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Manitoba Metis Federation

Metis Health Knowledge Authority
In Manitoba

Diabetes and Related Health Care Utilization in the Metis Population in Manitoba

Winnipeg, Manitoba, Canada 2010

Manitoba Metis Federation –
Health & Wellness Department

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The results and conclusions in this report are those of the authors and no official endorsement by the Manitoba Centre for Health Policy, Manitoba Health, or other parties is intended or should be inferred. The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada.

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Executive Summary

This report resulted from the need to further understand findings in the Metis Health Status & Health Services Utilization Study (also known as the Metis Atlas) (Martens, Bartlett, et al., 2010). In that study higher rates of diabetes were found in Metis[1] compared to All Other Manitobans. The purpose of this report is to build on baseline information from the Metis Atlas to support the need of Region Knowledge Networks for more detailed information to guide assessment of Manitoba Health programs and services. In Section 1 information on the introduction of the project and methods of the research are presented. Section 2 offers insight into the Metis, the Manitoba Metis Federation, and the Health & Wellness Department. The Manitoba Metis Federation-Health & Wellness Department (MMF-HWD) conceptual model and approach to ways of knowing are described. In Section 3 age and sex characteristics of the population are presented. Section 4 captures morbidity related to diabetes. Section 5 discusses the use of health services. In Section 6 health information on quality of care and prevention is given. A Glossary is provided to further clarify terms.

The Research Team

The principal investigator (PI) on this study was **Dr. Judith G. Bartlett**, an Associate Professor in the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba, and an Adjunct Scientist with the Manitoba Centre for Health Policy (MCHP). Dr. Bartlett holds MD, CCFP, and an MSc in Community Health Sciences. D**r. Julianne Sanguins** is an Assistant Professor in the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba, working on-site at the MMF-HWD. She is also Research Program Manager of the MMF-HWD. **Sheila Carter** is Assistant Director of the MMF-HWD. **Nathan Hoeppner** is a Research Associate with the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba, working on-site at the MMF-HWD. **Punam Mehta** is the Chronic Disease Surveillance Program Coordinator in the MMF-HWD. Through a contractual arrangement, the MCHP generated the aggregate data and provided mentorship for the MMF-HWD research team in our effort to successfully complete our first independent research study report: **Dr. Patricia Martens** provided mentorship to the MMF-HWD Director, **Charles Burchill** provided database support, **Hui Chen** provided aggregated data as a statistical programmer, and **Elaine Burland** provided instruction and guidance on graph development.

The Manitoba Metis Federation

The Manitoba Metis Federation (MMF), founded in 1967, is the "democratic and self-governing body of the Manitoba Metis community" (www.mmf.mb.ca). The MMF strives to develop and maintain its capacity to 'act collectively' to successfully promote, protect, and advance the political, social, and economic interests of Metis in Manitoba. The MMF negotiates with provincial and federal governments to access funding to provide a wide range of programs and services. Within the MMF, the MMF-HWD was established in 2005.

[1] The Manitoba Metis Federation does not use the term 'Metis' with the accent ('Métis') as is done in some parts of Canada. In this report 'Métis' is used only when referring to sources that use the accented form.

By using a Metis culture-based holistic health framework the MMF-HWD builds Metis health planning capacity, develops and implements a Metis health research agenda, and acts as a Metis health 'expert authority' to advise the health system.

Overview of Sections

Section 1 provides an introduction to the report and briefly reviews methods used for data generation in this study.

In Section 2 the reader is provided with an overview of the Manitoba Metis Federation, the MMF-HWD, and its holistic approach to knowledge development.

In Section 3 age and sex characteristics of the population are identified. Metis 19 years of age and older have a greater proportion of young people and lower proportions of mid-aged (40-49), and older adults (70+) compared to All Other Manitobans. For those with diabetes both Metis males and All Other Manitoban males have a similar age profile until age 49, where Metis begin to have a slightly higher percentage of males than All Other Manitobans, peaking at age 60-64. Over the age of 70 there were fewer Metis males. Females follow a similar distribution but Metis females peak at 55-59. There were fewer Metis females over the age of 75. Finally, premature mortality rate (PMR) - those dying before the age of 75- was calculated for each of the groups. Unlike the Metis Atlas, which found a higher PMR in the Metis population compared to All Other Manitobans, in this study of individuals with diabetes there is no difference in PMR between the two groups.

In Section 4 the prevalence and probability of developing diabetes and other associated comorbidities are examined. In this study both diabetes prevalence and probability of developing diabetes are higher for Metis than for All Other Manitobans. Rates of ischemic heart disease (IHD), lower limb amputation, depression, anxiety disorders, and substance abuse are all higher in Metis compared to All Other Manitobans. Prevalence of hypertension is lower for Metis compared to All Other Manitobans. In an analysis of comorbidities for those with diabetes it was found that Metis tended to have more comorbid conditions and thus a heavier burden of disease: more Metis with diabetes than All Other Manitobans with diabetes had two, three, four, or five of the following comorbidities: IHD, hypertension, depression, anxiety disorders, and substance abuse.

Section 5 describes the health services use of Metis with diabetes and All Other Manitobans with diabetes in Manitoba. Rates of ambulatory visits, total hospital separations, short stay hospital days, and number of different drug types dispensed are higher in Metis compared to All Other Manitobans. Long stay hospital days are similar for both Metis and All Other Manitobans.

In Section 6 rates of annual eye examinations for those with diabetes are reported. Consistent with the findings in the Metis Atlas this report found that rates of annual eye examination, an important preventative health care for those with diabetes, were lower than in All Other Manitobans.

A Summary of the Key Findings from Regression Modeling

There are two logistic regressions in this study. The first logistic regression examines the risk of developing diabetes. After controlling for other factors, Metis are at a greater risk of developing diabetes compared to All Other Manitobans. For Manitobans overall males are at greater risk of developing diabetes compared to females after controlling for other factors. Manitobans with a mental illness or major physical illness have a higher risk of developing diabetes after controlling for other factors.

The other logistic regression in this study examines the risk of having a lower limb amputation in those with diabetes. After controlling for other factors, Metis are at a similar risk for lower limb amputation compared to All Other Manitobans. Manitobans overall with diabetes are at increased risk of lower limb amputation in Mid and North aggregate areas and lower risk of lower limb amputation in Rural South aggregate area after controlling for other factors. Males are at more risk of lower limb amputation compared to females after controlling for other factors. Those with lower household income and lower rates of continuity of care are at higher rates of lower limb amputation after controlling for the other factors.

Conclusion

Diabetes and its associated complications are health issues of concern for the Metis in Manitoba. Higher rates of diabetes, as well as heart disease and selected mental disorders (depression, anxiety disorders and substance abuse) are seen in this report. Given the young Metis population shown in Section 3 it can be anticipated that absolute numbers of Metis with diabetes and associated comorbidities may increase in the future. By working with our Metis Regions and Regional Health Authorities in a holistic manner we can promote healthy living, help prevent the development of disease, and assure that services and programs are delivered to ensure a healthy Metis population.

Report available online at:

http://health.mmf.mb.ca

Section 1: Introduction & Methods

1.1 Background of this Report

Within Metis[1] in Manitoba there has been long-standing concern about diabetes expressed by community members and leaders. However, to support program and policy responses the stories and experiences shared by Metis living with diabetes or knowing someone with diabetes require essential complementary health and social services information and statistical data.

The ability to produce Metis-specific aggregate data resulted from the building of an anonymized 'Metis population cohort' during the previous Manitoba Metis Federation (MMF) research collaboration with the Manitoba Centre for Health Policy (MCHP) at the University of Manitoba. The MMF-MCHP research team produced the 'Profile of Metis Health Status and Healthcare Utilization in Manitoba: A Population-Based Study' (Martens, Bartlett, et al., 2010) - hereafter referred to as the 'Metis Atlas'. The Metis Atlas was the first comprehensive mapping out of Metis health status in Manitoba. It is an up-to-date report of administrative data for Metis living in the province in 2006.

In the Metis Atlas age- and sex-adjusted Metis rates for a number of chronic diseases, including diabetes, were measured and compared to rates for All Other Manitobans[2] by various geographical areas – by province, by the eleven Regional Health Authorities, by the seven Manitoba Metis Federation Regions, and by 12 Winnipeg CAs. For some data, small numbers required reporting by larger geographical areas. The Metis Atlas was a benchmark document for Metis both nationally and in Manitoba - historically there has been no other 'whole population' study available on the health of Metis, and very limited Metis-specific research has been conducted in Manitoba.

As early as 1991, Statistics Canada's General Social Survey demonstrated that the prevalence of diabetes in Metis in western Canada (6.1%) was more than twice that for the general population in that region (3%) (as cited in Bruce, 2000). The 2006 Aboriginal Peoples Survey reported that 7% of Metis in Canada aged 15 and over reported being diagnosed with the illness – almost twice the rate of 4% for the general population (Janz, Seto, & Turner, 2006). Most recently, the Metis Atlas (Martens, Bartlett, et al., 2010) reported a prevalence of 11.8% in Manitoba Metis aged 19+ years, which was statistically higher than the prevalence of 8.8% for All Other Manitobans and was almost double the 1991 self-reported prevalence of diabetes in the western Canadian Metis population (6.1%) noted by the General Social Survey (Bruce, 2000). The Metis Atlas reported extensive regional variation in the prevalence of diabetes in the Metis population, with higher rates in the north and lower rates in the south. It also pointed to a pattern of increased burden of disease,

[1] The Manitoba Metis Federation does not use the term 'Metis' with the accent ('Métis') as is done in some parts of Canada. In this report 'Métis' is used only when referring to sources that use the accented form.

[2] As noted in the Metis Atlas (Martens, Bartlett, et al., 2010): "The reader should be aware that for northern regions in particular, 'All Other Manitobans' as a comparative group would be comprised of a large portion of First Nations, which is in contrast to the southern regions where First Nations would only comprise a small portion of the population. Therefore, the composition of the comparative group may differ substantially from north to south. Given that the overall health status of First Nations is worse than the Manitoba average, the health status of the comparative group of All Other Manitobans in the north is poor, so the Metis group may show similar or better health status regionally. In contrast, the overall health status of all other Manitobans in the south is generally good, so the Metis group may show poorer health status regionally" (p. XXXII).

disability, and comorbidity in Manitoba Metis (Martens, Bartlett, et al., 2010) that required more focused investigation: specifically on the impact of diabetes in this population.

Diabetes is associated with a wide range of health-related complications such as ischemic heart disease (IHD), acute myocardial infarction (AMI or heart attack), hypertension, stroke, kidney failure leading to dialysis treatments, lower-limb amputations, depression, anxiety disorders, and substance abuse – all of which are explored in this study. Generally, the longer a person has the disease, the more likely they are to develop one or more of these complications (or 'comorbidities'). Comorbidities are often associated with poorer health status and health-related complications.

The existence of the anonymized Metis population cohort (housed in the MCHP under the authority of the MMF) allows for the production of more focused studies. In this study we examine age- and sex-specific rates of diabetes, and diabetes in relation to other health and social conditions in Metis compared to All Other Manitobans. The outcomes of this report will inform decision-making regarding health service delivery in our province. 'Diabetes in Metis in Manitoba' emerged as a direct result of the need to provide a more comprehensive measure and understanding of diabetes for Metis in Manitoba.

1.1.1 Diabetes Definition

In our study, the definition for diabetes includes both type 1 and type 2 diabetes. As secondary data was used, it was not possible to separate cases of type 1 and type 2 diabetes. It is generally estimated that 5% - 10% of people with diabetes have type 1 diabetes and the remainder of people have type 2 diabetes (Public Health Agency of Canada, 2009). A complete discussion of how diabetes was measured in this study is included in Section 4: Morbidity Profile.

1.1.2 Acronyms

In this report several acronyms are used. In an attempt to minimize confusion the most commonly used are outlined below.

AMI – Acute Myocardial Infarction (heart attack)
CA – Community Area
CCHS – Canadian Community Health Survey
IHD – Ischemic Heart Disease
MCHP – Manitoba Centre for Health Policy
MMF – Manitoba Metis Federation
MMF-HWD – Manitoba Metis Federation Health & Wellness Department
NPHS – National Population Health Survey
PMR – Premature Mortality Rate
RHA – Regional Health Authority

1.2 Background of the Research Team

The MMF-HWD research team was responsible for all aspects of this study with the exception of producing aggregate data. Specifically the MMF-HWD selected each of the indicators examined in this study, prepared and analyzed the graphs, and wrote the text of the report.

The principal investigator (PI) on this study was **Dr. Judith G. Bartlett**, an Associate Professor in the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba, and an Adjunct Scientist with the MCHP. Dr. Bartlett holds an MD, CCFP, and an MSc in Community Health Sciences. She is also Director of the MMF-HWD and provides direction and oversight for all research. Dr. Bartlett was Co-Principal Investigator on the Metis Atlas as well as PI on several projects funded by the Canadian Institutes of Health Research (CIHR). She is a part time clinician and an academic physician and scientific director with a strong understanding of and experience in public health administration.

Dr. Julianne Sanguins is an Assistant Professor in the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba. Dr. Sanguins is an RN and holds a PhD in Nursing. Dr. Sanguins is also Research Program Manager in the MMF-HWD and was a member of the Metis Atlas research team. Dr. Sanguins manages all aspects of the academic needs of the study, including directly supervising research staff.

Sheila Carter is Assistant Director of the MMF-HWD. Ms. Carter was a member of the Metis Atlas research team, providing expertise regarding health program and policy development. In this project, Ms. Carter was co-author of Section 2 and participated in the data interpretation, review and editing of this report.

Nathan Hoeppner is a Research Associate with the Department of Community Health Sciences in the Faculty of Medicine at the University of Manitoba, working on-site at the MMF-HWD. Mr. Hoeppner holds an MA in Canadian History.

Punam Mehta is the Chronic Disease Surveillance Coordinator in the MMF-HWD. Ms. Mehta holds an MSc in Community Health Sciences from the University of Manitoba and brings a background in epidemiology to the team.

We continue to respect and appreciate the role of the MCHP in our research projects. For consistency in working with the health sector, our report is structured similar to the Metis Atlas. The MCHP generated the aggregate data and provided mentorship for the MMF-HWD research team in our effort to successfully complete our first independent research study report. **Dr. Patricia Martens** provided mentorship to the MMF Director, **Charles Burchill** provided database support, **Hui Chen** provided aggregated data as a statistical programmer, and **Elaine Burland** provided instruction and guidance on graph development.

1.3 Purpose of this Report and Outline of the Sections

The overall purpose of this report is to examine population-based indicators of health status and health care utilization of Metis with diabetes in Manitoba, and to answer the following questions about the burden of diabetes, associated comorbidities, and related health services utilization. For each indicator is there a difference between *Metis with diabetes* and *All Other Manitobans with diabetes*:

- At the provincial level?
- Within each of the 11 Regional Health Authorities (RHAs) of Manitoba?
- Within each of the three 'aggregated' non-urban areas of Rural South, Mid and North?

A list of the sections included in this report is as follows:

Section 1: Introduction and Methods
Section 2: Overview of the MMF-Health & Wellness Department
Section 3: Age and Sex Characteristics of the Population
Section 4: Morbidity Profile
Section 5: Health Services Use
Section 6: Quality of Care and Prevention
Glossary

1.4 What's in the Report: The Types of Graphs, Tables, and Analyses

Section 1 provides an introduction to the report. Section 2 offers an overview of the Manitoba Metis Federation-Health & Wellness Department (MMF-HWD). Sections 3 through 6 have consistent formatting of information and contain one or more tables, population pyramids, line graphs, and/or bar graphs. There are two types of bar graphs used in this report:

- A comparison of Metis with diabetes and All Other Manitobans with diabetes living in the same geographical region
- A comparison of Metis with diabetes and All Other Manitobans with diabetes living in the same Community Area (CA) within Winnipeg RHA

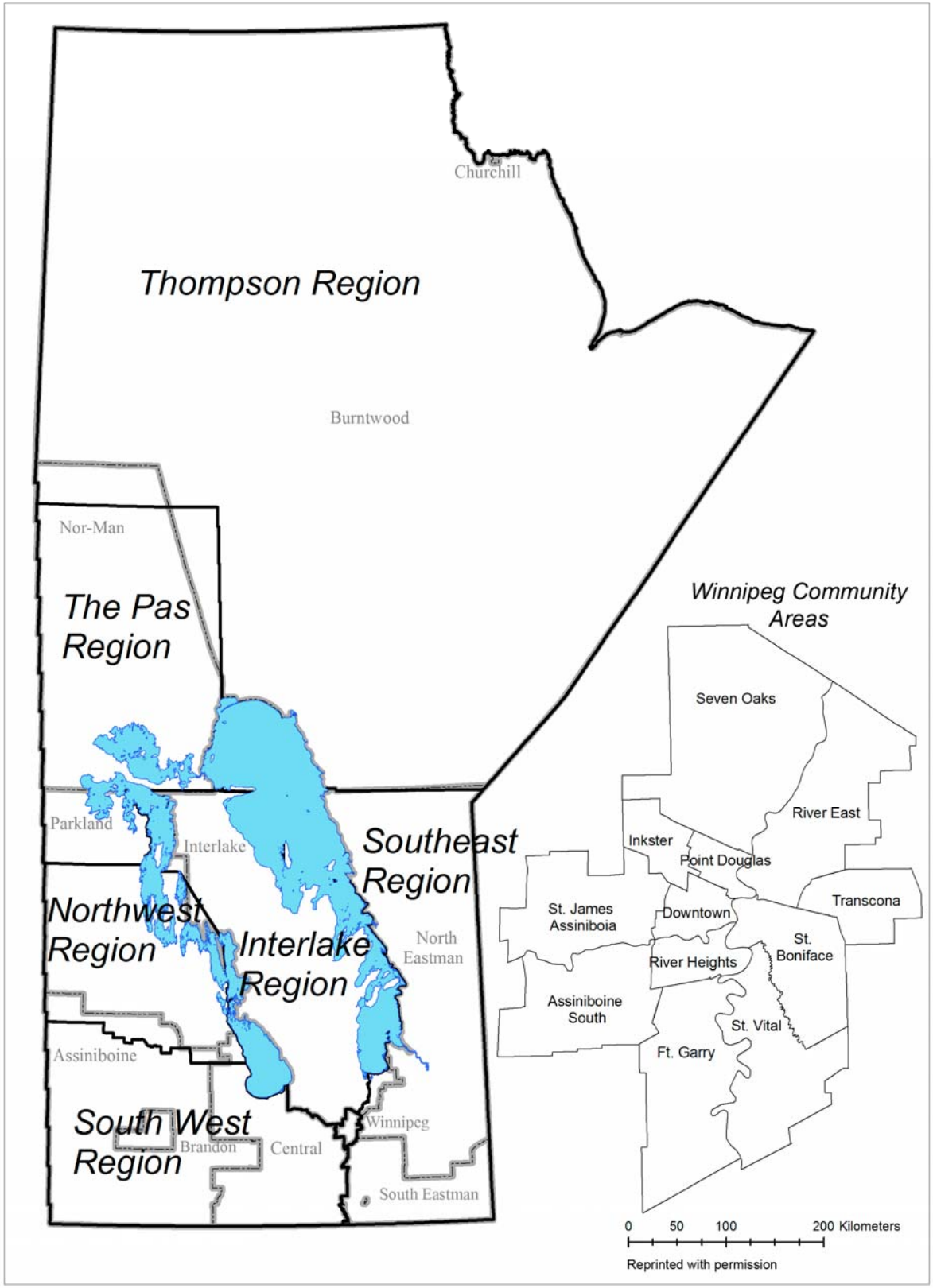
At the beginning of each section there is an Overall Key Findings sub-section which summarizes the findings for Metis with diabetes in table format. This is followed by more detailed description of the section graphs. At the end of each indicator there are findings from the literature review that compare findings from our study with published data related to Metis health, with the results of this study in *italics*. However, you will note that for many of the indicators in our study there is little or no comparable research on the health status of Metis people in Manitoba. This report will add to the growing body of Metis-specific health information.

