not they have diabetes, who participate in sports, games or recreational activities.

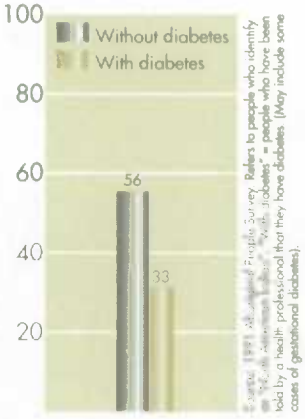
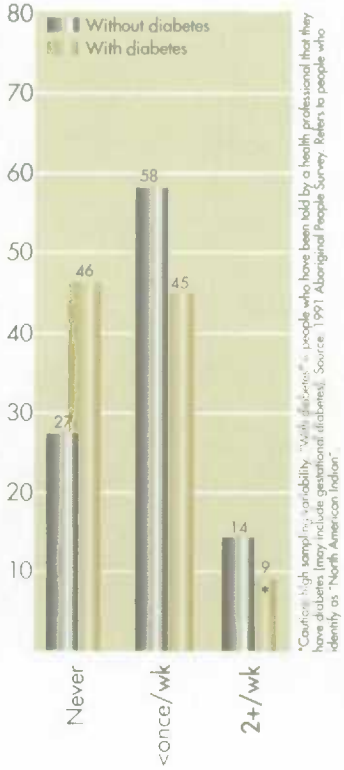


FIGURE 15

Drinking behavior in past year

Percentage of First Nations population age 40+, by whether or not they have diabetes.



people in the diabetic group; it persists even when controlling statistically for age. *(See figure 14.)*

Smoking

Since smoking increases the risks of cardiovascular disease associated with diabetes,[24] it is of interest to see, from the APS data, if people with diabetes manage to quit smoking. As a group, people with diabetes are less likely than others to smoke. However, a closer look reveals that this is due to the generally older age of the diabetic group, rather than with people quitting as a result of being told they have diabetes. Among people of comparable age, those with diabetes are about as likely to be daily smokers as anyone else.

Drinking

Although they smoke at the same rate, people with diabetes are less likely than other people to drink alcohol. This pattern is not simply due to changes in peoples' drinking habits as they age, since it also holds true when the rates are age-standardized. This suggests that although they may not be successful in controlling their overall weight, people with diabetes may nonetheless make positive changes in their dietary habits. *(See figure 15.)*

Indicators of traditional lifestyle

The most commonly-accepted explanation for high rates of diabetes among First Nations people is that diabetes occurs because of a combination of genetic factors and the impact of a "western" diet and lifestyle. It is believed that traditional First Nations lifestyles helped to prevent diabetes, because they involved frequent exercise as part of daily activities, as well as a diet based on land foods which are lower in fats and sugars. A few studies among Aboriginal peoples in other parts of the world have shown dramatic improvements in glycemic control when people return to their traditional diets and activities.[25] Because of this relationship, it seemed worth investigating whether the prevalence of diabetes was any lower among those First Nations people in Canada who appear to be living a more "traditional" lifestyle. The APS included questions about several aspects related to traditional practices, including:

- Whether the respondent was able to carry on a conversation in an Aboriginal language.
- How much time, if any, she/he spent on the land.
- How much land food was consumed.
- Did the person participate in traditional activities.

Land food

Although the APS did not directly measure how traditional a person's diet was, it did ask people how much of the meat they ate came from hunting or fishing by themselves, their family or friends. It seemed reasonable to use this question as a proxy for an indicator of traditional diet. The results do not suggest a relationship with diabetes: diabetes rates were the same among people who obtained half or more of their meat from hunting and fishing as they were in those whose meat came from other sources.

Time spent on the land

About 20% of respondents said that they had spent some time on the land in the past year to hunt, fish, or teach their children traditional ways. Of these, half reported spending 4 or more weeks on the land. It was thought that diabetes rates would be lower among the people spending 4 or more weeks on the land each year, as compared to those who spent no time on the land, or spent less than 4 weeks. However, the data do not support this notion. In fact diabetes rates are actually slightly higher among those who spent a lot of time on the land, because as a group they tend to be slightly older. After controlling for age, diabetes rates in the two groups are identical.