1.5 How to Read this Report

1.5.1 Geographical Boundaries

In this report health information for Metis with diabetes and All Other Manitobans with diabetes is compared within the context of different geographical areas. These include Manitoba's Regional Health Authorities (RHAs) and sub-regions within the Winnipeg Regional Health Authority (WRHA) called Winnipeg CAs (Winnipeg CAs). Figure 1.5.1 shows the geographical distribution of the MMF Regions, RHAs, and Winnipeg CAs.

Figure 1.5.1: Geographical distribution of the MMF Regions, RHAs, and Winnipeg CAs



Source: Martens, Bartlett, et al., 2010

Regional Health Authorities and Winnipeg CAs:

In Manitoba there are 11 RHAs: Churchill, Burntwood, Nor-Man,[1] Parkland, Interlake, North Eastman, Assiniboine, Brandon, Central, South Eastman, and Winnipeg.

Winnipeg Regional Health Authority (WRHA) encompasses the provincial capital city of Winnipeg and has a population of close to 700,000 people, or approximately 60% of Manitoba's population. (The other ten RHAs have much smaller populations, ranging from under 1,000 in Churchill RHA to over 100,000 in Central RHA). The large population in Winnipeg RHA has been divided into 12 Winnipeg CAs: Assiniboine South, Fort Garry, St. Vital, St. Boniface, River Heights, St. James – Assiniboia, Inkster, Downtown, Point Douglas, Transcona, River East, and Seven Oaks.

Aggregate Areas in the RHA graphs:

The non-urban RHAs have been grouped into three aggregate areas: 'North', 'Mid', and 'Rural South.' North aggregate area is made up of Burntwood, Churchill, and Nor-Man RHAs; Mid aggregate area includes Interlake, North Eastman, and Parkland RHAs; and Rural South aggregate area is made up of Assiniboine, Central, and South Eastman RHAs. Grouping information in this manner provides health planners with an opportunity to compare rural and remote areas.

At times sample sizes are too small for all 12 Winnipeg CAs. In these instances the Winnipeg CAs are grouped into three Winnipeg sub-regions: 'Winnipeg Most Healthy', 'Winnipeg Average Health', and 'Winnipeg Least Healthy.' *Winnipeg Most Healthy* consists of grouped 'neighbourhood clusters' with a PMR lower than the Winnipeg average PMR: Assiniboine South, Fort Garry North, Fort Garry South, Inkster West, River East North, River East East, River East West, River Heights West, St. Boniface East, St. James – Assiniboia West, and St.Vital South. *Winnipeg Average Health* is comprised of grouped 'neighbourhood clusters' with a PMR similar to the average PMR in Winnipeg: River Heights East, Seven Oaks North, Seven Oaks East, Seven Oaks West, St. Vital North, and Transcona. *Winnipeg Least Healthy* is a group of ' neighbourhood clusters' with a PMR higher than the average PMR in Winnipeg: Downtown East, Downtown West, Inkster East, Point Douglas North, Point Douglas South, River East South, St. Boniface West, and St. James – Assiniboia East.

Throughout this report, the RHAs and Winnipeg CAs in the graphs are ordered by ten-year premature mortality rate (PMR), with PMR increasing from the most healthy areas at the top of the graph to the least healthy areas at the bottom of the graph. This format reflects the order used in the Metis Atlas and many MCHP publications. It has been demonstrated that PMR is highly correlated with self-rated health and underlying disease burden; it is used as a general indicator of the health status of a group of people and their need for health care (Martens, Bartlett, et al., 2010). By ordering the graphs by PMR the relationship between poorer health outcomes (which increase from top to bottom of the graph) and increased usage of health services within specific populations in a specific geographical location can be seen more clearly. See Section 3 for a more thorough explanation of PMR and relevant data for Metis with diabetes and All Other Manitobans with diabetes. The Glossary provides a more detailed definition of the PMR gradient (or slope) from the most healthy to least healthy areas.

[1] The correct written form of NOR-MAN RHA has capital letters throughout. However, as in the Metis Atlas, for purposes of this report NOR-MAN is indicated by Nor-Man in order to standardize naming of RHAs.

1.5.2 Making Sense of the Graphs

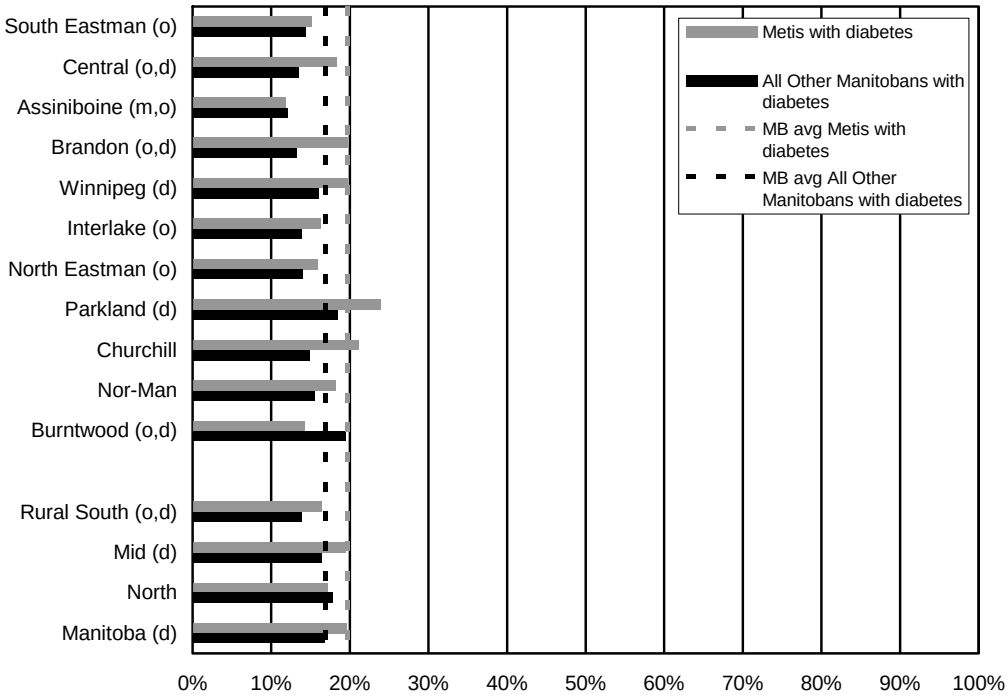
In this report each indicator includes a definition based upon MCHP standard definitions and a description of the population included in the analysis. An abbreviated description of the population measured is also included in the subtitle for each graph.

Below the indicator definition is a description of findings related to each of the geographical boundaries in the following order:

1) Differences between the two groups: Metis with diabetes and All Other Manitobans with diabetes
2) Differences between the first group and the first group's provincial average: Metis with diabetes and the provincial average for Metis with diabetes
3) Differences between the second group and the second group's provincial average: All Other Manitobans with diabetes and the provincial average for All Other Manitobans with diabetes

Figure 4.5.1: Ischemic Heart Disease Prevalence by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

In this report the graphs immediately follow the description of findings. Above is a sample graph from the report (Figure 4.5.1). The title shows the indicator measured (IHD prevalence), the geographical areas shown (RHAs), the population measured (Metis with

diabetes and All Other Manitobans with diabetes), and the time period of measurement (fiscal year 2002/03-2006/07). The subtitle (in smaller font) describes the population measured (residents aged 19+) and indicates if the data is age- and sex-adjusted or based on crude numbers. The inset box in the top-right corner of the graph is the legend, which provides a breakdown of what the bar and dotted lines on the graph represent. The light grey horizontal bar represents the indicator rate for Metis with diabetes whereas the dark grey bar represents the indicator rate for All Other Manitobans with diabetes. The light grey vertical dotted line represents the Manitoba provincial average for Metis with diabetes whereas the black vertical dotted line represents the provincial average for All Other Manitobans with diabetes.

The letters 'm', 'o', d', and 's', represent a classification developed by the MCHP and used extensively in other Atlases. The use of these letters eases interpretation of data for each graph. As the key at the bottom of each chart notes:

- 'm' indicates the area's rate for Metis with diabetes was statistically different from the provincial average for Metis with diabetes
- 'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the provincial average for All Other Manitobans with diabetes
- 'd' indicates the area's rate for Metis with diabetes was statistically different from the area's rate for All Other Manitobans with diabetes
- 's' indicates the data was suppressed due to small numbers

For example, in the chart above you can see that Assiniboine RHA has the notation (m, o) beside it on the y-axis (left side) of the graph. According to the classification system the 'm' means that Metis with diabetes in Assiniboine RHA are statistically different compared to the Metis average for diabetes. As the line for Metis with diabetes in Assiniboine is shorter than the provincial average line for Metis with diabetes, we can conclude that Metis with diabetes have a lower prevalence of IHD compared to the provincial average for Metis with diabetes. The 'o' refers to the fact that All Other Manitobans with diabetes in this geographical area are statistically different from the Manitoba average for All Other Manitobans with diabetes. As the line for All Other Manitobans is shorter than the provincial average line we can conclude that All Other Manitobans with diabetes in Assiniboine RHA have a lower prevalence compared to the provincial average for All Other Manitobans. There is no 'd', so we can conclude that there is no statistical difference between prevalence of IHD in Metis with diabetes in Assiniboine RHA compared to the prevalence in All Other Manitobans with diabetes in that area.

Unless otherwise indicated any mention of 'lower' or 'higher' in this report refers to results that are statistically significant. Statistical significance is a term commonly used throughout this report. It means that we can be 95% certain that the difference between the two comparison groups is due to a real difference and not due to random variation in the populations (Wassertheil-Smoller, 1995).

In this report, except for the prevalence of diabetes indicator, all comparisons are between *Metis with diabetes* and *All Other Manitobans with diabetes*.

1.6 Methods Used in This Report

Population-based health research is the cornerstone of public health research. It provides information related to patterns of health and illness in a population, and is used to inform evidence-based decision making around disease treatment and service delivery (Gordis, 1996).

Our report is a population-based research study. As Martens, Bartlett, et al. (2010) note, this means several things:

1) Data is based on every person living in Manitoba who had a provincial health card during the time period measured, and includes all people living in Manitoba's First Nations communities.
2) Information is based on where you live and not where you go for treatment. This provides greater accuracy when comparing the health issues and health care utilization of people living in particular geographic regions.
3) Rates are not based upon smaller "samples," but rather the entire population fitting these criteria – hence "population-based."

It is important to note that for some indicators the data is based on a small number of individuals. For indicators where numbers resulted in suppression (five individuals or less), the aggregate data was produced by aggregate areas (e.g., Winnipeg, Brandon, Rural South, Mid, and North), or was measured over longer periods of time in order to acquire a greater number of individuals. In some cases, suppression could not be avoided due to the relative rareness of the condition or event.

In our study, data was coded to protect the identification of study participants. All data used in this study comes from an administrative database with identifying information of both patients and health care providers removed. In addition, there was no contact with patients or providers during any part of this study. The intent of these analyses was to examine patterns amongst groups based on Metis ethnicity and on different geographical divisions. No individual-level data is presented as part of this study (Martens, Bartlett, et al., 2010).

For the purposes of this particular study we obtained approvals from the Manitoba Metis Federation to access the Metis Population Database, the Faculty of Medicine's Research Ethics Board at the University of Manitoba for approval of our research design and activities, and the Manitoba Government's Health Information Privacy Committee to access the Population Health Research Data Repository.

1.7 Data Sets used in this Research

The data sources used in diabetes surveillance and research are often limited to existing secondary data sources such as administrative data – that is, data that is collected for a purpose other than research (e.g., physician billing records). The Manitoba Centre for Health Policy (MCHP) stores sets of data collectively referred to as the Population Health Research Data Repository (the Repository). The data stored in the Repository is used for research related health and social services within Manitoba. It houses a wealth of information useful to community organizations, community planners, governments, and researchers (Martens, Bartlett, et al., 2010). However, it is important to understand that each data set has an 'owner', and approvals must be sought from each dataset owner in order to link one dataset with another.

To protect the confidentiality of citizens all names, street addresses, and Personal Health Information Numbers (PHINs) are removed, and new encrypted identification numbers assigned to each individual (Martens, Bartlett, et al., 2010). This anonymized data was retrieved from the following files in the Repository located at the MCHP:

- Hospital claims (records of hospital admissions)
- Medical claims (records of visits to physicians outside of those occurring to a hospital in-patient)
- Physician files to identify the type of service provided - a family physician/general practitioner or a specialist (such as a psychiatrist)
- Personal care homes (records of the use of nursing homes)
- The registry files (records of the time a person is registered as a resident of Manitoba, as well as their age, sex, and area of residence)
- Vital statistics (records of births, deaths, and causes of death)
- Pharmaceutical claims (pharmaceutical use from the Drug Program Information Network)
- The 1990, 1996, 2001, and 2006 census files (for socioeconomic information at the neighbourhood level) – used in logistic regression

Depending on the data source, prevalence and incidence rates were generated for particular fiscal years or calendar years (Martens, Bartlett, et al, 2010). Many of the variables used in this study are based on fiscal year (e.g., eye exams were measured for 2006/07, which represents the fiscal year from April 1, 2006 to March 31, 2007) because most health care utilization information is reported by fiscal year; other variables such as PMR are based on calendar years (e.g., 2006) (Martens, Bartlett, et al., 2010). Specific periods of measurement for each indicator (e.g., five-year time period for PMR) were chosen by the MCHP to ensure adequate sample sizes, which ensure proper modelling of statistical data. For indicators in this report that were measured using more than one year of data, the graphs are generally presented using an average value for a single year – that is, an annualized rate. Exceptions are indicated in the graph subtitle when they do occur.

1.8 How the Cohort was Created

The Metis Population Database (MPDB) was used to develop the cohort both for the Metis Atlas and for this study. The MPDB is an anonymized dataset including health information for a total of more than 73,000 Metis of all ages in Manitoba (Martens, Bartlett, et al., 2010). The MPDB includes Manitoba Metis identified from three sources – the MMF membership list, the Canadian Community Health Survey (CCHS), and the National Population Health Survey (NPHS) – in addition to the children and both parents of these individuals (Martens, Bartlett, et al., 2010). When developing the cohort for this study, however, the segment of the population identified through the CCHS and NPHS (including children and parents matched to these individuals) were not included. This segment added only about 2% to the population, half of whom would be under the age of twenty. Thus, it was determined that not including this relatively small group in the Metis cohort for our study would have no significant effect on our analysis; they were included instead in the All Other Manitobans cohort.

1.9 Data Production and Analysis

In the following subsection rate generation, adjustment and statistical testing of rates, differences between prevalence and rate, as well as logistic regression modelling will be addressed. Statistical modelling and aggregate data production were performed by staff at the Manitoba Centre for Health Policy. A more detailed explanation of data production and analysis can be found in the Metis Atlas (Martens, Bartlett, et al., 2010).

1.9.1 Generation of Rates

Rates were generated through a statistical technique called a generalized linear model (GLM). GLM emerged as a way of unifying various statistical tests. In our study the MCHP used Poisson and negative binominal distribution models for count data and logistic regression to predict the influence of one variable (the dependent or explanatory variable) on a condition or event while controlling for other variables (the independent variables). MCHP determined what model to use based upon the statistical model which best fit the data.

For age- and sex-adjusted rates, both age and sex were included in a model to 'adjust' for differences in underlying regional age and sex distributions (Martens, Bartlett, et al., 2010). Adjusted rates were based on relative risks of rates rather than events for each region for both Metis and All Other Manitobans (Martens, Bartlett, et al., 2010).

To determine differences by region and by Metis and All Other Manitobans, covariates described geography (using Manitoba as the reference population) and ethnicity, as well as geography by ethnicity interactions (Martens, Bartlett, et al., 2010). A list of all covariates can be obtained from the MCHP website at:
http://umanitoba.ca/faculties/medicine/units/mchp/projects/project-metis_health_status.html

1.9.2 Crude and Adjusted Rates

In this study, each indicator is presented as either a crude or adjusted rate. Age- and sex-adjusted rates have been statistically adjusted in order to compare different populations. The adjusted rates for different populations represent what the populations' rates would be if the populations all had the same age and sex distribution (Gordis, 1996). This is particularly important when comparing Metis with diabetes to All Other Manitobans with diabetes, as we know from Section 3 that Metis with diabetes have a higher proportion of young people and a lower proportion of older people compared to All Other Manitobans with diabetes (see Figure 3.2.1 and Figure 3.2.2). Adjusting the data for age and sex accounts for this difference, allowing for true comparability between Metis with diabetes and All Other Manitobans with diabetes.

While most indicators in this study are age- and sex-adjusted, a few are represented using crude data. Crude (i.e., not adjusted) rates are determined by simply dividing the total count of a condition or event by the total population. They are helpful in figuring out how many people are 'walking through the door' for treatment and for determining trends in disease distribution between different populations. In this report comorbidities among specified illnesses, causes of hospital separations and annual eye exams are represented by crude rates, as the actual percentage of individuals is most important for these indicators. For example, according to the Canadian Clinical Practice Guidelines, every person with diabetes – regardless of age and sex – should receive a regular eye exam (Boyd & Altomare, 2008).

Age- and sex-specific rates are also crude percentages. However, this data is further broken down into males and females, then into specific age groups, in order to see exactly which sub-groups in the population have the greatest burden of disease (Gordis, 1996). In this study age- and sex-specific rates are used for the prevalence of diabetes, ischemic heart disease, and hypertension in order to provide information on how these conditions are affecting men and women of different ages in the Manitoba Metis population.

1.9.3 Prevalence and Rate

In this report the terms 'prevalence' and 'rate' are both used. Prevalence refers the total number of cases in a population. For example, if the prevalence of diabetes is 10.0% this tells us that one in ten people have been diagnosed with diabetes over the period of measurement. Prevalence is an important indicator because it measures the burden of disease in a community. This can be helpful for health planning.

In this report, rate indicates incidence which refers to the number of new cases or incidents in a population over a specific time period. For some indicators an individual can contribute more than once to the rate. For example, one person could have more than one hospitalization contributing to the overall rate of hospitalizations in a given period of time.

1.9.4 Logistic Regression Modeling

Logistic regression is a statistical tool that allows us to understand the many factors which contribute to a condition, including age, sex, geography, annual income, or comorbidities. For specific indicators (selected based on their previous use in the Metis Atlas), the use of logistic regression enables us to determine the unique contribution of a single factor while controlling for factors in addition to age and sex differences in the population. However, it is important to remember that logistic regression does not indicate causation – only factors associated with a specific outcome (Martens, Bartlett, et al., 2010). In this report diabetes and lower-limb amputations were explored using logistic regression. Selected covariates such as average household income and mental/physical comorbidity were included in the model (Martens, Bartlett, et al., 2010).