Aboriginal language

Diabetes rates are significantly higher among people who report that they are able to speak an Aboriginal language: 10.4% vs 4%. This is partly age-related, since ability to speak an Aboriginal language is strongly related to age. However, some differences persist even when the figures are age-standardized. There is no obvious explanation for this relationship.

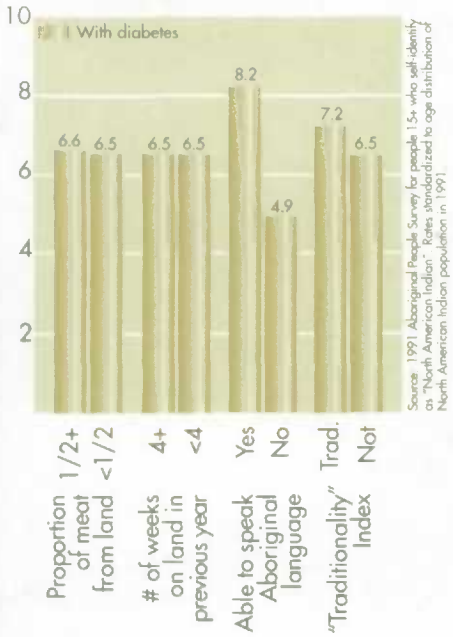
Participation in traditional activities

Slightly over half of all respondents to the survey said that they participate in traditional activities. Interestingly, this is not related to age, that is, people under 40 were just as likely as those over 40 to participate. There was no appreciable difference in diabetes rates among those who participated as compared to those who did not. Either participation in traditional activities is not associated in any way with a tendency to develop diabetes, or the measure of "participation" used was not fine enough to distinguish between occasional traditional activities and living a traditional lifestyle on a day-to-day basis.

FIGURE 16

Diabetes and indicators of traditional way of life

A comparison of age-standardized rates



Measuring "traditionality"

As well as considering diabetes rates in relation to individual factors such as participation in traditional activities, it seemed useful to create a composite indicator of "traditionality". For this indicator people were classified as "traditional" if they could carry on a conversation in an Aboriginal language, had spent 4 or more weeks on the land in the previous year, and said that they participated in traditional activities.

Even with this composite indicator, and even controlling for age, there was no statistically significant relationship between traditionality and diabetes rates. Given that other research has found the traditional diet to be protective against diabetes, and that studies continue to find higher rates of diabetes in southern areas, this finding is somewhat unexpected. It is possible that the indicators used are not in fact good gauges of the extent to which a person is truly living a traditional lifestyle. Alternatively, these indicators may indeed measure some aspects of "traditionality", but the crucial aspect in terms of diabetes control may be traditional diet, which was not measured in any detail on the APS.* The results suggest that there is a need to trace more clearly which particular aspects of the traditional lifestyle help to protect against diabetes, and to measure more accurately these aspects in future. *(See figure 16.)*

Outside support and health care services

As well as looking at individual lifestyle habits, it is useful to consider the types of support from family members, the community, and the health care system that could help a person to cope with their diabetes.

Social support

Support from families, friends, and communities is believed to have a major impact on health. Some experts believe that it may have as much effect as some of the accepted risk factors such as smoking or exercise.[26] "Social support" as a concept has been measured in various ways, ranging from emotional support (how many people you can confide in) to help with everyday activities. The APS measured support with the question "Thinking about where you are living now, is there someone you could turn to if you needed help in an emergency?" Aside from the question's usefulness as a measure of social support, it is of interest in its own right to know how many people with diabetes have someone they could call on if they had a sudden crisis or required help.

*This theory would be consistent with Robinson's findings from a study in a James Bay community. The study found little improvement in blood glucose levels even among people living on the land for a three to four month period. The authors attributed this lack of improvement to the fact that most of the people concerned were taking a great deal of store-bought food into the bush with them. The short period of measurement may have also affected the results. (See Robinson, 1995).

FIGURE 17

People who saw someone about their health in past year

Percentage of First Nations people who saw someone, by whether or not they have diabetes.

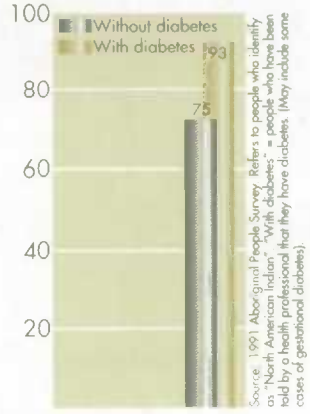
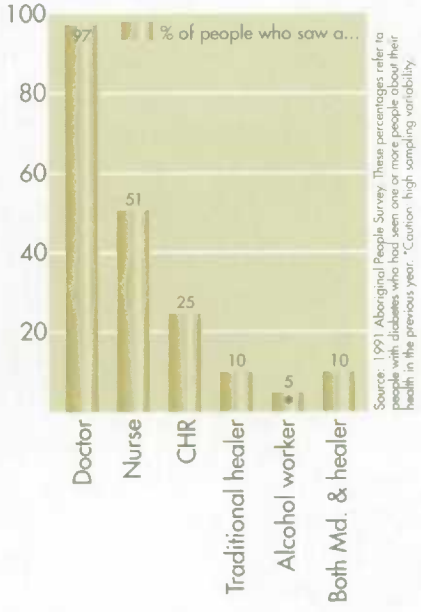


FIGURE 18

Who do people with diabetes see for health care?

Percentage of First Nations people with diabetes who saw a... in past year.



In answer to this question, 95% of First Nations people (whether or not they have diabetes) reported that they had at least one person they could turn to in an emergency. Among the people with diabetes, about ¾ had three or more people that they could turn to for help. These people were generally spouses, parents, family members, and friends.

Use of health care services

93% of the people with diabetes have seen someone about their health in the past year, as compared to 74.5% of people without diabetes. Of the people with diabetes who had seen someone about their health, 97% had seen a doctor, 51.4% a nurse, and 10.1% a traditional healer. The figures for traditional healers may be understated, since not everyone is prepared to report use of traditional approaches on a Statistics Canada survey. Judging by the figures reported to APS, it appears that people are using traditional and western medicine in combination: almost everyone who saw a traditional healer had also seen a doctor. *(See figures 17 and 18.)*

Although these figures do not tell us how closely people with diabetes monitor their condition, they do show that the vast majority see a health professional at least once a year. While this is good, a visit to a health professional is of limited value in the absence of proper, ongoing education and counselling. In many cases, it would be expected that a nurse would provide updated counselling to people about how to manage their diabetes. In view of this, the proportion of people who report that they saw a nurse during the past year seems somewhat low. However, it must be remembered that these numbers also include people living off-reserve, who may be less likely than those actually living in a First Nations community to have access to a Community Health Nurse. The numbers provide information for diabetes-control activities, in that they identify which types of health professionals people with diabetes are seeing. They also show which groups of health workers need information about the management of diabetes, and would be able to pass such information on to their clients.

Special medical needs

92% of people with diabetes said that their special medical needs were covered by their health insurance plan(s), leaving 8% with unmet needs. *(Note: the question was general, so the medical needs mentioned are not necessarily related to the person's diabetes).* The people with unmet needs most frequently mentioned that their health insurance did not cover needed drugs; the next most common concerns were dental care, and eye care.

Summary

The information on lifestyle habits indicates that many First Nations people with diabetes are at high risk of developing complications. It appears from these data that people with diabetes are more likely than others to be overweight, are less likely to exercise, and are just as likely as anyone else to smoke cigarettes on a daily basis. However, they do seem to be somewhat more likely than other people to abstain from alcohol, and they may have made other changes in their diet.

Measuring "traditional" lifestyle or diet on a survey is difficult, but the APS did contain a series of what might be considered proxy measures of traditionality, such as ability to hold a conversation in an Aboriginal language, time spent on the land, and use of land food. None of these measures were clearly associated with lower diabetes rates.

The findings on support from family and community are more encouraging. Most people with diabetes reported that their health care plan covered their special medical needs, and almost everyone had seen a health care provider (usually a doctor) in the previous year. This suggests that their diabetes is being at least occasionally monitored. In addition, emergency support networks appear to be strong, in that most people with diabetes have several people to whom they could turn for help in a crisis.

Community Impact

FIGURE 19

Perceived health problems in the community

What do you feel are the most serious health problems in your community? For example diabetes, allergies, stress...