The 'adjusted Odds Ratio' (aOR) indicates a higher or lower likelihood of a specific outcome after taking into account the other factors (Martens, Bartlett, et al., 2010). If this number is bolded in our logistic regression tables, that increased or decreased likelihood is statistically significant. (Statistical significance is also indicated by a 'p-value' less than 0.05 and a '95% Confidence Interval' that does not include 1). An aOR of greater than 1 together with a p-value less than 0.05 and 95% Confidence Limits both above 1 indicate a significantly higher likelihood; an aOR of less than 1 together with a p-value of less than 0.05 and 95% Confidence Limits both below 1 indicate a significantly lower likelihood (Martens, Bartlett, et al., 2010).

In the logistic regression table (Table 4.13.1) you can see that for the 'Metis' factor the aOR is 1.135. The p-value for this factor is not less than 0.05 and the 95% Confidence Interval includes 1, which means that the aOR is not statistically significant. Therefore we can say that, in this study, Metis are not likely to be more at risk for a lower limb amputation compared to All Other Manitobans after adjusting for the other factors in the table.

It is important to emphasize that in the logistic regression tables, only the first factor – Metis (vs. All Other Manitobans) – compares Metis and All Other Manitobans. Each of the other factors applies to *all* Manitobans, Metis and All Other Manitobans combined.

Table 4.13.1: Logistic Regression Modeling of the Risk of Lower Limb Amputation

Probability of Lower Limb Amputation by Aggregate Region 2002/03-2006/07, all Manitoba residents with diabetes, aged 19+		
Variable	**Adjusted Odds Ratio (95% Confidence Interval)**	**p-value**
Metis (vs. All Other Manitobans)	1.135 (0.911 - 1.413)	0.2594
Aggregate Regions (ref=Manitoba)		
South	**0.851 (0.734 - 0.986)**	**0.0322**
Mid	**1.219 (1.063 - 1.398)**	**0.0046**
North	**1.805 (1.529 - 2.131)**	**<0.001**
Brandon	**0.585 (0.429 - 0.797)**	**0.0007**
Winnipeg	0.913 (0.812 - 1.026)	0.1264
Age, linear	**1.145 (1.106 - 1.184)**	**<0.001**
Age, quadratic	**0.999 (0.9988 - 0.9993)**	**<0.001**
Sex (Male vs. Female)	**1.944 (1.711 - 2.209)**	**<0.001**
Average Household income of Neighborhood (per $10,000)	**0.790 (0.757 - 0.823)**	**<0.001**
Continuity of Care	**0.709 (0.624 - 0.806)**	**<0.001**
Mental Illness ADGs	0.945 (0.808 - 1.107)	0.4849
Major Physical Illness ADGs	**3.253 (2.825 - 3.745)**	**<0.001**

Bold = statistically significant results

Note: Please see Glossary for definition of all variables. Source: MMF, 2010

Information in the logistic regression models in this report may provide valuable insights into factors at both the individual and regional level that may influence the likelihood of a good outcome (in some indicators, this may mean decreasing the likelihood and in some cases increasing the likelihood). After controlling for variations in individual characteristics, those regions of the province that still have a greater likelihood of a good outcome could be examined for particularly effective programs or policies. Once again, it is important to remember that a regression model does not indicate causation. However, it may highlight factors to consider when planners are exploring specific programs or polices related to diabetes in Manitoba Metis.

1.10 Data Interpretation

Within the MMF there was a systematic collaborative process used for review of every graph for each indicator used in our study. The review process involved three steps: reviewing for scientific integrity (data processing), ensuring the context of the data was captured, and describing each graph in point form.

1.11 Summary

Until recently, the health and social concerns of Metis have been largely invisible. Metis concerns have often been absent from health program and policy planning – in no small part due to the lack of data on the health of Metis in Manitoba. This study provides a reliable source of information of the burden of disease for Metis with diabetes in this province. Moreover, 'Diabetes in Metis in Manitoba' offers information additional to that included in the Metis Atlas for MMF Regions wanting to make specific diabetes-related health concerns visible. Working together, health planners, policy makers, and Metis community members can begin to change the picture of Metis health in Manitoba.

References

Boyd, S. R., & Altomare, F. (2008). Retinopathy. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S134-S139.

Bruce, S. (2000). Prevalence and determinants of diabetes mellitus among the Metis of Western Canada. *American Journal of Human Biology, 12*(4)*,* 542-551.

Gordis, L. (1996). *Epidemiology*. Toronto, ON: W.B. Saunders Company.

Janz, T., Seto, J., & Turner, A. (2009). *Aboriginal Peoples Survey, 2006: An overview of the health of the Métis population*. Ottawa, ON: Minister of Industry.

Martens, P.J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study*. Winnipeg, MB: Manitoba Centre for Health Policy.

Public Health Agency of Canada (2009). *Report from the National Diabetes Surveillance System: Diabetes in Canada, 2008*. Ottawa, ON: Health Canada.

Wassertheil-Smoller, S. (1995). *Biostatistics and epidemiology: A primer for health professionals* (2nd ed.). New York, NY: Springer-Verlag.

Section 2: Overview of the MMF-Health & Wellness Department

Authors: Dr. J. G. Bartlett and Ms. S. Carter

2.1 Introduction

The Manitoba Metis Federation-Health & Wellness Department (MMF-HWD) undertakes Metis-specific health research along with a province-wide process to enhance the use of this research. This section provides an overview of the Metis, the Manitoba Metis Federation (MMF), highlights of the MMF-HWD's use of a Metis-specific lens, and Knowledge Networks. A more complete discussion of the details touched upon in this section can be found in Chapter 2 of the Metis Atlas (Martens, Bartlett, et. al., 2010).

2.2 The Metis

The Metis are descendants of early 17th-century relationships between North American Indians and Europeans (Sprague & Frye, 1983). The Metis coalesced into a distinct nation in Manitoba in the late 18th century. After the 1885 fall of Batoche "Metis were denied a separate identity and ignored for a century" (McMillan, 1995, pp. 312-313). By 1967, with the formation of the Manitoba Metis Federation, the Metis in Manitoba were again asserting their capacity to advocate and function once more in a collective manner. In the 1982 amendment to the Canadian Constitution Metis were named as one of the three Aboriginal peoples of Canada (Government of Canada, 1982).

2.3 The Manitoba Metis Federation

The Manitoba Metis Federation website (2010) documents that to be an Individual Member or Child Member [5] of the Manitoba Metis Federation you must:

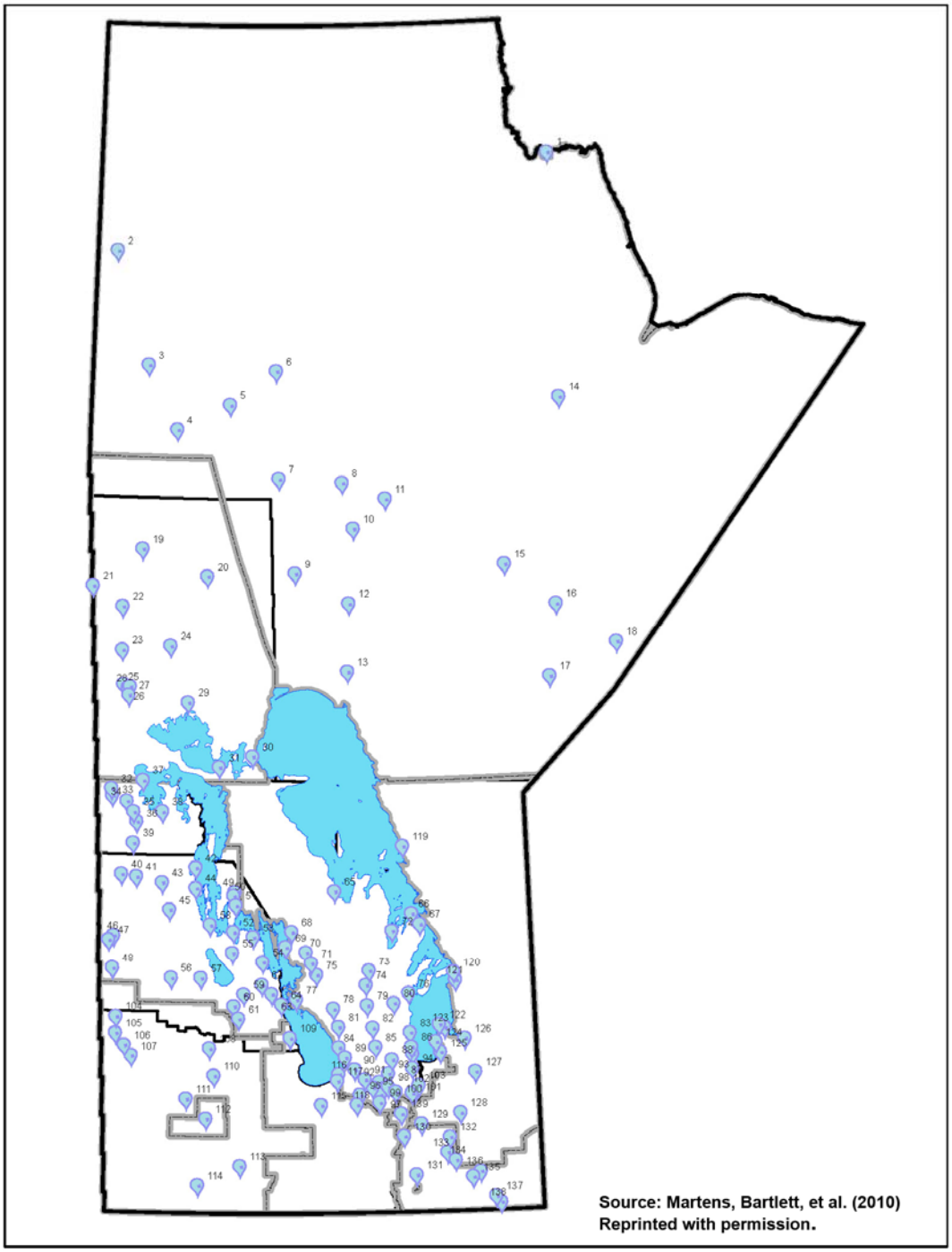
1) Self-identify as Metis
2) Show an ancestral connection to the Historic Metis Community
3) Be accepted by the contemporary Metis Community

For 43 years, the MMF has 'acted collectively' to promote, protect, and advance the political, social, and economic interests of Metis citizens in Manitoba. The MMF negotiates with governments to access funding for programs and services that are better able to meet Metis citizens' cultural norms. Metis citizens live in 139 villages, towns, cities and unorganized territories (See Figure 2.3.1) across Manitoba.

Twenty-one Representatives and a President are elected as the MMF Governing Body every four years. The MMF has seven Regions and a Home Office, along with a number of associated subsidiaries and affiliations. The MMF Governing Body leads, manages, and guides the strategic direction, objectives, and policies of the Federation and its subsidiaries. The President is the Chief Executive Officer, leader, and MMF spokesperson. The MMF has an Executive Director responsible for overseeing the day-to-day operations of the Federation. Each Region is administered by an elected Vice President and two elected Directors.

[5] 'Child Member' is a new addition by majority vote on a Resolution at the 2009 MMF Annual Assembly.

Figure 2.3.1: Villages, Towns, Cities, and Unorganized Territories Where Metis Live in Manitoba, 2009



Code Key for Villages, Towns, Cities, and Unorganized Territories: In Regional Order

Thompson Region	
Churchill	1
Brochet	2
Lynn Lake	3
Granville Lake	4
Leaf Rapids	5
South Indian Lake	6
Nelson House	7
Thompson	8
Wabowden	9
Thicket Portage	10
Pikwitonei	11
Cross Lake	12
Norway House	13
Gillam	14
Oxford House	15
Gods Lake Narrows	16
Garden Hill	17
Red Sucker Lake	18
The Pas Region	
Sherridon	19
Snow Lake	20
Flin Flon	21
Cranberry Portage	22
Wanless	23
Cormorant	24
Umpherville	25
Big Eddy Settlement	26
Young Point	27
The Pas	28
Moose Lake	29
Grand Rapids	30
Easterville	31
Red Deer Lake	32
Barrows	33
Baden	34
Mafeking	35
Bellsite	36
Dawson Bay	37
Pelican Rapids	38
Birch River	39
Northwest Region	
Swan River	40
Minitonas	41
Duck Bay	42
Cowan	43
Camperville	44
Pine River	45
Boggy Creek	46
San Clara	47
Roblin	48
Mallard	49
Rock Ridge	50
Waterhen	51
Spence Lake	52
Crane River	53
Cayer	54
Rorketon	55
Gilbert Plains	56
Dauphin	57
Winnipegosis	58
Ste. Rose	59
Laurier	60
McCreary	61
Eddystone	62
Bacon Ridge	63
Kinosota	64
Interlake Region	
Dauphin River	65
Matheson Island	66
Pine Dock	67
Fairford	68
Steep Rock	69
Grahamdale	70
Moosehorn	71
Fisher Bay	72
Hodgson	73
Fisher Branch	74
Ashern	75
Riverton	76
Vogar	77
Eriksdale	78
Poplarfield	79
Arborg	80
Lundar	81
Narcisse	82
Gimli	83
Oak Point	84
Inwood	85
Winnipeg Beach	86
Matlock	87
Teulon	88
St. Laurent	89
Lake Francis	90
Woodlands	91
Argyle	92
Balmoral	93
Petersfield	94
Warren	95
Marquette	96
Grosse Isle	97
Stonewall	98
Rosser	99
Stony Mountain	100
Lockport	101
St. Andrews	102
Selkirk	103
Southwest Region	
Russell	104
Binscarth	105
St. Lazare	106
Birtle	107
Erickson	108
Amaranth	109
Minnedosa	110
Rivers	111
Brandon	112
Belmont	113
Boissevain	114
Portage la Prairie	115
St. Ambroise	116
St. Marks	117
St. Eustache	118
Southeast Region	
Berens River	119
Seymourville	120
Manigotagan	121
Victoria Beach	122
Traverse Bay	123
Grand Marais	124
Beaconia	125
Powerview	126
Lac du Bonnet	127
Ste. Rita	128
Lorette	129
St. Adolphe	130
St. Malo	131
Richer	132
La Broquerie	133
Marchand	134
Woodridge	135
St. Labre	136
Vassar	137
South Junction	138
Winnipeg Region	
Winnipeg	139

2.4 Manitoba Metis Federation-Health & Wellness Department

The MMF-Health & Wellness Department (MMF-HWD) was created in July 2005 as a Metis-specific 'health knowledge authority.' Over time it has solidified a vision of 'a well Metis community' with its mission of 'creating and facilitating the use of knowledge' to contribute to improving Metis health status. The MMF-HWD is focused on four main strategies intended to move department activity toward its vision. These include:

- Using a Metis culture-based holistic wellness framework
- Building Metis health planning capacity
- Implementing a Metis health research agenda
- Developing as a Metis 'Health Knowledge Authority' to advise the health system

For the MMF-HWD, the Metis Atlas was 'the' base research setting the stage for a range of new research and related activities intended to positively impact the health and wellbeing of Metis citizens in Manitoba. The anonymized (no names) Metis Population Database (MPDB), created during production of the Metis Atlas is housed in the Manitoba Centre for Health Policy (MCHP) under a data sharing agreement that ensures MMF Ownership, Control, Access, and Stewardship (OCAS). This maximizes privacy protection for Metis citizens. As well, the MMF has developed a stringent process for use of the MPDB in new projects, whether by its own MMF-HWD researchers or other university-situated researchers. The MPDB enabled aggregated data for this 'Diabetes in Metis in Manitoba' study to be generated.

2.5 Description of a Culturally Coherent Metis 'Methodology' or Lens for Wellness

2.5.1 Ways of Knowing

The MMF-HWD approaches all departmental activities from a Metis-specific Methodology (that is, a Metis perspective or lens). This Metis lens is rooted in the integration of our historic Indigenous and European ancestries to become a uniquely Metis 'way of knowing'. Adapted from work by Burton-Jones (1999), the MMF-HWD considers the inclusion of both 'ways of knowing' as appropriate for Metis. This Metis 'way of knowing' is holistic, including: Narrative (our story, spiritual); Experience (our experience, emotional); Data (our research, physical); and Information (our synthesis of the first three, intellectual). This simple approach is used to demystify research (Figure 2.5.1), and to envelop our strategies (Figure 2.5.2).

Figure 2.5.1: Holistic Research Process

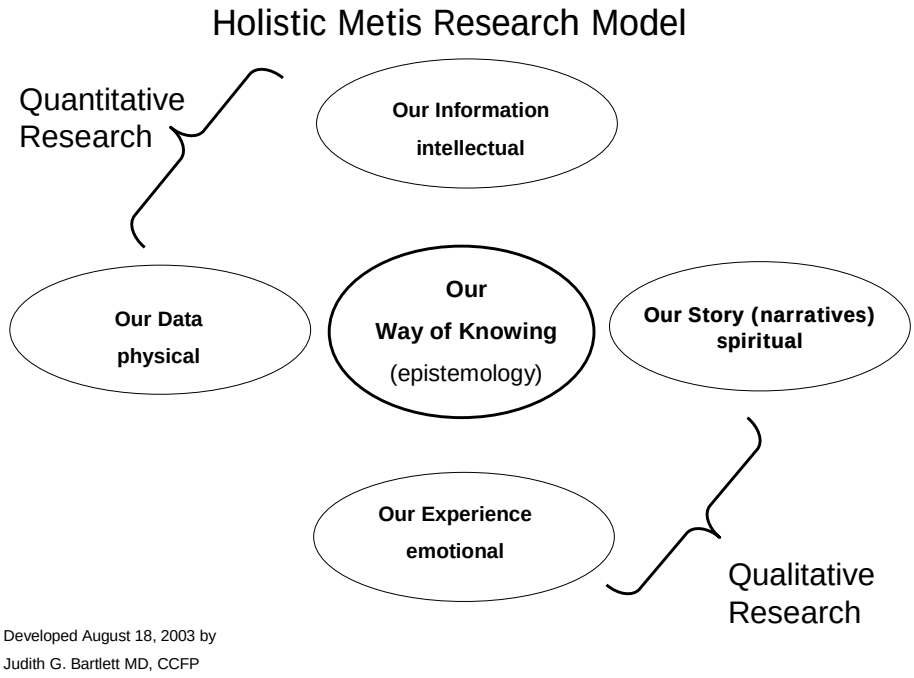
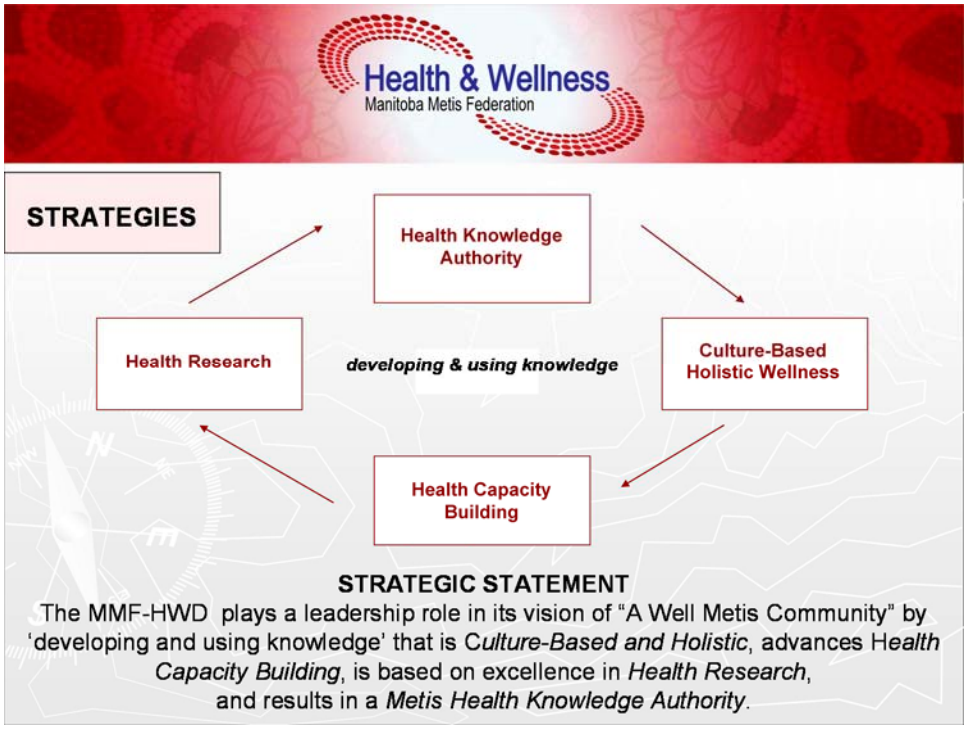
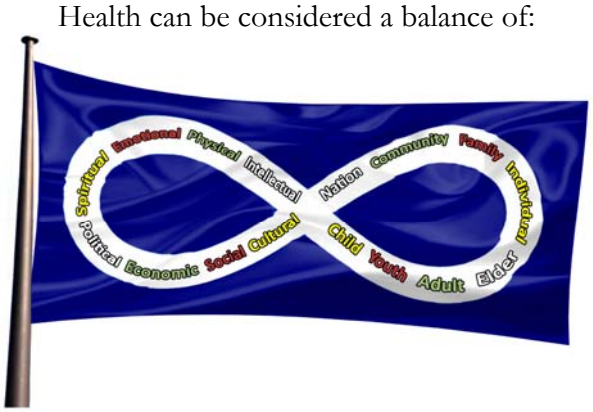


Figure 2.5.2: MMF-HWD Strategies



The MMF-HWD adapted a holistic framework originally developed for use in a community-requested holistic urban Aboriginal community health centre (Bartlett, 1995). For use with Metis, the framework was renamed the Metis Life Promotion Framework© (MLPF©). It is critical to keep in mind that the MLPF© is a tool for holistically organizing thoughts and information – it does not 'represent' Metis culture. The MLPF© includes finding 'balance' among 16 important areas that help to 'determine how our life unfolds' [*spiritual*, *emotional*, *physical*, and *intellectual; child*, *youth*, *adult*, and *elder (senior); individual, family*, *community*, *and nation; cultural, social, economical, and political]* (i.e. 16 Determinants of Life (Figure 2.5.3)).

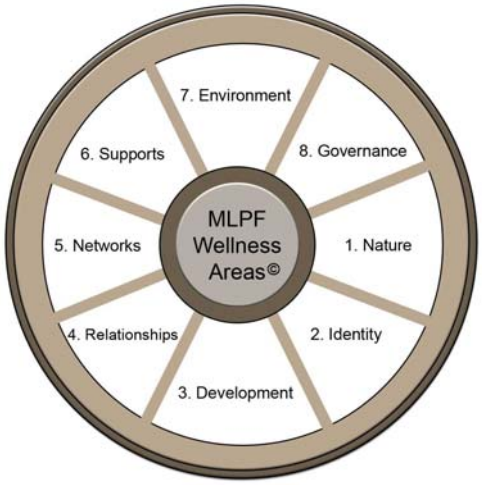
Figure 2.5.3: Metis Life Promotion Framework© Determinants of Life©



Developed by Judith G. Bartlett MD, MSc, CCFP

In 1996, the framework was adapted to consider 'Wellness' (Bartlett, 2004). The 16 'Determinants of Life' were grouped as eight Wellness Areas©, which made it easier to think about the determinants for health planning and interpretation of research findings. MLPF© Wellness Areas© naturally flow around the spokes of a Red River cart, representing constant motion and change (Figure 2.5.4).

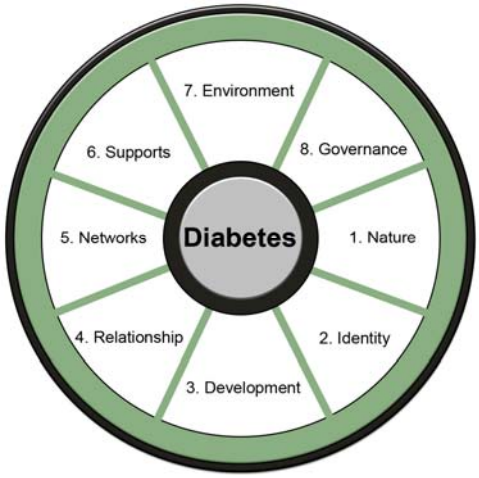
Figure 2.5.4: Wellness Areas©



Developed by Judith G. Bartlett MD, MSc, CCFP

Although not explicitly an accepted Metis lens, this tool allows every person engaged in Metis-related health planning to undertake a process where they learn 'how to create' Wellness Areas based on their own life experience. The Wellness areas can be used for individuals, families, or groups as well as distinct diseases. Figure 2.5.5 illustrates the use of Wellness Model for those with diabetes. Table 2.5.1 demonstrates the types of questions individuals would be asked about their own experiences.

Figure 2.5.5: Wellness Model for Examining Diabetes



Developed by Judith G. Bartlett MD, MSc, CCFP

- Approaching diseases from a wellness prospective
- Needs to occur at both policy & program levels

Table 2.5.1: Wellness Area© Question Type

WELLNESS AREA©	**QUESTION:** How does diabetes affect my:
Nature	sense of who I really am as a person?
Identity	experience of how others see me or how I want others to see me?
Development	sense of age/ability to express the child, youth, adult, and elder parts of me?
Relationships	ability to respect and care for others?
Networks	ability to interact with others?
Supports	body, ability to work and be involved in community?
Environment	cultural, social, economic, and political influence?
Governance	ability to choose my destiny and future?

2.6 Knowledge Translation

Knowledge Translation (KT) essentially means using *'what we know'* from research to influence *'what gets done'* in health/social programs/services in order to improve health (Masching, 2006). Using KT for the 'Diabetes in Metis in Manitoba' maximizes benefit for Manitoba Metis citizens. The MMF-HWD's existing Knowledge Network (KN) 'discussion tables' (Table 2.6.1) will examine the Metis health information in this report. For a more detailed description of this process see Chapter 2 in the Metis Atlas (Martens, Bartlett, et. al., 2010).

Table 2.6.1: Knowledge Networks-Association of MMF Regions with RHAs

Region Knowledge Networks	
MMF Region	**RHA**
Thompson	Burntwood
	Churchill
Southeast	North Eastman
	South Eastman
Southwest	Brandon
	Assiniboine
	Central
The Pas	Nor-Man
Northwest	Parkland
Interlake	Interlake
Winnipeg	Winnipeg

Each Knowledge Network carefully examines the study results and documents *'what it now knows'*, which can result in practical *'changes to what is done'* in the health system and MMF program planning.

References

Bartlett, J. G. (2004, November). *Leadership environment*. Paper presented at the 2004 CMA Leaders Forum: Leaders Developing Leaders, Ottawa, ON.

Bartlett, J. G. (1995). Medicine wheel framework for health. *Theory, reality, hope: Proceedings of the Third International Conference on Diabetes and Indigenous Peoples*. Winnipeg, MB.

Burton-Jones, A. (1999). *Knowledge capitalism: Business, work, and learning in the new economy*. Oxford, UK: Oxford University Press.

Government of Canada. (1982). *Constitution Act: Section 35*. Retrieved June 17, 2011 from http://laws.justice.gc.ca/eng/Const/page-12.html#anchorsc:7-bo-ga:l_II

Manitoba Metis Federation. (2010). *Membership application and confirmation package*. Retrieved Sept 30, 2010 from http://mmf.mb.ca/images/pdf/membership/mmf_membership_package.pdf

Martens, P. J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study*. Winnipeg, MB: Manitoba Centre for Health Policy.

Masching, R. (2006). *The essentials of knowledge translation: Fact sheet*. Ottawa, ON: Canadian Aboriginal AIDS Network. Retrieved from http://caan.ca/new/wp-content/uploads/2010/06/KT.pdf

McMillan, A. D. (1995). *Native peoples and cultures of Canada*. Toronto, ON: Douglas & McIntyre.

Sprague, D. N., & Frye, R. P. (1983). *The genealogy of the first Métis nation: The development and dispersal of the Red River Settlement, 1820-1900*. Winnipeg, MB: Pemmican Publications.

Section 3: Age and Sex Characteristics of the Population

Population health is an approach to thinking about health differences across populations and asking why some populations are healthier than others (Young, 2004). By doing so population health researchers seek to improve the health of the entire population and reduce inequalities between groups within the population (Young, 2004). This section focuses on the 'demographics' (age and sex characteristics) of the Metis population with diabetes in Manitoba. Population pyramids and line graphs are used to draw an age- and sex-specific picture of people with diabetes in this province. Premature mortality rates (PMR), which measure the number of people dying before the expected age of 75, are also presented. Mortality (i.e., death rate) statistics such as PMR are frequently used as overall indicators of population health (Gordis, 1996).

It is important to understand the age and sex characteristics of our population so that health programs and services for Metis in Manitoba can be adapted to best meet our unique needs. This is especially true when there may be inequalities in health status, access to health care services, and public health programs between Metis and All Other Manitobans.

All definitions used in this section have been developed by the Manitoba Centre for Health Policy (MCHP) for the Metis Atlas (Martens, Bartlett, et al., 2010) unless otherwise cited.

Indicators in this section include:

- Age profile of Manitoba
- Age profiles of males and females with diabetes
- Premature mortality rate

3.1 Age Profile of Manitoba

One way to describe the age and sex make-up of a population is to use *population pyramids*. A population pyramid is an illustration showing the age and sex distribution of a population. It provides important information on the health status of a population in a specific geographical location (Young, 2004). A population pyramid shows males on the left side, females on the right side, the youngest age group on the bottom, and the elderly on the top.

Populations across the world are differently affected by birth rates, mortality rates (numbers of people dying), migration rates, and other factors. These factors contribute to the shape of a population pyramid. For example, many developing countries will have a population pyramid which is triangular in shape, indicating a higher birth rate (i.e. faster growing population) and a lower proportion of older people (i.e. population not living to an older age). Developed countries such as Canada will have a population pyramid that looks more rectangular. A population pyramid with this 'block' shape indicates a population that has a lower birth rate and higher proportion of older people (Merrill & Timmreck, 2002). However, population pyramids may not reflect the age and sex distribution of different sub-groups within a population. For example, the population pyramids illustrating the entire population of Manitoba do not directly reflect the unique 'shape' of the Metis population with diabetes in this province.

In this study we were able to pull this information out using the Metis Population Database in order to highlight crucial differences between the Metis and All Other Manitoban populations with diabetes. It is important to remember that when developing the cohort for this study, the segment of the Metis population identified through the Canadian Community Health Survey (CCHS) and National Population Health Survey (NPHS), including children and parents matched to these individuals, were not included. Also, in this study the population pyramid only includes individuals aged 19 years and older, as this is the standard age group used to measure diabetes prevalence by the Manitoba Centre for Health Policy.

The following population pyramid (Figure 3.1.1) shows the age and sex distribution of the overall Metis and All Other Manitoban populations – that is, Metis and All Other Manitobans with and without diabetes. The percentages of the population aged 19+ years within each age category are grouped as follows: 19-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-85, and 85+ years of age. Males are shown on the left side of the graph and females are shown on the right side of the graph. All of the 'bars' add up to 100%, meaning the entire population fits into these groupings (Martens, Bartlett, et al., 2010). The percentages in these graphs are based on data from the Population Registry located at the Manitoba Centre for Health Policy. Population totals are given immediately below the pyramid title.

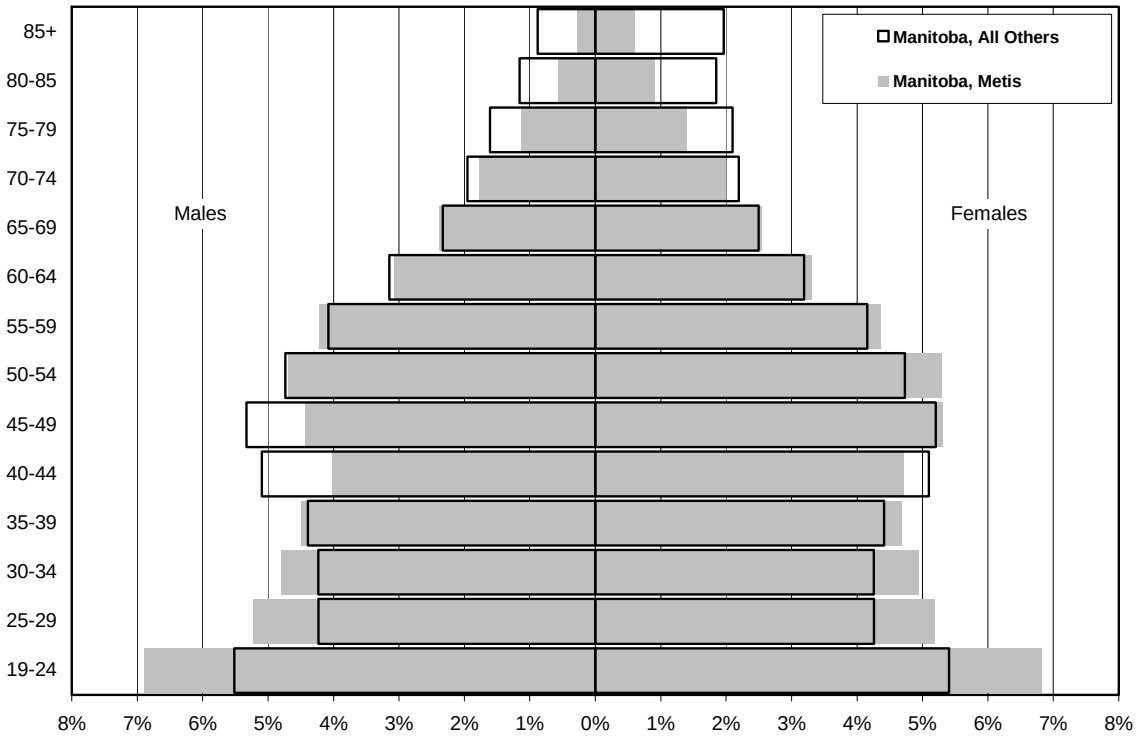
Key observations:

Metis overall compared to All Other Manitobans overall (Figure 3.1.1)

- For those Manitobans aged 19+ in 2006, the Metis population have a greater proportion of young people (19-34), a lower proportion of mid-aged people (40-49), and a lower proportion of older adults (70+) compared to All Other Manitobans
- For males and females aged 19+ combined: 19-34 year olds comprised 33.9% of the Metis population compared to 27.9% of the All Other Manitobans population; 40-49 year olds comprised 18.5% of the Metis population compared to 20.7% of the All Other Manitobans population; 70+ year olds comprised 8.6% of the Metis population compared to 13.7% of the All Other Manitobans population

Figure 3.1.1: Age Profile of Metis and All Other Manitobans, 2006

Metis Population Aged 19+: 48,904
All Other Manitobans Population Aged 19+: 829,215



Source: MMF, 2010

3.2 Age Profiles of Males and Females with Diabetes

Figure 3.2.1 and Figure 3.2.2 are line graphs. A line graph shows the relationship between two continuous variables: age group in years along the bottom and percentage of the population along the left side. Each point on the graph represents the relationship between the two variables at that particular point (Wassertheil-Smoller, 1995).

In this indicator Metis with diabetes are compared to All Other Manitobans with diabetes.

Key observations:

Metis Males with diabetes compared to All Other Manitoban Males with diabetes (Figure 3.2.1)

- Both Metis males and All Other Manitoban males have a similar age profile until age 49, where Metis begin to have a slightly higher percentage of males than All Other Manitobans, peaking at age 60-64 (7.5% vs. 6.8%)
- There are fewer older Metis males aged 70+ compared to All Other Manitoban males (10.2% vs. 14.6%)

Key observations:

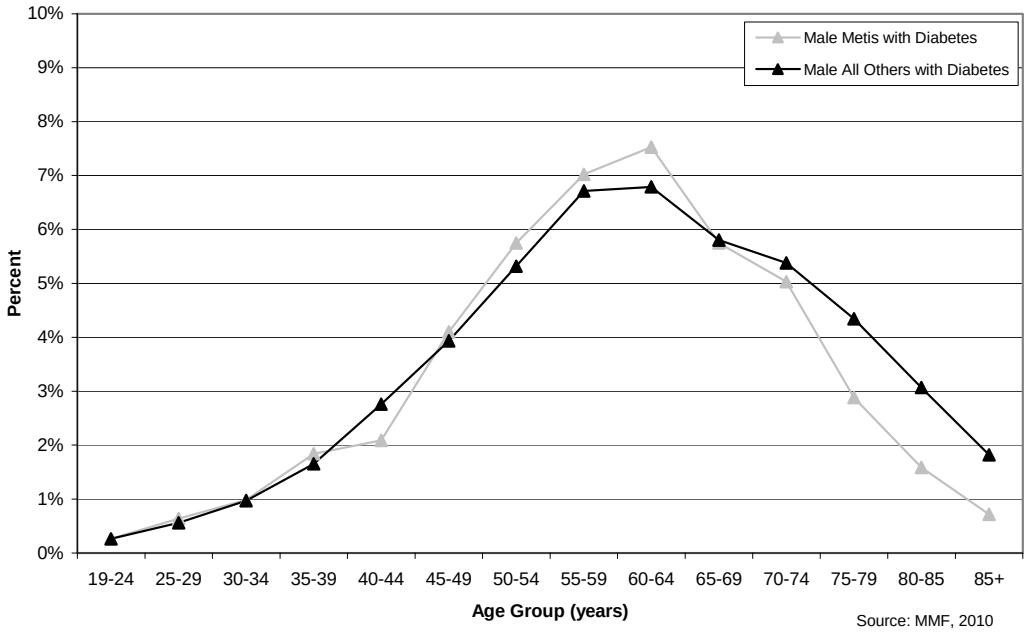
Metis Females with diabetes compared to All Other Manitoban Females with diabetes (Figure 3.2.2)

- Metis females and All Other Manitoban females have a similar age profile to age 49, where Metis begin to have a higher percentage of females than All Other Manitobans, peaking at age 55-59 (7.3% vs. 5.5%) but continuing until age 70-74
- There are fewer older Metis females aged 75+ compared to All Other Manitoban females (6.6% vs. 11.8%)

Figure 3.2.1: Age Profile of Male Metis with Diabetes and Male All Other Manitobans with Diabetes, 2006

Male Metis Population Aged 19+ with Diabetes: 2,400

Male All Other Manitobans Population Aged 19+ with Diabetes: 35,206

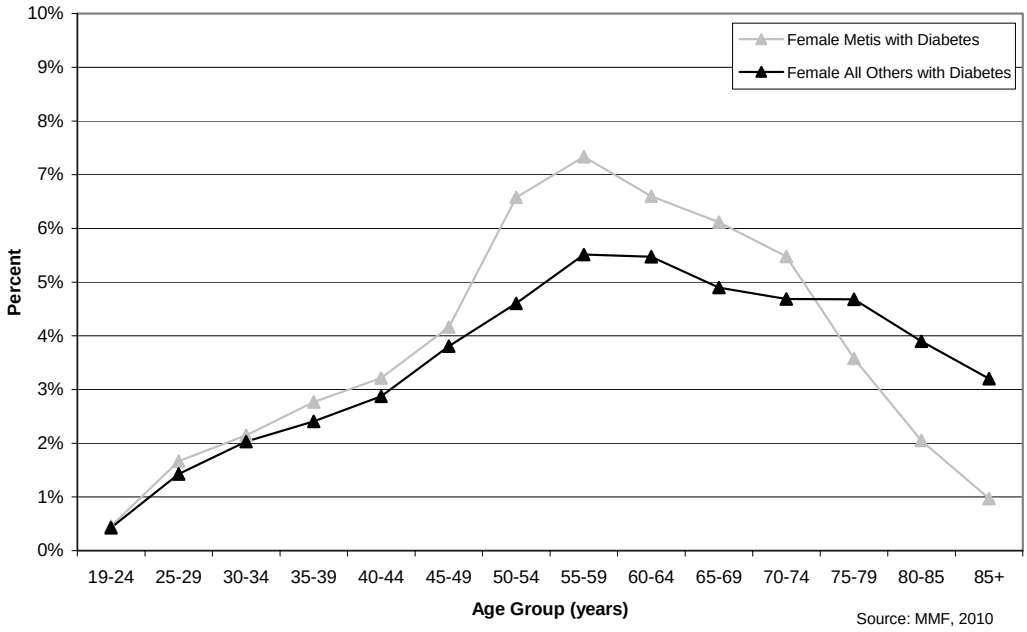


Source: MMF, 2010

Figure 3.2.2: Age Profile of Female Metis with Diabetes and Female All Other Manitobans with Diabetes, 2006

Female Metis Population Aged 19+ with Diabetes: 2,768

Female All Other Manitobans Population Aged 19+ with Diabetes: 35,709



Source: MMF, 2010

Findings from Literature Review

(Compared to the results in this study – *in italics*)

The Metis make up 33% of Aboriginal peoples in Canada, numbering 389,785 in 2006 (Janz, Seto, & Turner, 2009). More than 18% of Metis in Canada live in Manitoba, with over 10% in Winnipeg alone (Statistics Canada, 2008). The Metis are also the fastest growing Aboriginal group in Canada, with an increase in population of 91% between 1996 and 2006 (Statistics Canada, 2008). Increased rates of self-identification are partially responsible for this change in demographic. According to Statistics Canada data, between 1996 and 2006 the number of self-identified Metis in Manitoba increased from 40,720 to 71,805, representing an increase of 76% (Martens, Bartlett, et al., 2010).