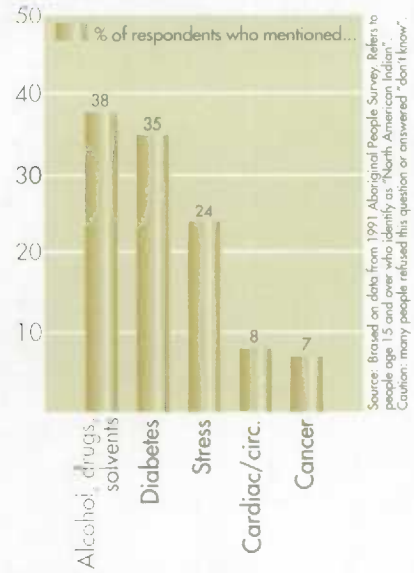
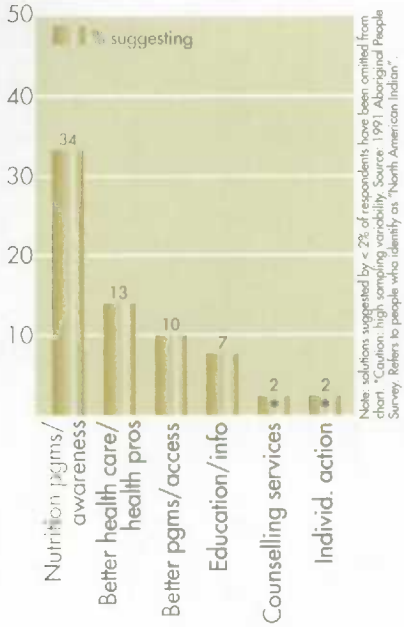


FIGURE 20

Solutions suggested by people who thought diabetes was a problem in their community

First Nations people, 1991.



Surveys of individuals do not lend themselves easily to measuring the impact of diabetes on a family or community. However, the APS results do provide information about people's level of awareness of diabetes as a problem, and what they thought should be done about it. When asked about health problems among Aboriginal people in their community, 35% of respondents mentioned diabetes, a figure roughly comparable to the number of people who cited alcohol/drugs/solvents as a problem. This number may have been artificially raised by the fact that diabetes was mentioned as an example in the question, but it nonetheless suggests that levels of concern about diabetes are high. *(See figure 19.)*

People were also asked what solutions they believed would address the problems they identified. Of the people who listed diabetes among the top three health problems in their community, 36% believed that nutrition or nutrition-awareness programs would help, while about 21% suggested better health care services or better health professionals. About 10% suggested education and information, while small percentages suggested options such as other programs, counselling, or individual action. It is noteworthy that while many people thought of nutrition programs and health care, almost no-one mentioned exercise or a need for recreational facilities. It is possible that people are not generally aware of the role that exercise can play in preventing diabetes or reducing the risk of complications. From this, it appears that diabetes-control programs need to emphasize the importance of exercise. *(See figure 20.)*

Conclusion

Who has diabetes?

Age-standardized rates of diabetes among First Nations people in Canada are three times the national average. By age 30–39, many people have already been diagnosed with diabetes, and the numbers increase with age. Prevalence rates vary from one part of the country to another, with Alberta, B.C. and the North showing markedly lower rates than other provinces, while Ontario, Manitoba and Saskatchewan report the highest rates. Contrary to accepted wisdom, prevalence as reported to APS was somewhat lower off-reserve and in urban areas than for reserves and rural locations. There is no obvious explanation for these findings. Individuals diagnosed with diabetes tend to be older, and to have less formal education and lower incomes than others, a fact that must be borne in mind when developing interventions and educational materials.

Who can help?

Health care workers are well positioned to share the most recent information on care of diabetes with their patients and this is strongly reflected in the APS. Doctors and nurses are the workers that people with diabetes report seeing most frequently, so they might be the best choices for this role. The spouses, family and friends that people with diabetes rely on in an emergency may also be well placed to provide more routine help and information.

Associated conditions

Although it cannot be concluded from a cross-sectional survey that diabetes caused any other condition, individuals with diabetes are more likely to report that they have hypertension, heart disease and vision problems; and that their health is poor as compared to others. In addition, First Nations people with diabetes are more likely than non-Aboriginals of comparable age to report that they have hypertension and heart disease. An important finding is that even in the absence of diabetes, First Nations people are more likely to report some of these problems. This suggests that the risk factors for hypertension and heart disease are widespread in the population. Obesity, poor diet, lack of exercise and smoking put people at risk for diabetes, or can worsen its complications. They are also implicated in the development of hypertension and heart disease. This suggests the need for population-wide approaches to reduce such risks in addition to efforts that target a specific condition.