The Metis Atlas (Martens, Bartlett, et al., 2010) reported that the 2006 Metis population was younger than that of All Other Manitobans. They found that 25.4% of the Metis population in Manitoba was less than 15 years of age compared to 19.1% of All Other Manitobans. Only 9.1% of the Metis population was 65 years of age or older compared to a rate of 13.9% in All Other Manitobans (Martens, Bartlett, et al., 2010). The information in that study was not specific to those living with diabetes.

There are no comparative studies of the population distribution for Metis with diabetes reported in the literature. Comparisons with other Metis population data are difficult due to the fact that our study focused only on Metis in Manitoba aged 19 years and older. In our study, for the overall Manitoba population aged 19+ years, Metis have a higher proportion of younger adults aged 19-39 compared to All Other Manitobans (43.0% vs. 36.7%), a fairly similar proportion of mid-aged adults aged 40-64 (43.4% vs. 44.8%), and a lower proportion of older adults aged 65+ (13.5% vs. 18.5%). For the Manitoba population with diabetes aged 19+, Metis with diabetes have a fairly similar proportion of younger adults aged 19-39 compared to All Other Manitobans with diabetes (10.8% vs. 9.7%), a higher proportion of mid-aged adults aged 40-64 (54.4% vs. 47.8%), and a lower proportion of older adults aged 65+ (34.2% vs. 41.8%).

The higher proportion of younger and mid-aged Metis adults with diabetes and the lower proportion of older Metis adults with diabetes may have significant implications for health programs and policies. Initiatives to address diabetes in the Metis population may most effectively target younger and mid-aged Metis adults, given the age distribution of the Metis population with diabetes in this province.

3.3 Premature Mortality Rate

Premature Mortality Rate (PMR) is an internationally used measure which reflects the health status of a population. It is defined as the number of deaths occurring before age 75, and is usually described as the age-adjusted number of deaths per 1,000 persons under the age of 75. Premature mortality rate is often used as an overall indicator of population health, with higher premature mortality rates indicating poorer health (Eyles & Birch, 1993). However, PMR does not reveal specific reasons why deaths at an earlier age might be high or low in a particular geographical location.

PMR is a standard measure for the overall 'healthiness' of a group of people, since it is easy to measure using vital statistics files. In our study, PMR is an age- and sex- adjusted annual rate of death among residents with diabetes aged 19 to 74 per 1,000 residents for calendar years 2002-2006.

The denominator includes all Manitoba residents with diabetes aged 19 to 74 years as of December 31 of each year (2002 to 2006). In this indicator Metis with diabetes are compared to All Other Manitobans with diabetes. As noted in Section 1, unless otherwise indicated any mention of 'lower' or 'higher' refers to results that are statistically significant.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 3.3.1):

- There is no difference in PMR between Metis and All Other Manitobans in Manitoba (7.8 vs. 7.5 per 1,000)

Aggregate areas (Figure 3.3.1):

- There are no differences in PMR between Metis and All Other Manitobans in Rural South, Mid, or North aggregate areas

RHAs (Figure 3.3.1):

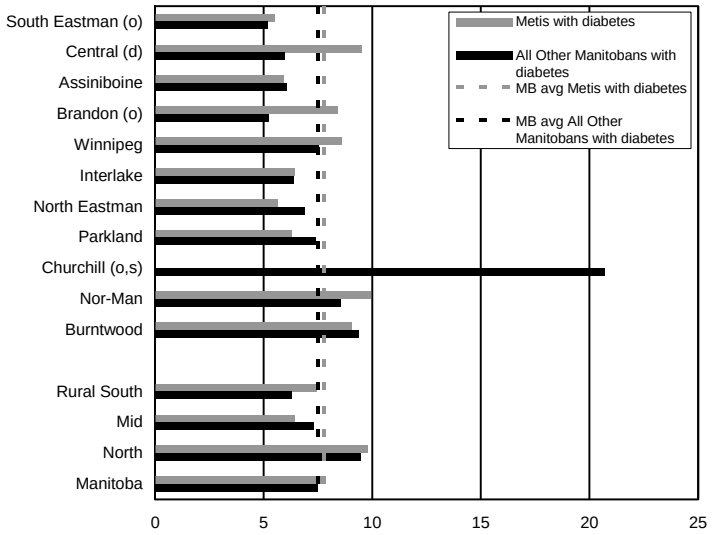
- Metis have a higher PMR compared to All Other Manitobans in Central RHA (9.5 vs. 6.0 per 1,000)
- All Other Manitobans have a higher PMR compared to their provincial average in Churchill RHA (20.7 vs. 7.5 per 1,000) whereas All Other Manitobans have a lower PMR compared to their provincial average in South Eastman (5.2 vs. 7.5) and Brandon RHAs (5.2 vs. 7.5)

Winnipeg CAs (Figure 3.3.2):

- Metis have a higher PMR compared to All Other Manitobans in Assiniboine South CA (13.7 vs. 5.1 per 1,000)
- Metis have a higher PMR compared to their provincial average in Point Douglas (13.3 vs. 7.8 per 1,000)
- All Other Manitobans have a higher PMR compared to their provincial average in Downtown CA (9.4 vs. 7.5 per 1,000) whereas they have a lower PMR compared to their provincial average in Fort Garry (5.5 vs. 7.5), Assiniboine South (5.1 vs. 7.5), St.Vital (4.8 vs. 7.5), and River East (5.6 vs. 7.5) CAs

Figure 3.3.1: Premature Mortality Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002-2006

Age- & sex-adjusted annual rate per 1,000 residents aged 19-74 years

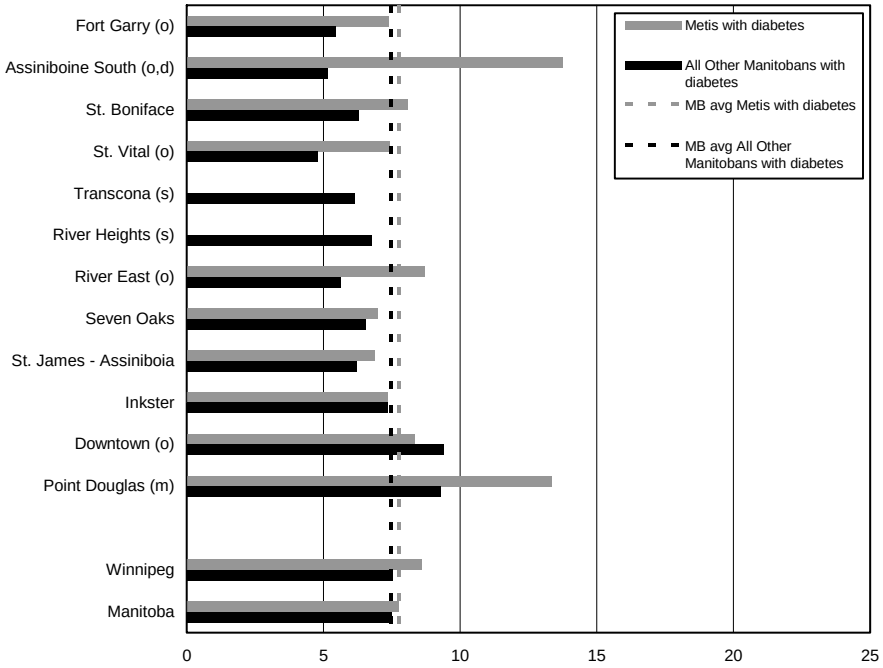


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 3.3.2: Premature Mortality Rate by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002-2006

Age- & sex-adjusted annual rate per 1,000 residents aged 19-74 years



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(Compared to the results in this study – *in italics*)

There is significant indication in the literature that Metis in Manitoba have a shorter life expectancy than All Other Manitobans. In the 2006 Canadian Census the proportion of Metis 65 years of age or older in Manitoba was 5% compared to 13% of All Other Manitobans (Statistics Canada, 2008). In an 11-year follow-up study of mortality rates for Metis and First Nations in Canada, remaining life expectancy at age 25 was shorter for both Metis men and women compared to those for 'non-Aboriginal' individuals (Tjepkema, Wilkins, Senécal, Guimond, & Penney, 2009). The gap between remaining life expectancies for Metis males and non-Aboriginal males was 3.3 years (49.5 vs. 52.8 years), while the gap between Metis females and non-Aboriginal females was even greater at 5.5 years (53.7 vs. 59.2 years) (Tjepkema et al., 2009).

Male Metis life expectancy in Winnipeg in 2001 was 70.0 years compared to 77.3 years for female Metis; estimates for 2004 in the same report increased slightly to 70.4 and 77.6 years, respectively (cited in Martens, Bartlett, et al., 2010). Michalowski, Loh, Verma, Germain, & Grenier (2005) compared life expectancies in 2001 for Metis and the total Canadian population, estimating 71.9 years for male Metis (compared to 77.0 for all Canadian males) and 77.7 years for female Metis (compared to 82.2 years for all Canadian females). More recently, life expectancy at birth was measured for Metis compared to All Other Manitobans in the Metis Atlas (Martens, Bartlett, et al., 2010). Life expectancy was measured from birth, based on mortality (death) of the population for calendar years 2002-2006. In that report Metis males had a significantly lower life expectancy compared to All Other Manitoban males (75.0 years vs. 76.8 years), while Metis females had a life expectancy similar to All Other Manitobans (81.0 years vs. 81.8 years) (Martens, Bartlett, et al., 2010).

In the Metis Atlas (Martens, Bartlett, et al., 2010) potential years of life lost (PYLL), an internationally used measure of death before 75 years which gives greater weight to the deaths of younger individuals, was calculated for Metis compared to All Other Manitobans. The PYLL for Metis was 64.6 per 1,000 compared to a rate of 54.6 per 1,000 for All Other Manitobans (Martens, Bartlett, et al., 2010). This indicates that Metis in Manitoba are dying significantly younger than All Other Manitobans. These findings support other research which suggests that the probability of surviving to at least age 75 (assuming survival to age 75) for Metis men was 57% compared to 64% of non-Aboriginal men in Canada; for Metis women the probability of survival was 63% compared to 79% for non-Aboriginal women (Tjepkema et al., 2009).

Martens, Bartlett, et al. (2010) found that Metis had a statistically higher PMR compared to All Other Manitobans (4.0 vs. 3.3 deaths per 1,000) in Manitoba. This difference was also seen in Rural South aggregate area, where Metis had a significantly higher PMR than All Other Manitobans (3.8 vs. 2.9 per 1,000). For the North aggregate area, PMR was significantly higher than the provincial average for Metis (5.3 vs. 4.0 per 1,000) but similar to the rate for All Other Manitobans in the aggregate area (5.3 vs. 5.3). Significant differences between Metis and All Other Manitobans were also seen in Central (4.6 vs. 2.8 per 1,000) and Winnipeg (4.2 vs. 3.3) RHAs, as well as St. Vital (4.0 vs. 2.6), River East (4.0 vs. 2.9), Inkster (5.0 vs. 3.4), Downtown (7.6 vs. 5.2), and Point Douglas (6.2 vs. 5.8) CAs. The information in the Metis Atlas was not specific to those living with diabetes.

There are no comparative studies of Premature Mortality Rate in Metis with diabetes in the literature. In our study, we found that there is no statistical difference in PMR between Metis with diabetes and All Other Manitobans with diabetes in Manitoba (7.8 vs. 7.5 per 1,000). We also found that Metis with diabetes in Central RHA have a higher PMR compared to All Other Manitobans with diabetes (9.5 vs. 6.0 per 1,000). Within Winnipeg RHA Metis with diabetes have a higher PMR compared to All Other Manitobans with diabetes in Assiniboine South CA (13.7 vs. 5.1 per 1,000). The PMR for Metis with diabetes in Point Douglas CA is higher than their provincial average (13.3 vs. 7.8 per 1,000).

While no differences were observed in PMR between Metis with diabetes and All Other Manitobans with diabetes, the rate for Metis with diabetes (7.76 per 1,000) is substantially higher than the rate previously identified in the Metis population as a whole (4.02 per 1,000) (Martens, Bartlett, et al., 2010). Additionally, there are a few areas where the Metis with diabetes are dying younger: Central RHA, Assiniboine South CA, and Point Douglas CA. Further inquiry into health conditions for Metis with diabetes in these regions may be a priority in the near future.

References

Eyles, J., & Birch, S. (1993). A population needs-based approach to health-care resource allocation and planning in Ontario: A link between policy goals and practice? *Canadian Journal of Public Health, 84*(2), 112-117.

Janz, T., Seto, J., & Turner, A. (2009). *Aboriginal Peoples Survey, 2006: An overview of the health of the Métis population.* Ottawa, ON: Minister of Industry. Retrieved from http://dsp-psd.pwgsc.gc.ca/collection_2009/statcan/89-637-X/89-637-x2009004-eng.pdf

Martens, P. J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study.* Winnipeg, MB: Manitoba Centre for Health Policy.

Merrill, R. M., & Timmreck, T. C. (2002). *Introduction to epidemiology* (4th ed). Mississauga, ON: Jones & Bartlett.

Michalowski, M., Loh, S., Verma, R. B. P., Germain, M.-F., & Grenier, C. (2005). *Projections of the Aboriginal populations, Canada, provinces and territories.* Ottawa, ON: Statistics Canada. Retrieved from http://www.statcan.gc.ca/pub/91-547-x/2005001/4155176-eng.htm

Statistics Canada. (2008). *Aboriginal peoples in Canada in 2006: Inuit, Métis and First Nations, 2006 Census.* Ottawa, ON: Statistics Canada. Retrieved from http://www12.statcan.ca/census-recensement/2006/as-sa/97-558/pdf/97-558-XIE2006001.pdf

Tjepkema, M., Wilkins, R., Senécal, S., Guimond, É., & Penney, C. (2009). Mortality of Métis and Registered Indian adults in Canada: An 11-year follow-up study. *Health Reports, 20*(4), 31-51.

Wassertheil-Smoller, S. (1995). *Biostatistics and epidemiology: A primer for health professionals* (2nd ed.). New York, NY: Springer-Verlag.

Young, T. K. (2004). *Population health.* Toronto, ON: Oxford University Press.

Section 4: Morbidity Profile

4.1 Diabetes

This section focuses on morbidity (illness) associated with diabetes. Diabetes is a chronic disease caused by either an inherited or acquired deficiency of insulin production by the pancreas or by the ineffectiveness of the insulin produced by the pancreas (Public Health Agency of Canada [PHAC], 2010; Lin & Sun, 2010). Type 1 diabetes results from the lack of or diminished production of insulin whereas type 2 diabetes develops when the body becomes resistant to insulin and cannot produce enough insulin to overcome this resistance (Deshpande, Harris-Hayes, & Schootman, 2008; Ur, 2008). By its very nature diabetes does not 'go away' and as a result many other disease conditions related to the illness can develop over time (Ur, 2008). Diabetes is a significant cause of heart disease, blindness, kidney failure, and non-traumatic amputation (World Health Organization [WHO], 2010a).

In each of the graphs in this section the Regional Health Authorities and Winnipeg Community Areas (CAs) are ordered by the ten-year Premature Mortality Rate (PMR). More information on ten-year PMR is provided in Section 1.

Most of the indicators in this section are presented as 'age- and sex-adjusted' rates. Three of the indicators (diabetes, ischemic heart disease, and hypertension) are also presented as 'age- and sex-specific' rates. Such age- and sex-specific charts are included in response to requests for more in-depth information from our Knowledge Networks and because of their policy implications for future health services.

All definitions used in this section were developed by the Manitoba Centre for Health Policy for the Metis Atlas (Martens, Bartlett, et al., 2010) unless otherwise noted. In this section, except for the prevalence of diabetes chart, Metis with diabetes are compared to All Other Manitobans with diabetes. As noted in Section 1, unless otherwise indicated any mention of 'lower' or 'higher' refers to results that are statistically significant.

Indicators in this section include:

- Diabetes prevalence (age- and sex-adjusted)
- Diabetes prevalence (age- and sex-specific)
- Ischemic heart disease (IHD) prevalence (age- and sex-adjusted)
- Ischemic heart disease (IHD) prevalence (age- and sex-specific)
- Hypertension prevalence (age- and sex-adjusted)
- Hypertension prevalence (age- and sex-specific)
- Acute myocardial infarction (AMI) rate
- Stroke incidence rate
- Dialysis initiation rate
- Lower limb amputation rate for people with diabetes
- Prevalence of depression
- Prevalence of anxiety disorders
- Prevalence of substance abuse
- Comorbidities among specified illnesses (ischemic heart disease, hypertension, depression, anxiety, and substance abuse)

Overall Key Findings (Table 4.1):

- Diabetes and its associated complications are health issues of concern for the Metis in Manitoba
- There is considerable variation in rates of diabetes and associated comorbidities among Metis between RHAs
- In this study diabetes prevalence (12.0% vs. 8.9%) and probability of developing diabetes (1.30 adjusted odds ratio) are higher for Metis than for All Other Manitobans
- In this study, ischemic heart disease (IHD) prevalence (19.7% vs. 16.9%), lower limb amputation rate (24.3 vs. 16.2 per 1,000), prevalence of depression (28.2% vs. 25.7%), prevalence of anxiety disorders (10.4% vs. 8.8%), and prevalence of substance abuse (8.3% vs. 6.6%) are higher in Metis compared to All Other Manitobans whereas hypertension prevalence (46.9% vs. 51.5%) is lower for Metis compared to All Other Manitobans

Table 4.1: Overall Key Findings of Morbidity Indicators

Indicator (age of inclusion for this indicator)	Provincial difference between Metis with diabetes and All Other Manitobans with diabetes (age- and sex-adjusted prevalence in %, unless otherwise stated), with RR (relative rate) for Metis with diabetes	Statistically better off regions for Metis with diabetes compared to provincial average for Metis with diabetes (unless otherwise noted)	Statistically worse off regions for Metis with diabetes compared to provincial average for Metis with diabetes (unless otherwise noted)
Diabetes Prevalence, 19+	12.0% vs. 8.9% RR = 1.35	South Eastman RHA; Assiniboine South CA; St. Boniface CA; and St. Vital CA	Parkland RHA; Burntwood RHA; Downtown CA; and Point Douglas CA
IHD Prevalence, 19+	19.7% vs. 16.9% RR = 1.17	Assiniboine RHA	None
AMI Rate, 40+	10.7 vs. 9.1 (per 1,000) RR = 1.18, NS	None	None
Hypertension Prevalence, 19+	46.9% vs. 51.5% RR = 0.91	None	None
Stroke Rate, 40+	6.4 vs. 6.4 (per 1,000) RR = 1.00, NS	None	Burntwood RHA
Dialysis Initiation Rate, 19+	1.39% vs. 1.21% RR = 1.15, NS	None	None
Lower Limb Amputation Rate, 19+	24.3 vs. 16.2 (per 1,000) RR = 1.50	None	None
Prevalence of Depression, 19+	28.2% vs. 25.7% RR=1.10	North aggregate area	Winnipeg RHA; Downtown CA; Point Douglas CA
Prevalence of Anxiety Disorders, 19+	10.4% vs. 8.8% RR = 1.18	Interlake RHA; South aggregate area	Brandon RHA; Downtown CA
Prevalence of Substance Abuse, 19+	8.3% vs. 6.6% RR = 1.26	None	Burntwood RHA; North aggregate area; Downtown CA; Point Douglas CA

NS = Not statistically different between Metis and All Other Manitobans

4.2 Diabetes Prevalence

Diabetes prevalence refers to the proportion of people diagnosed with diabetes in a population at a certain time. If the prevalence rate was 10% then we would know that one in ten people (or 10%) had been diagnosed with diabetes (Gordis, 1996).

The age- and sex-adjusted prevalence and the age- and sex-specific prevalence of diabetes were measured for residents aged 19 or older over three fiscal years: 2004/05-2006/07. Residents were considered to have diabetes if they met one of the following conditions:

- one or more hospitalizations with a diagnosis of diabetes: ICD-9-CM code 250, ICD-10-CA codes E10-E14
- two or more physician visits with a diagnosis of diabetes (ICD-9-CM codes as above)
- one or more prescriptions for medications to treat diabetes

For Metis the numerator includes all Metis with diabetes aged 19 and older over three fiscal years: 2004/05-2006/07. The denominator includes all Metis aged 19 and older as of December 31, 2005. For All Other Manitobans the numerator includes All Other Manitobans with diabetes aged 19 and older over three fiscal years: 2004/05-2006/07. The denominator includes All Other Manitobans aged 19 and older as of December 31, 2005.

Note that this measure of diabetes combines type 1 and type 2 diabetes, as physician claims data do not allow for separate identification. A third type of diabetes, gestational diabetes, has a separate diagnosis code and is not included in these results.

Key observations:

Metis and All Other Manitobans

Manitoba (Figure 4.2.1):

- Metis have a higher prevalence of diabetes compared to All Other Manitobans in Manitoba (12.0% vs. 8.9%)

Aggregate areas (Figure 4.2.1):

- Metis have a higher prevalence of diabetes compared to All Other Manitobans in Rural South (10.1% vs. 7.9%) and Mid (12.5% vs. 9.5%) aggregate areas whereas Metis have a lower prevalence of diabetes compared to All Other Manitobans in North aggregate area (15.9% vs. 18.6%)
- Metis have a higher prevalence of diabetes compared to their provincial average in North aggregate area (15.9% vs. 12.0%) whereas Metis have a lower prevalence of diabetes compared to their provincial average in Rural South aggregate area (10.1% vs. 12.0%)
- All Other Manitobans have a higher prevalence of diabetes compared to their provincial average in the Mid (9.5% vs. 8.9%) and North (18.6% vs. 8.9%) aggregate areas whereas All Other Manitobans have a lower prevalence of diabetes compared to their provincial average in the Rural South aggregate area (7.9% vs. 8.9%)
- Aggregate areas for both Metis and All Other Manitobans clearly follow a PMR pattern, with the prevalence of diabetes increasing from Rural South to North aggregate areas – that is, from most healthy to least healthy

RHAs (Figure 4.2.1):

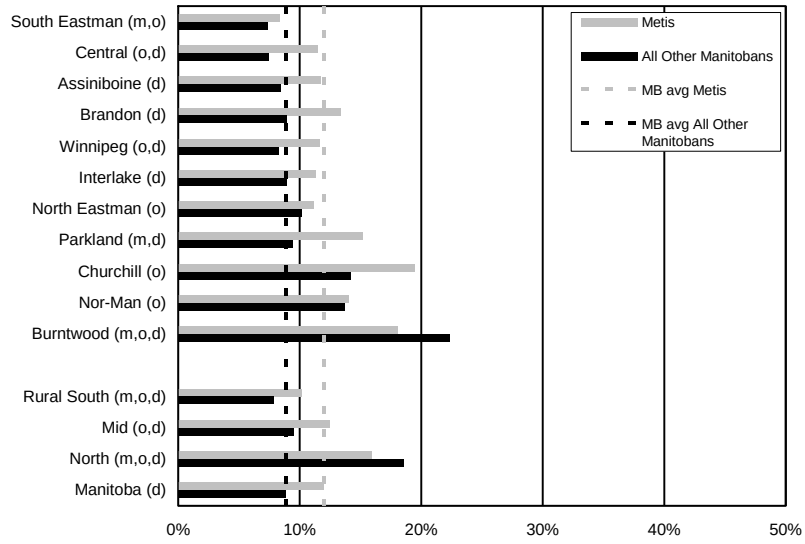
- Metis have a higher prevalence of diabetes compared to All Other Manitobans in Central (11.5% vs. 7.5%), Assiniboine (11.7% vs. 8.5%), Brandon (13.4% vs. 8.9%), Winnipeg (11.7% vs. 8.3%), Interlake (11.4% vs. 8.9%), and Parkland (15.2% vs. 9.4%) RHAs whereas Metis have a lower prevalence of diabetes compared to All Other Manitobans in Burntwood RHA (18.1% vs. 22.3%)
- Metis have a higher prevalence of diabetes compared to their provincial average in Parkland (15.2% vs. 12.0%) and Burntwood (18.1% vs. 12.0%) RHAs whereas Metis have a lower prevalence of diabetes compared to their provincial average in South Eastman RHA (8.4% vs. 12.0%)
- All Other Manitobans have a higher prevalence of diabetes compared to their provincial average in North Eastman (10.2% vs. 8.9%), Churchill (14.2% vs. 8.9%), Nor-Man (13.7% vs. 8.9%), and Burntwood (22.3% vs. 8.9%) RHAs whereas All Other Manitobans have a lower prevalence of diabetes compared to their provincial average in South Eastman (7.4% vs. 8.9%), Central (7.5% vs. 8.9%), and Winnipeg (8.3% vs. 8.9%) RHAs
- There is a slight PMR gradient for the RHAs, with the prevalence of diabetes appearing to increase from the most healthy RHAs at the top of the graph to the least healthy RHAs at the bottom of the graph

Winnipeg CAs (Figure 4.2.2):

- Metis have a higher prevalence of diabetes compared to All Other Manitobans in Fort Garry (9.7% vs. 7.1%), St. Boniface (9.9% vs. 7.4%), St. Vital (9.9% vs. 7.4%), Transcona (10.7% vs. 8.7%), River Heights (11.9% vs. 6.9%), River East (11.4% vs. 7.9%), Seven Oaks (11.7% vs. 9.6%), St. James – Assiniboia (10.8% vs. 7.7%), Inkster (14.0% vs. 10.9%), Downtown (15.9% vs. 10.6%), and Point Douglas (15.8% vs. 11.5%)
- Metis have a higher prevalence of diabetes compared to their provincial average in Downtown (15.9% vs. 12.0%) and Point Douglas (15.8% vs. 12.0%) CAs whereas Metis have a lower prevalence of diabetes compared to their provincial average in Assiniboine South (7.8% vs. 12.0%), St. Boniface (9.9% vs. 12.0%), and St. Vital (9.9% vs. 12.0%) CAs
- All Other Manitobans have a higher prevalence of diabetes compared to their provincial average in Seven Oaks (9.6% vs. 8.9%), Inkster (10.9% vs. 8.9%), Downtown (10.6% vs. 8.9%), and Point Douglas (11.5% vs. 8.9%) CAs whereas All Other Manitobans have a lower prevalence of diabetes compared to their provincial average in Fort Garry (7.1% vs. 8.9%), Assiniboine South (6.0% vs. 8.9%), St. Boniface (7.4% vs. 8.9%), St. Vital (7.4% vs. 8.9%), River Heights (6.9% vs. 8.9%), River East (7.9% vs. 8.9%), and St. James – Assiniboia (7.7% vs. 8.9%) CAs
- There is a slight gradient of PMR for Winnipeg CAs, with some evidence of a lower prevalence of diabetes in the most healthy CAs and higher prevalence of diabetes in the least healthy CAs

Figure 4.2.1: Diabetes Prevalence for Metis and All Other Manitobans by RHA, 2004/05-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a three-year period

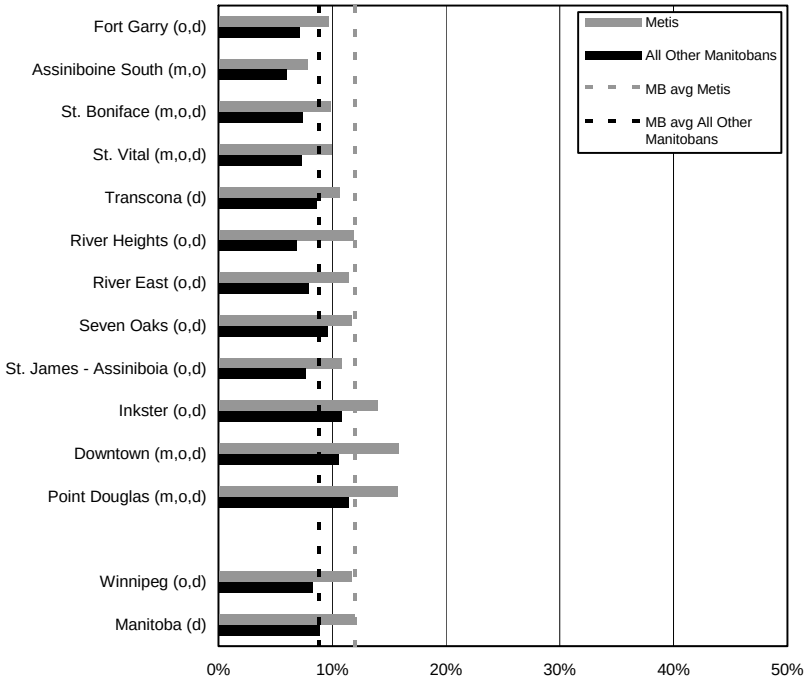


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.2.2: Diabetes Prevalence for Metis and All Other Manitobans by Winnipeg Community Area, 2004/05-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a three-year period



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

4.3 Diabetes Prevalence by Age and Sex

Key observations:

Metis and All Other Manitobans

Manitoba (Figure 4.3.1):

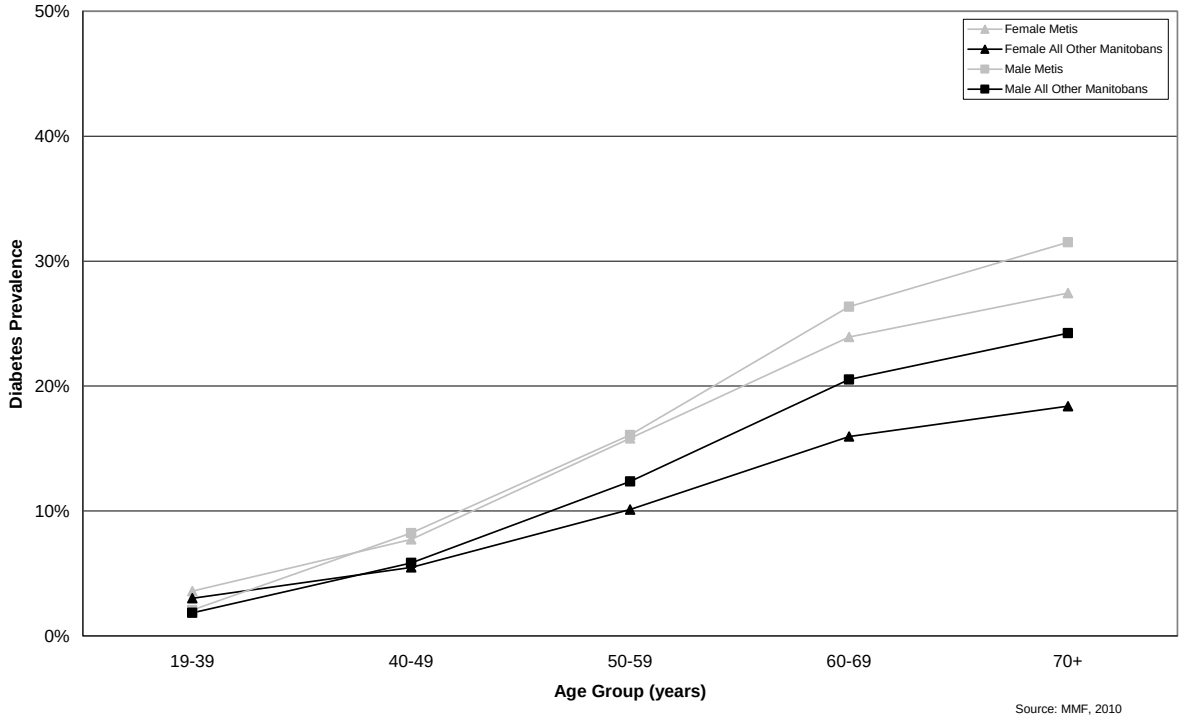
- Metis and All Other Manitoban males aged 19-39 years have similar crude rates of diabetes (2.1% vs. 1.9%)
- Metis and All Other Manitoban females aged 19-39 years have similar crude rates of diabetes (3.6% vs. 3.0%)
- From age 40-49 years onwards, Metis males have a higher crude rate of diabetes than All Other Manitoban males and Metis females have a higher crude rate of diabetes than All Other Manitoban females
- From age 50-59 years onwards, the difference in diabetes crude rate between Metis males and females is less than the difference in diabetes crude rate between All Other Manitoban males and females
- The difference in crude rates of diabetes between Metis males and females begins to escalate after age 50-59 years, while the difference in crude rates of diabetes between All Other Manitoban males and females begins to escalate after age 40-49 years

Winnipeg (Figure 4.3.2):

- Metis and All Other Winnipeg males aged 19-39 have similar crude rates of diabetes (2.1% vs. 1.6%)
- Metis and All Other Winnipeg females aged 19-39 have similar crude rates of diabetes (3.3% vs. 2.5%)
- Metis males and females from aged 40-49 onwards have higher crude rates of diabetes compared to All Other males and females in Winnipeg
- From age group 60-69 Metis males have much higher crude rate of diabetes compared to All Other males in Winnipeg (26.3% vs. 20.5%)
- For age group 70+ Metis males and Metis females have much higher crude rate of diabetes compared to All Other males and females in Winnipeg; (31.5% vs. 27.4%) and (24.2% vs. 18.3%), respectively
- The difference in crude rates of diabetes for both Metis males and females is slightly higher in age group 40-49 and 50-59; and differences for both Metis males and females in crude rates increases in age groups 60-69 and 70+ compared to All Other Manitoban males and females

Figure 4.3.1: Diabetes Prevalence in Manitoba by Age and Sex for Metis and All Other Manitobans, 2004/05-2006/07

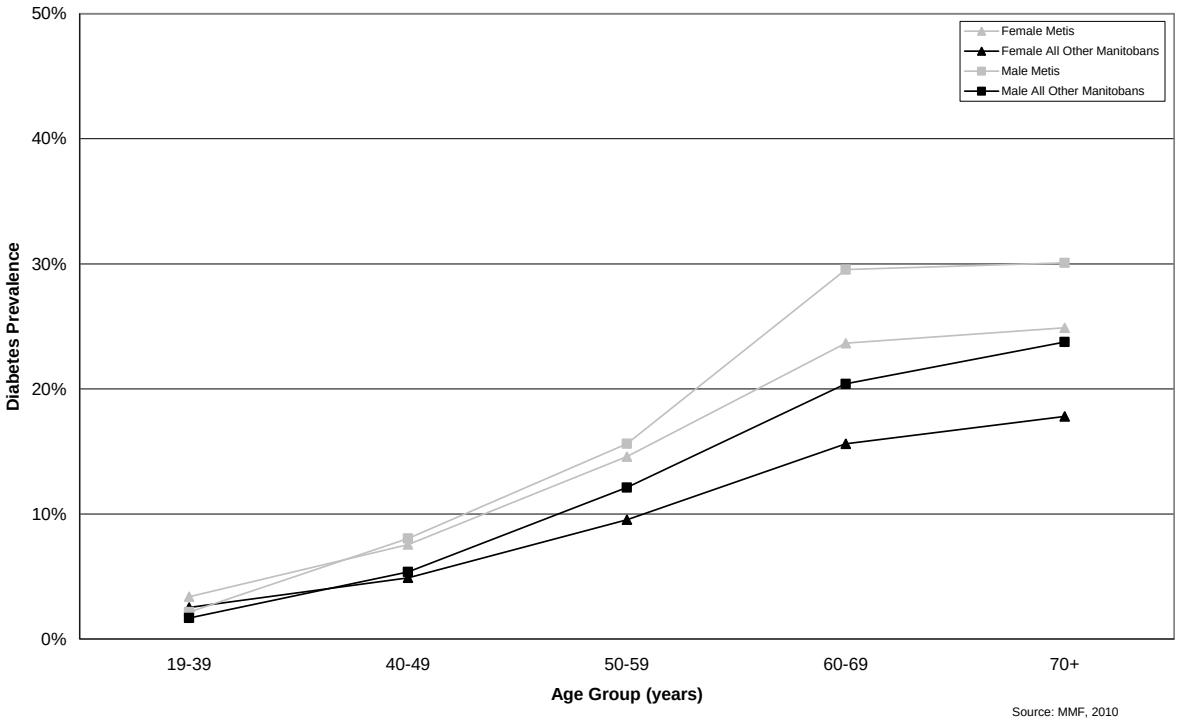
Crude percent of residents aged 19+ in a three-year period



Source: MMF, 2010

Figure 4.3.2: Diabetes Prevalence in Winnipeg by Age and Sex for Metis and All Other Manitobans, 2004/05-2006/07

Crude percent of residents aged 19+ in a three-year period



Source: MMF, 2010

4.4 Logistic Regression: Probability of Diabetes

Logistic regression is a statistical process intended to 'predict' the probability of something occurring while taking into account other factors. This is called 'controlling' for these factors. Logistic regression allows us to determine if any of a group of factors can uniquely predict a certain outcome, including behaviours or the development of a specific disease (Hassard, 1991). In the following logistic regression table, factors considered to determine the probability of developing diabetes were: income, sex, geographic area, age (linear and quadratic), and mental and physical comorbidities.