Changing lifestyle habits

People diagnosed with diabetes are often asked to make difficult and far-reaching changes to their lifestyles, including changes to their diet, exercise habits, smoking behaviour, monitoring of blood glucose levels, self care and medications. The APS results suggest that although people with diabetes modify some habits, few are successful in keeping a healthy body weight and exercise pattern. In fact, awareness of the role of exercise in preventing and managing diabetes seems to be low. Almost no-one mentioned it when asked about solutions to the problem of diabetes. The message that lifestyle habits can help to prevent and manage diabetes needs to be reinforced in the First Nations population.

A positive note

Almost everyone with diabetes had seen a health care worker at least once during the preceding year. Also, most had several people that they could call on for help in an emergency. An encouraging finding is that a large proportion of First Nations people are aware that diabetes is a major health problem in their community, and they identify nutrition programs, along with improved health care, as part of the solution. This indicates that public awareness efforts to date have had an impact. Further, there appears to be a knowledge base on diabetes in First Nations communities, upon which to build future public health initiatives to prevent and manage this disease.

Appendix 1

Estimated undercoverage of the Indian population living on-reserve

1991 Aboriginal Peoples Survey

	Estimated population of the communities that did not participate in the APS. (Statistics Canada estimates for 1986 or 1981).	Number of Indian people living on reserve or crown land in the province, December 1991, according to Dept of Indian Affairs.	% of people on-reserve who did not participate in APS.
Newfoundland	118	798	17%
P.E.I.	145	826	15%
Nova Scotia	0	8,818	18%
New Brunswick	1,932	8,762	0%
Québec	8,505	35,953	22%
Ontario	21,211	61,882	24%
Manitoba	2,577	21,017	34%
Saskatchewan	1,569	42,379	5%
Alberta	8,680	41,565	4%
B.C.	9,328	46,096	21%
Yukon	665	2,940	20%
N.W.T.	0	9,297	0%
Total	**54,730**	**310,333**	**18%**

Individual response rate:
People living in Aboriginal communities – 77%
People living in other areas – 79%

Appendix 2

Crude and age-standardized rates for selected indicators

(Standardized to 1991 North American Indian population as reported to APS)

Diabetes rates (%) among people with the characteristics shown below:	Crude diabetes rate	Age standardized diabetes rate
Residence on/off reserve		
On–reserve	8.4	7.9
Off–reserve	5.7	6.1
Urban/rural residence		
Urban	5.3	6.0
Rural	8.1	7.5
Time spent on land in past year		
None, or less than 4 weeks	6.5	6.5
4 weeks or more	7.1	6.5
Ability to converse in Aboriginal language		
Able to converse	10.4	8.2
Not able to converse	4.0	4.9
Proportion of meat obtained from the land		
less than half	6.4	6.6
Half or more	7.1	6.5
less than 100%	6.5	6.6
100%	6.1	5.5
Fills criteria for "traditionality" index		
Traditional	8.9	7.2
Non	6.4	6.5

Characteristics of people with/without diabetes:

crude and age-standardized proportions (%)

CHARACTERISTIC	CRUDE PROPORTION		AGE-STANDARDIZED	
	with diabetes	without diabetes	with diabetes	without diabetes
Income below low-income cut-off	44.5	34.4	49.1	34.2
Body Mass Index Range				
Overweight	57.5	26.6	49.4	27.1
Some excess	19.4	22.0	16.1	22.1
Acceptable	20.7	42.7	30.3	42.2
Underweight	2.4	4.3	8.8	8.7
Have heart disease	23.0	5.6	16.0	6.0
Have vision problems	6.6	1.7	3.1	1.8
Participate in sports, games, etc.	33.2	56.3	46.5	55.3
Smoke				
Daily	36.6	43.5	45.5	43.1
Occasionally	11.0	13.2	12.2	13.1
Alcohol use in past year				
Never	38.6	18.0	28.2	18.7
Once/twice per week or less	51.5	68.5	59.7	67.9
2–3 times per week or more	9.7	13.6	12.1	13.4

Bibliography

Assembly of First Nations, First Nations Health Commission. *Report on the Second International Conference on Diabetes and Native Peoples "Sociocultural Approaches in Diabetes Care for Native Peoples"*. Honolulu, Hawaii, May 19–21, 1993. FNHC, November 1993.

Bennet, Peter. "NIDDM etiology and complications". Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Brassard, Paul, Elizabeth Robinson, Claudette Lavallée. "Prevalence of Diabetes Mellitus among the James Bay Cree of Northern Quebec". *Can Med Assoc J.* 1993; 149 (3): 303–307.

Canada, Statistics Canada & Department of National Health and Welfare. *The Health of Canadians: Report of the Canada Health Survey*. Ottawa: Supply and Services Canada, 1981.

Daniel, Mark, and Diane Gamble. *Aboriginal Community-Directed Diabetes Prevention and Control: The Okanagan Diabetes Project*. NHRDP project 6610-2022-ND, Sept. 30, 1996.

Daniel, Mark, Diane Gamble, Joyce Henderson and Sandy Burgess, "Diabetes Prevalence, Behavioural and Anthropometric Risk Factors, and Psychosocial Constructs in Three Aboriginal Communities in Central British Columbia". Chronic Diseases in Canada, Autumn 1995, vol. 16 no. 4: 165–174.

Delisle, Hélène F., Jean-Marie Ekoé, "Prevalence of non-insulin-dependent diabetes melitus and impaired glucose tolerance in two Algonquin communities in Quebec". *CMAJ* 1993; 148(1). 41–47.

Depew, Noella & Jamie Blanchard, "Incidence and Prevalence of Diabetes in Manitoba's First Nations People: 1986–1991". Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Dyck, Roland F. and Helena Cassidy, "Preventing Non-Insulin-Dependent Diabetes Among Aboriginal Peoples: Is Exercise the Answer?". Chronic Diseases in Canada, 16(4) Fall 1995: 175–177.

Dyck, Roland F. and Leonard Tan, "Differences in High Birthweight Rates between Northern and Southern Saskatchewan: Implications for Aboriginal Peoples." *Chronic Diseases in Canada*, 16(3), Summer 1995: 107–110.

Dyck, Roland F., Leonard Tan, "Rates and Outcomes of Diabetic End-stage Renal Disease Among Registered Native People in Saskatchewan." *CMAJ* 1994: 150(2), 203–208.

Dyck, Roland F., Leonard Tan, and Vern H. Hoeppner. "Body Mass Index, Gestational Diabetes and Diabetes Mellitus in Three Northern Saskatchewan Aboriginal Communities". Short Report, *Chronic Diseases in Canada* vol. 16 no. 1, Winter 1995: 24–26.

Farkas, Carol. "Ethnospecific Communication in Diabetes Education", in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Federal/Provincial/Territorial Advisory Committee on Population Health. *Strategies for Population Health: Investing in the Health of Canadians*. Ottawa: Supply and Services Canada, 1994.

Garro, Linda. "Cultural Knowledge About Diabetes", in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Gerhardt, Krista, *Nova Scotia Native Diabetes Project*. Unpublished, MSB, February 1990.

Gittelsohn, Joel, Stewart B. Harris, Sara Whitehead, Thomas Wolever, Anthony Hanley, Annette Barnie, Louisa Kakegamic, Alexander Logan, Bernard Zinman. "Developing Diabetes Interventions in an Ojibwa-Cree Community in Northern Ontario: Linking Qualitative and Quantitative Data." Chronic Diseases in Canada, 16(4) Autumn 1995: 157–164.

Gohdes, Dorothy, Stephen Kaufman, Sarah Valway, "Diabetes in American Indians: An Overview". *Diabetes Care* vol. 16, supplement 1, Jan 1993: 239–243.

Grams, Garry D., Carol Herbert, Clare Heffernan, Betty Calam, Mary Ann Wilson, Stefan Grzybowski, and Diane Brown, "Haida Perspectives on Living with Non-Insulin-Dependent Diabetes Mellitus". *Canadian Medical Association Journal*, 155(11) Dec. 1996: 1563–1568.

Hanley, Anthony G., Stewart B. Harris, Annette Barnie, Joel Gittelsohn, Thomas Wolever, Alexander Logan and Bernard Zinman, "The Sandy Lake Health and Diabetes Project: Design, Methods and Lessons Learned." Chronic Diseases in Canada, 16(4): 149–156.

Harris, Stewart B., Bruce A. Perkins, Elaine Whalen-Brough, "Non-insulin-dependent diabetes mellitus among First Nations children". Canadian Family Physician, vol 42, May 1996: 869–876.