As noted in Section 1, it is important to remember that in the logistic regression tables, only the first factor – Metis (vs. All Other Manitobans) – compares Metis and All Other Manitobans. Each of the other factors applies to *all* Manitobans, Metis and All Other Manitobans combined.

Key observations (Table 4.4.1):

- Metis are at a greater risk of developing diabetes compared to All Other Manitobans (aOR 1.30, 95% CI 1.25-1.34) after controlling for the other factors
- Manitobans in North aggregate region have a higher risk of developing diabetes compared to Manitobans living elsewhere (aOR 1.94, 95% CI 1.89-1.99) after controlling for the other factors
- Risk of developing diabetes increases with age (aOR 1.19, 95% CI 1.187-1.94) after controlling for the other factors
- Males in Manitoba are at a greater risk for developing diabetes compared to females in Manitoba (aOR 1.14, 95% CI 1.12-1.16) after controlling for the other factors
- Manitobans with a higher household income are at lower risk of developing diabetes compared to those with a lower household income (aOR 0.89, 95% CI 0.89-0.90) after controlling for the other factors
- Manitobans with a mental illness have a higher risk of developing diabetes compared to those without a mental illness (aOR 1.03, 95% CI 1.01-1.05) after controlling for the other factors
- Manitobans with a major physical illness have a higher risk of developing diabetes compared to those without a major physical illness (aOR 1.64, 95% CI 1.61-1.67) after controlling for the other factors

Table 4.4.1: Logistic Regression Modeling of the Risk of Diabetes

Probability of Diabetes by Aggregate Region, 2004/05-2006/07, all Manitoba residents aged 19+		
Variable	**Adjusted Odds Ratio (95% Confidence Interval)**	**p-value**
Metis (vs. All Other Manitobans)	**1.295 (1.255-1.337)**	**<0.001**
Aggregate Regions (ref=Manitoba)		
South	**0.730 (0.717-0.744)**	**<0.001**
Mid	**0.906 (0.889-0.923)**	**<0.001**
North	**1.937 (1.889-1.987)**	**<0.001**
Brandon	**0.882 (0.855-0.910)**	**<0.001**
Winnipeg	**0.885 (0.873-0.897)**	**<0.001**
Age, linear	**1.191(1.187-1.194)**	**<0.001**
Age, quadratic	**0.998 (0.998-0.9988)**	**<0.001**
Sex (Males vs. Females)	**1.141 (1.124-1.160)**	**<0.001**
Average Household Income of Neighborhood (per $10,000)	**0.892 (0.889-0.896)**	**<0.001**
Mental Illness ADGs	**1.029 (1.008-1.050)**	**0.0055**
Major Physical Illness ADGs	**1.640 (1.613 -1.667)**	**<0.001**

Bold = statistically significant results

Note: Please see Glossary for definition of all variables. Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Diabetes is a global health issue. Worldwide there were more than 171 million people with diabetes in 2000, and it is estimated that the global prevalence of this illness will increase to 366 million by 2030 (WHO, 2006). In Canada it was estimated that in 2005, 1.9 million individuals (5.5% of the population) had been diagnosed with diabetes (PHAC, 2007). These numbers will continue to grow as the demographics of Canada – including an aging population, increasing immigration from populations at high risk of developing diabetes, and growth of the First Nations, Metis and Inuit populations – evolve (Dannenbaum, Dawson, Harris, & Wortman, 2008; Harvey, Harris, & Sohol, 2008; Woo, 2008).

Screening for diabetes is an important population health measure. In one community-based screening program in Alberta, 3,148 adults without diabetes were screened. The sample consisted of First Nations, Metis, and 'non-Aboriginal' participants. The authors reported that Metis had the highest prevalence of pre-diabetes, and were more likely than First Nations (but not more likely than non-Aboriginals) to be overweight (but not obese). They also found that Metis had 'intermediate values' for obesity and abnormal waists (that is, between First Nations and non-Aboriginals) and that Metis were more likely to have metabolic syndrome than non-Aboriginals (Oster & Toth, 2009).

Janz, Seto, & Turner (2009) found that 7% of Metis self-reported having been diagnosed with diabetes compared to 4% of the total Canadian Population. Analysis of the 1991 Aboriginal Peoples Survey (APS) determined a crude prevalence of self-reported diabetes of 6.1% in the Metis of western Canada - twice the rate (3%) found in all other Canadians in the same region (Bruce, 2000). In the Metis Atlas (Martens, Bartlett, et al., 2010) Metis had a significantly higher age- and sex-adjusted prevalence of diabetes compared to All Other Manitobans (11.8% vs. 8.8%) at the provincial level and a significantly higher prevalence for Metis compared to All Other Manitobans in the Rural South (10.0% vs. 7.8%) and Mid (12.3% vs. 9.7%) aggregate areas. In our study the age- and sex-adjusted prevalence of diabetes at the provincial level is similar to the Metis Atlas (12.0% vs. 8.9%). Also similar to the Metis Atlas, significantly higher rates were seen in Metis compared to All Other Manitobans in Rural South (10.1% vs. 7.9%) and Mid (12.5% vs. 9.5%) aggregate areas. A lower prevalence of diabetes in North aggregate area for Metis compared to All Other Manitobans in our study is likely due to the proportionally larger First Nations population in that region. As in the Metis Atlas, in our study Metis have a higher prevalence of diabetes compared to All Other Manitobans in Central (11.5% vs. 7.5%), Assiniboine (11.7% vs. 8.5%), Brandon (13.4% vs. 8.9%), Winnipeg (11.7% vs. 8.3%), Interlake (11.4% vs. 8.9%), and Parkland (15.2% vs. 9.4%) RHAs whereas Metis have a lower prevalence rate compared to All Other Manitobans in Burntwood (18.1% vs. 22.3%) RHA.

Both the Metis Atlas and our study include a logistic regression table, and in both studies Metis are found to be at a greater risk of developing diabetes compared to All Other Manitobans. Both studies also show that males are at an increased risk of developing diabetes compared to females, and that having a physical or mental illness increases one's risk of developing diabetes.

The information contained in this report confirms that not only do Metis have a higher prevalence of diabetes than do All Other Manitobans in the province; they also have a higher probability of developing diabetes in their lifetimes, even after controlling for other factors. This has significant policy implications for the health care delivery system.

4.5 Ischemic Heart Disease Prevalence

Ischemic Heart Disease (IHD) is defined as a blockage or constriction of the arteries causing inadequate blood supply to the heart. Ultimately IHD can lead to a heart attack (Poirier, 2008). People with diabetes and especially women with diabetes are at higher risk of developing heart disease, and at an earlier age than those who do not have diabetes (Booth, Kapral, Fung, & Tu, 2006).

The age- and sex-adjusted prevalence of IHD, as well as age-and sex-specific prevalence, was measured for residents aged 19 and older over five fiscal years: 2002/03-2006/07. Residents were considered to have IHD if they met one of the following conditions:

- one or more hospitalizations with a diagnosis of IHD: ICD-9-CM codes 410-414; ICD-10-CA codes I20-I22, I24, I25
- two or more physician visits with a diagnosis of IHD (ICD-9-CM codes as above)
- one physician visit with a diagnosis of IHD (ICD-9-CM codes as above) and two or more prescriptions for medications to treat IHD (see Glossary for a complete list)

The denominator includes all Manitoba residents with diabetes aged 19 and older as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.5.1):

- Metis have a higher prevalence of IHD compared to All Other Manitobans (19.7% vs. 16.9%)

Aggregate areas (Figure 4.5.1):

- Metis have a higher prevalence of IHD compared to All Other Manitobans in Rural South (16.5% vs. 13.8%) and Mid (19.5% vs. 16.4%) aggregate areas
- All Other Manitobans have a lower prevalence of IHD compared to their provincial average in the Rural South aggregate area (13.8% vs. 16.9%)
- There is no association between IHD prevalence and PMR for Metis or All Other Manitobans (IHD prevalence does not increase from the most healthy Rural South to the least healthy North)

RHAs (Figure 4.5.1):

- Metis have a higher prevalence of IHD compared to All Other Manitobans in Central (18.3% vs. 13.5%), Brandon (19.7% vs. 13.2%), Winnipeg (19.7% vs. 16.1%), and Parkland (23.9% vs. 18.5%) RHAs whereas Metis have a lower prevalence of IHD compared to All Other Manitobans in Burntwood RHA (14.3% vs. 19.5%)
- Metis have a lower prevalence of IHD compared to their provincial average in Assiniboine RHA (11.9% vs. 19.7%)
- All Other Manitobans have a higher prevalence of IHD compared to their provincial average in Burntwood RHA (19.5% vs. 16.9%) whereas All Other Manitobans have a lower prevalence of IHD compared to their provincial average in South Eastman (14.4% vs. 16.9%), Central (13.5% vs. 16.9%), Assiniboine (12.1% vs. 16.9%),

Brandon (13.2% vs. 16.9%), Interlake (13.8% vs. 16.9%), and North Eastman (14.1% vs. 16.9%) RHA

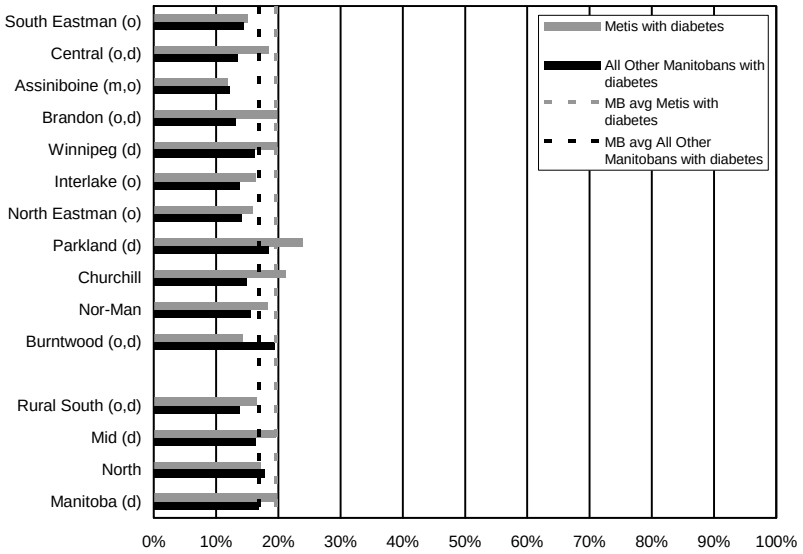
- There is no obvious PMR gradient across RHAs. (IHD prevalence does not increase steadily from the most healthy RHAs to the least healthy aggregate RHAs)

Winnipeg CAs (Figure 4.5.2):

- Metis have a higher prevalence of IHD compared to All Other Manitobans in River East (19.4% vs. 14.5%) and Inkster (25.0% vs. 14.1%) CAs
- All Other Manitobans have a lower prevalence of IHD compared to their provincial average in Fort Garry (13.3% vs. 16.9%), Assiniboine South (14.0% vs. 16.9%), St. Boniface (14.4% vs. 16.9%), St.Vital (14.5% vs. 16.9%), River Heights (14.3% vs. 16.9%), River East (14.5% vs. 16.9%), Seven Oaks (14.8% vs. 16.9%), St. James – Assiniboia (14.7% vs. 16.9%), and Inkster (14.1% vs. 16.9%) CAs
- There does not appear to be a correlation with PMR in the CAs – that is, IHD prevalence does not increase from most healthy to least healthy CAs. Surprisingly, Point Douglas and Downtown CAs do not have higher prevalence of IHD in Metis or in All Other Manitobans

Figure 4.5.1: Ischemic Heart Disease Prevalence by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period

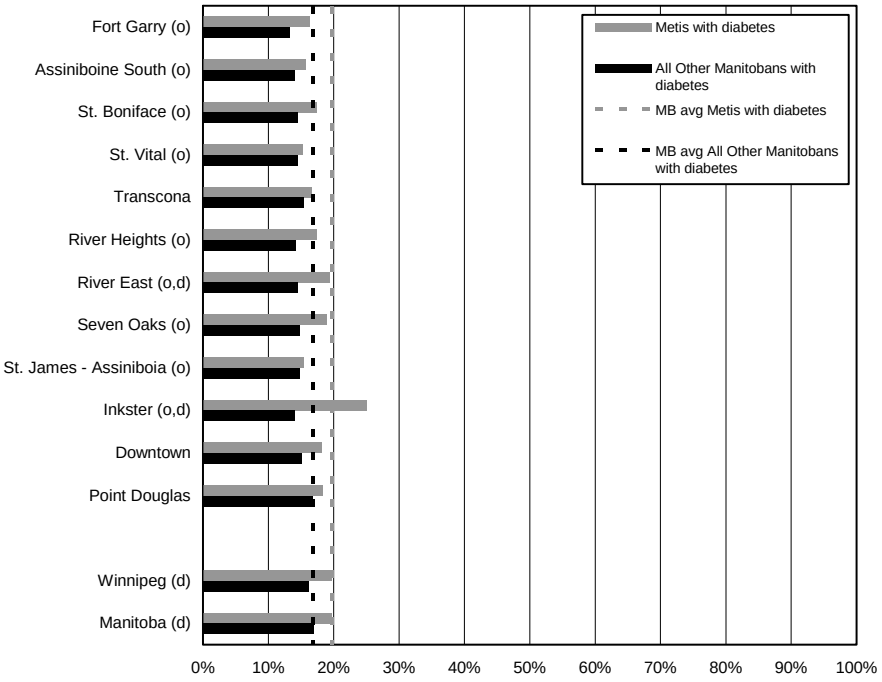


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.5.2: Ischemic Heart Disease Prevalence by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

4.6 Ischemic Heart Disease Prevalence by Age and Sex

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.6.1):

- Throughout most of their lives, Metis males have a higher crude prevalence of IHD than All Other Manitoban males, and Metis females have a higher crude prevalence of IHD than All Other Manitoban females
- For Metis and All Other Manitobans the crude prevalence of IHD for both sexes increases steadily until 65-69 years of age and rapidly begins to rise thereafter
- Metis males have the highest prevalence of IHD at age 70+ (63.8%)
- For each age range Metis males with diabetes have a higher crude prevalence of IHD compared to Metis females with diabetes, and All Other Manitoban males with diabetes have a higher crude prevalence of IHD compared to All Other Manitoban females with diabetes
- Metis females have a crude prevalence of IHD fairly similar to All Other Manitoban females until the 55-59 age range, at which point there is a steadily widening gap with Metis females having a higher rate compared to All Other Manitoban females
- Between the age ranges of 55-59 and 60-64 years, Metis females have an absolute increase of 13.4% in prevalence of IHD (from 21.2% to 34.6%)

Winnipeg (Figure 4.6.2):

- Crude prevalence of IHD rises steadily for all groups until age 59 and then increases rapidly for Metis males and Metis females; prevalence for All Other Manitoban males and All Other Manitoban females only increase rapidly in the age 70+ range
- At age 65-69 years the rate continues to increase for Metis females but drops for Metis males
- At 70+ years of age Metis males with diabetes have the highest rate of IHD prevalence and Metis females with diabetes are higher compared to All Other Manitoba females with diabetes

Figure 4.6.1: Ischemic Heart Disease Prevalence in Manitoba by Age and Sex for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Crude percent of residents aged 19+ in a five-year period

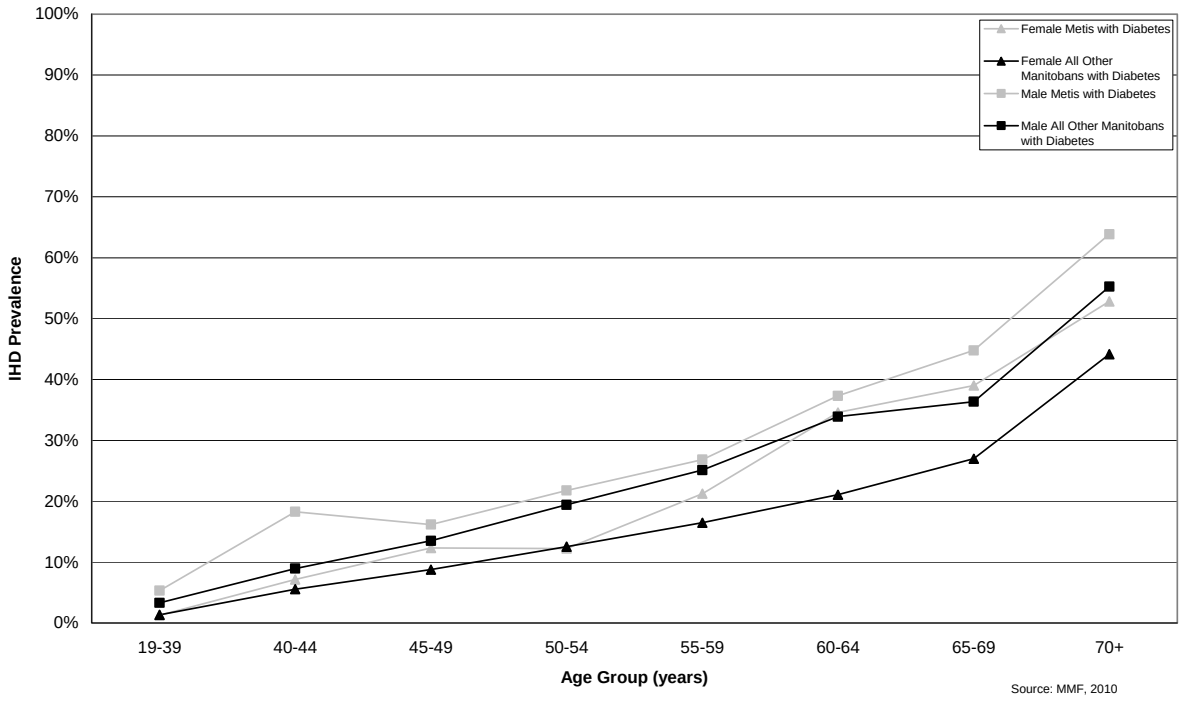
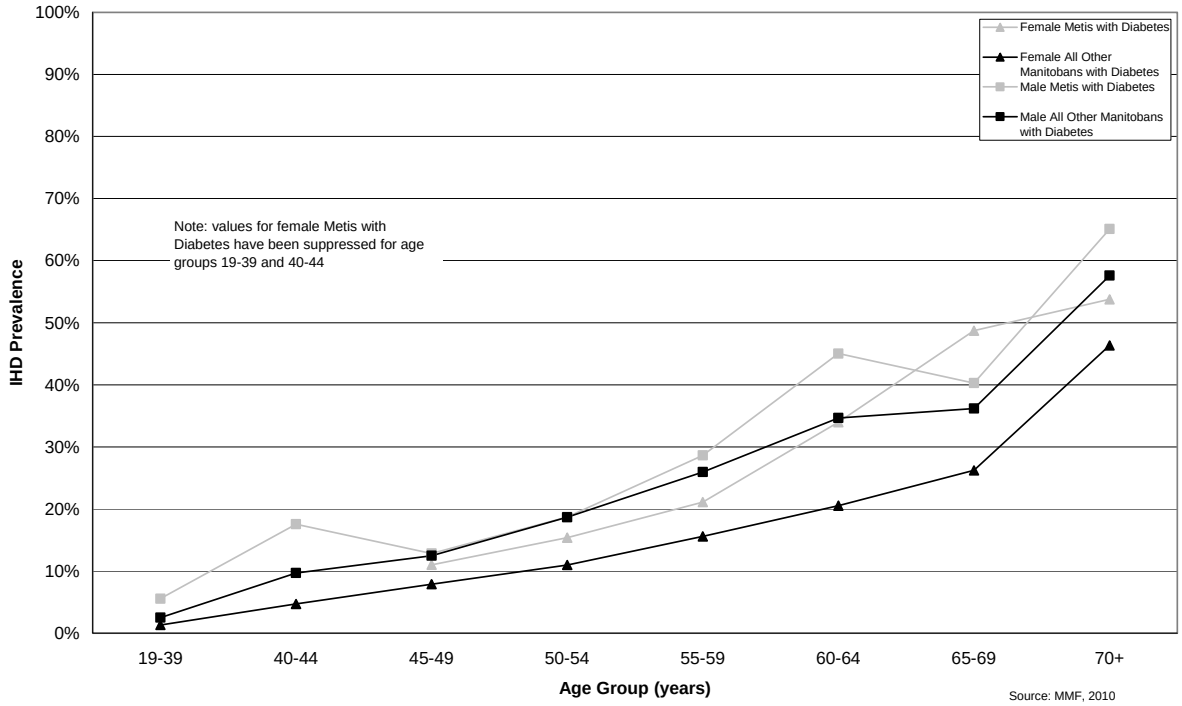


Figure 4.6.2: Ischemic Heart Disease Prevalence in Winnipeg by Age and Sex for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Crude percent of residents aged 19+ in a five-year period



Findings from Literature Review

(compared to the results in this study – *in italics*):

Modifiable risk factors for heart disease include unhealthy diet, physical inactivity, and tobacco use (PHAC, 2009; Woo, 2008). Intermediate risk factors for cardiovascular disease include raised blood pressure, raised blood glucose, raised blood lipids, and being overweight or obese (Lloyd-Jones et al., 2006).