Health Canada, Medical Services Branch. *National Database on Breastfeeding Among Indian and Inuit Women. Survey of Infant Feeding Practices from Birth to Six Months, Canada 1988*. Supply and Services Canada, 1990.

Hoy, Wendy E. "A Profile of Navajo Indians with Type II Diabetes." Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Kewayosh, Alethea. "Yesterday, Today and Tomorrow". Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Leclaire, Keith. "Community Participation in Health Research" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Litwin, Louise. "Educating the Health Professional" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Locke, Krista, Ronald Noseworthy, Arthur Davies. "Management of Diabetes Mellitus in Nova Scotia MicMac Communities". *Journal of the Canadian Dietetic Association*, 54(2) Summer 1993: 92–96.

Macaulay, Ann. "Natural History and Complications" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Macaulay, Ann and Nancy Hanusaik. "Primary Care of the Native Diabetic" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Manitoba Health, Epidemiology unit and Diabetes unit. "The Manitoba Burden of Illness Study: The Epidemiology of Diabetes and Diabetic Complications in Manitoba". Unpublished, Feb 1996.

Martin, J.D. & P. Bell, "Diabetes Mellitus in the Native Population of British Columbia, Canada". *Circumpolar Health* 90: 433–435.

Martin, J. David and Haile M. Yidegiligne, "Diabetes Mellitus in the First Nations Population of British Columbia". Unpublished, 1996.

Martinez, Charlene B, Karen Strauss. "Diabetes in St Regis Mohawk Indians". *Diabetes Care*, vol. 16 supplement 1, Jan 1993: 260–262.

Montour, Louis T., Ann C. Macaulay, Naomi Adelson, "Diabetes Mellitus in Mohawks of Kahnawake, PQ: A Clinical and Epidemiologic Description". *CMAJ* vol 141, Sept 1989, 549–552.

O'Neill, John, Joseph Kaufert, William Koolage. "The Role of Native Interpreters in Diabetes Education" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Piorro, Maggie. Medical Services Branch, Health Canada Saskatchewan Region. Unpublished material, n.d.

Robinson, Elizabeth J., Yitades Gebre, Joyce L. Pickering, Beatrice Petawabano, Beatrice Superville and Claudette Lavallée, "Effect of Bush Living on Aboriginal Canadians of the Eastern James Bay Region with Non-insulin-dependent Diabetes Mellitus." *Chronic Diseases in Canada* 16(4) Autumn 1995: 144–148.

Ross, Stuart. "Clinical and Laboratory Aspects" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Steckle, Jean. "Community-Based Resources for Nutritional Education" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Szathmary, Emoke. "Genetic and Environmental Risk Factors" in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Tuomilehto, Jaakko. "World View of Diabetes." Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Verroneau, Mavis. "Learning As We Go". Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Wasicuna, Tina. "Prevalence of Risk Factors for NIDDM". Presented at 3rd International Conference on Diabetes and Indigenous Peoples: "Theory, Reality and Hope". Winnipeg, May 26–30, 1995.

Young, T. Kue. "Diabetes in the Aboriginal Population: A Strategy Paper". Prepared for Medical Services Branch of Health Canada, draft July 1997a. Unpublished.

Young, T. Kue. *The Health of Native Americans: Towards A Biocultural Epidemiology.* Oxford University Press, 1994: pp. 145–175.

Young, T. Kue, Cameron Mustard, Jamie Blanchard, and Robert James. "The Burden and Impact of Diabetes Mellitus in the Canadian Population". Draft report, NHRDP 6607-1782-NPH, April 1997b.

Young, T. Kue and Stuart A. Ross, *Research on Diabetes in the Canadian Native Population: A Discussion Paper.* June 1991.

Young, Kue, and Chandrakant Shah. "Extent and Magnitude of the Problem", in Canadian Diabetes Association, *Diabetes in the Canadian Native Population: Biocultural Perspectives*. ed T. Kue Young. Canadian Diabetes Association, 1987.

Young, T. Kue, Emoke J. E. Szathmary, Susan Evers, Brian Wheatley, "Geographical Distribution of Diabetes Among the Native Population of Canada: A National Survey." *Soc Sci Med* vol. 31 no. 2 pp. 129–139, 1990.

Young, T. Kue & Stewart B. Harris, "Risk of Clinical Diabetes in a Northern Native Canadian Cohort". *Arct Med Res* 1994: 53; 64–70.

Young, T. Kue, L. Lynn McIntyre, Joseph Dooley, & Jude Rodriguez, "Epidemiologic Features of Diabetes Mellitus among Indians in northwestern Ontario and northeastern Manitoba". *CMAJ* vol. 132, April 1, 1985: 793–797.

WHO Expert Committee on Diabetes Mellitus. Second report. Technical Report series 646, WHO, Geneva, 1980.

Endnotes

1 See for example Dean et al (1992), cited in Young (1987a).

2 Young and Szathmary (1990). In contrast to the APS, this study used case registries, and the information refers only to people living on-reserve.

3 Daniel (1995).

4 Young and Shah (1987).

5 Brassard (1993).

6 Delisle (1993).

7 Manitoba Health (1996).

8 Mao, cited in Young and Ross (1991).

9 Szathmary (1987); Gohdes (1993).

10 Young and Szathmary.

11 For instance, studies in Manitoba (Depew and Blanchard, 1995), Nova Scotia (Locke, 1993), and Sioux Lookout zone, Ontario (Harris, 1996) all observed a younger-than-average age of onset among First Nations people. However, even on this aspect it must be remembered that there can be significant variations between different First Nations communities and groups; for instance, Montour (1989) notes that the mean age at diagnosis among Kahnawake residents was 10 years older than that reported among Oneida Iroquois.

12 Young (1997a).

13 Canadian diabetes rates as reported to Statistics Canada's *National Population Health Survey* in 1994 were 3.1% for men, and 3% for women.

14 Young et al (1990) observed that nationally, diabetes rates were higher in urban reserves than in rural ones, but this pattern did not hold true within each language family. There was a distinct north-south gradient in prevalence, but it was not clear if this was because low-prevalence groups such as Inuit and Athapascan are concentrated in northern areas, or if this reflected intensity of non-Native influence on lifestyle. North-south gradients in prevalence have also been postulated for Saskatchewan (Piorro, n.d.), James Bay (Brassard, 1993), and B.C. (Martin and Bell, n.d.).

15 Federal/Provincial/Territorial Advisory Committee on Population Health (1994).

16 A few studies have suggested that diabetes is under-diagnosed in men as compared to women. Piorro (n.d.) found that the number of First Nations men in Saskatchewan diagnosed with diabetes increased from 1980 to 1990, and attributed this to improved diagnosis and increased awareness. In a study of two First Nations communities in Quebec, three times as many men as women were unaware that they had diabetes until it was diagnosed during the course of the study (Delisle, 1993).

17 Bennet (1995); Macaulay (1987); Daniel (1995).

18 The 1994 National Population Health Survey, 1991 General Social Survey, and 1979 Canada Health Survey all found that rates of *self-reported* hypertension among women were equal to, or higher than, the male rates. The Canada Health Survey also took physical measures, and discovered that although *reported* rates were higher among women, rates as actually measured with a blood-pressure cuff were higher among men. (Canada, Statistics Canada & National Health and Welfare, 1981).

19 Montour (1989). The mortality figures are from Medical Services Branch – Health Canada statistics.

20 Recent research suggests that although people with NIDDM frequently have heart disease, it is not associated with increasing blood sugar levels; it is associated with the established risk factors of age, hypertension, and cigarette smoking. (See US Department of Health and Human Services, Agency for Health Care Policy and Research, *Research Activities* vol 205, June 1997, p 8).

21 "Overweight" was defined using Body Mass Index. This is based on height and weight as self- reported by the respondent. Body Mass Index (BMI) is defined as weight in kilograms divided by squared height in metres. The cut-off points were the same as those employed for the 1994–95 National Population Health Survey, that is: underweight = BMI <20; acceptable = BMI between 20 and <25; some excess weight = BMI between 25 and <28; overweight = BMI of 28 or more.

22 Young and Harris (1994); Hoy (1995).

23 World Health Organization, 1980.

24 Macaulay (1989).

25 For example, Tuomilehto (1995) describes the impact of the traditional Hawaian diet on glycemic control. There is also O'Dea's study among Australian Aborigines (see Robinson, 1995).

26 Federal/Provincial/Territorial Advisory Committee on Population Health (1994).