In the Aboriginal Peoples Survey 7% of Metis males and females reported 'heart problems' (Janz et al., 2009). In a survey in British Columbia 27.2% of Metis respondents identified themselves or a family member as living with 'heart disease' (Hutchinson, Evans, & Reid, 2007). In both of those studies 'heart problems' and 'heart disease' were not specifically defined (e.g. cardiovascular disease or ischemic heart disease). In the Metis Atlas (Martens, Bartlett, et al., 2010) the age- and sex-adjusted rate of IHD was found to be significantly higher for Metis compared to All Other Manitobans (12.2% vs. 8.7%) in Manitoba. Moreover, most Winnipeg CAs (CAs) showed a higher rate for Metis compared to All Other Manitobans. The information in those studies was not specific to those living with diabetes.

Bruce (2000) conducted the first study on the impact of diabetes on self-identified Metis people in Canada, using data from the 1991 Aboriginal Peoples Survey. In that study the prevalence of 'heart problems' in Metis with diabetes in Western Canada was 32% for those aged 50-64 and 55% for those aged 65 and over. This finding, although not containing a definitive diagnosis, is consistent with the crude rates of ischemic heart disease in Manitoba Metis with diabetes reported in our study: 25.3% for those aged 50-64 and 51.8% for those aged 65 and over.

In our study Metis with diabetes have a significantly higher age- and sex-adjusted prevalence of ischemic heart disease than do All Other Manitobans with diabetes (19.7% vs. 16.9%). There are regional variations with higher rates seen in Metis with diabetes in Rural South (16.5% vs. 13.8%) and Mid (19.5 % vs. 16.4%) aggregate areas. There is not a significantly higher prevalence of ischemic heart disease in Metis compared to All Other Manitobans in North aggregate area (17.2% vs. 17.9%) as the rate for All Other Manitobans will be influenced by the large number of First Nations people represented in that sample.

The higher rates reported in the Rural South and Mid aggregate areas may suggest the continuing need for programs directed at the risk factors for IHD identified earlier. Ongoing screening for earlier identification of diabetes may also assist in preventing this complication.

4.7 Hypertension Prevalence

Commonly known as high blood pressure, hypertension is defined as repeated blood pressure measurements exceeding 140/90 mmHg for individuals without diabetes and 130/80 for individuals with diabetes (Quinn et al., 2010). Hypertension is a risk factor for heart attack, stroke, transient ischemic attack, retinopathy, and kidney damage, and is managed with regular aerobic exercise, weight reduction, salt reduction, and medications (Culleton et al., 2008). It is recommended that a rate of blood pressure at or below 130/80 for all individuals with diabetes be maintained to prevent complications (McFarlane, Holden, Harris, & Tobe, 2003).

The age- and sex-adjusted prevalence of hypertension, as well as age- and sex-specific prevalence, was measured for residents with diabetes aged 19 and older over one fiscal year: 2006/07. Residents were considered to have hypertension if they met one of the following conditions:

- one or more hospitalizations with a diagnosis of hypertension: ICD-9-CM codes 401-405; ICD-10-CA codes I10-I13, I15
- one or more physician visits with a diagnosis of hypertension (ICD-9-CM codes as above)
- two or more prescriptions for medication to treat hypertension (see Glossary for listing of medications)

The denominator includes all Manitoba residents with diabetes aged 19 and older as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.7.1):

- Metis have a lower prevalence of hypertension compared to All Other Manitobans in Manitoba (46.9% vs. 51.5%)

Aggregate areas (Figure 4.7.1):

- Metis in North aggregate area have a lower prevalence of hypertension compared to All Other Manitobans in North aggregate area (50.2% vs. 58.4%)
- Metis have a lower prevalence of hypertension compared to their provincial average in the Rural South aggregate area (40.5% vs. 46.9%)
- All Other Manitobans have a higher prevalence compared to their provincial average in North aggregate area (58.4% vs. 51.5%) whereas All Other Manitobans have a lower prevalence of hypertension compared to their provincial average in the Rural South aggregate area (41.6% vs. 51.5%)
- Hypertension follows a PMR pattern for Metis and All Other Manitobans, with prevalence increasing from Rural South to North aggregate areas

RHAs (Figure 4.7.1):

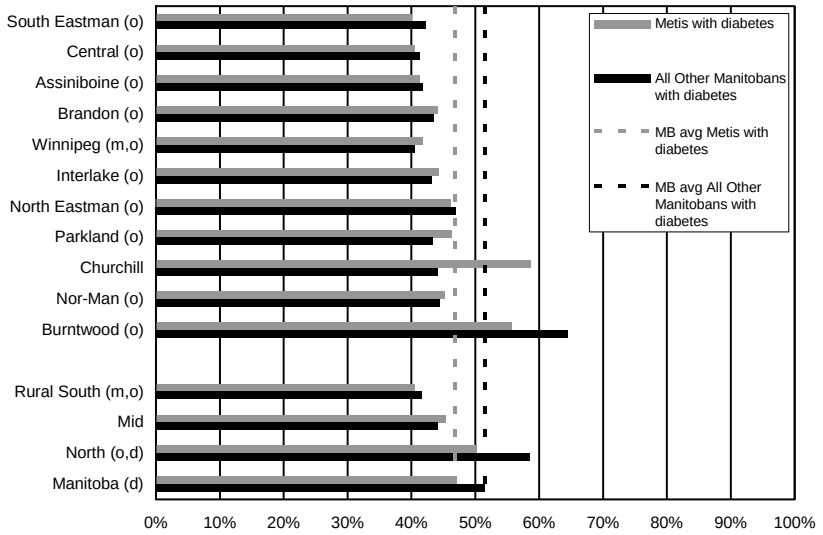
- Metis in Winnipeg RHA have a lower prevalence of hypertension compared to their provincial average for Metis (41.8% vs. 46.9%)
- All Other Manitobans have a higher prevalence of hypertension compared to their provincial average in Burntwood RHA (64.4% vs. 51.5%) whereas All Other Manitobans have a lower prevalence of hypertension compared to their provincial average in South Eastman (42.2% vs. 51.5%), Central (41.2% vs. 51.5%), Assiniboine (41.8% vs. 51.5%), Brandon (43.4% vs. 51.5%), Winnipeg (40.4% vs. 51.5%), Interlake (43.1% vs. 51.5%), North Eastman (46.9% vs. 51.5%), Parkland (43.3% vs. 51.5%), and Nor-Man (44.4% vs. 51.5%) RHAs
- There is a slight PMR gradient for Metis, with hypertension prevalence appearing to increase slightly from the most healthy to the least healthy RHAs

Winnipeg CAs (Figure 4.7.2):

- All Other Manitobans have a lower prevalence of hypertension compared to their provincial average in Fort Garry (39.1% vs. 51.5%), Assiniboine South (37.7% vs. 51.5%), St. Boniface (38.9% vs. 51.5%), St. Vital (38.4% vs. 51.5%), Transcona (41.0% vs. 51.5%), River Heights (38.6% vs. 51.5%), River East (40.9% vs. 51.5%), Seven Oaks (40.4% vs. 51.5%), St. James – Assiniboia (40.7% vs. 51.5%), Inkster (42.8% vs. 51.5%), Downtown (42.9% vs. 51.5%), and Point Douglas (42.8% vs. 51.5%) CAs
- There is no PMR gradient, as hypertension prevalence does not appear to increase from most healthy to least healthy Winnipeg CAs

Figure 4.7.1: Hypertension Prevalence by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted percent of residents aged 19+ treated for high blood pressure

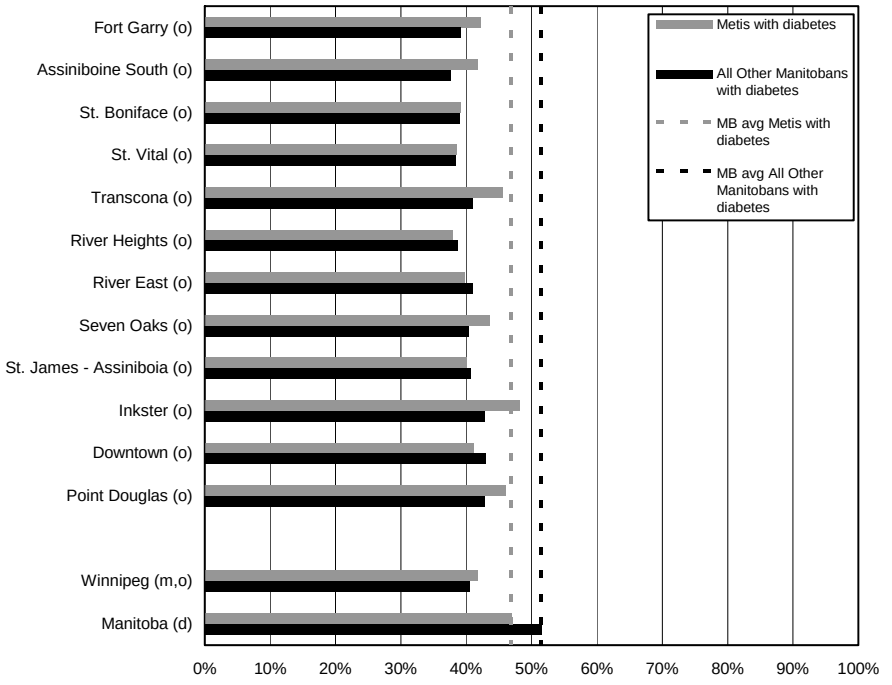


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.7.2: Hypertension Prevalence by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted percent of residents aged 19+ treated for high blood pressure



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

4.8 Hypertension Prevalence by Age and Sex

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.8.1):

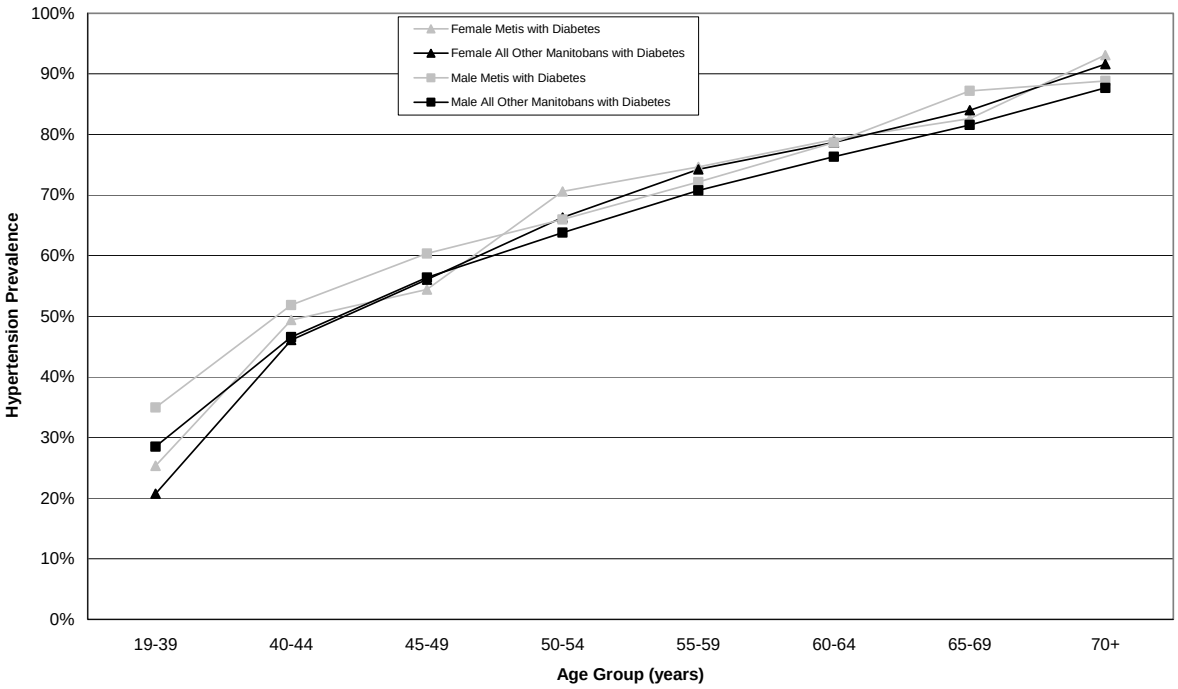
- Between the ages of 19 and 70+ years, Metis males and females and All Other Manitoban males and females have very similar crude prevalence of hypertension which increase with age
- In the 19-39 year age range Metis males have a higher crude prevalence of hypertension compared to Metis females (35.0% vs. 25.3%)
- At age 70+ years close to 90% of Metis males and females and All Other Manitoban males and females have hypertension, with Metis females slightly higher than Metis males (93.1% vs. 88.8%)

Winnipeg (Figure 4.8.2):

- In the 19-39 years age range Metis males have a higher crude prevalence of hypertension than All Other Manitoban males (30.6% vs. 25.2%)
- Between the 19-39 and 40-44 year age ranges, Metis males have a sharp spike in absolute rate of crude hypertension prevalence (from 30.6% to 54.0%)
- Between ages 55 and 59 approximately 70% of Metis and All Other Manitobans of both sexes have hypertension
- From the age of 70 years onwards, high prevalence of hypertension exist in all groups, with a rate of almost 90% in Metis and All Other Manitoban females (89.4% vs. 89.9%)

Figure 4.8.1: Hypertension Prevalence in Manitoba by Age and Sex for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

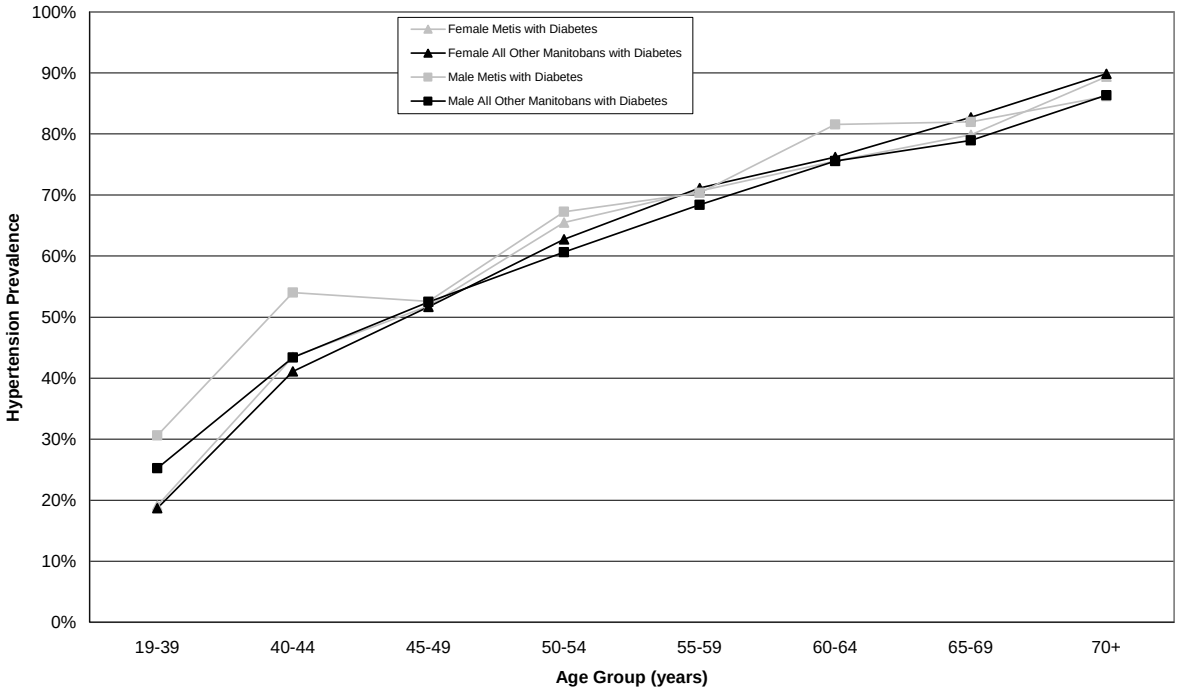
Crude percent of residents aged 19+



Source: MMF, 2010

Figure 4.8.2: Hypertension Prevalence in Winnipeg by Age and Sex for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Crude percent of residents aged 19+



Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Hypertension is often a comorbid condition with diabetes. Canadian adults with diabetes are almost four times more likely to be hospitalized with hypertension compared to those without diabetes (PHAC, 2009). Ensuring blood pressure is maintained at or below 130/80 mmHg may result in the prevention of cardiovascular and renal complications associated with diabetes (Tobe et al., 2010). It has been found that for those with diabetes each 10 mmHg increase in systolic blood pressure resulted in a 13% increased risk of microvascular disease (Alder, Stratton, & Neil, 2000).

Using results from the Aboriginal Peoples Survey Bruce (2000) described higher self reported rates of high blood pressure by Metis with diabetes compared to Metis without diabetes in the age ranges of 25-49 (26% vs. 10%), 50-64 (52% vs. 23%), and 65+ (36% vs. 33%). In another study hypertension was reported by 16% of Metis respondents (with *and* without diabetes) compared to a rate of 12% in the total population (Janz et al., 2009).

In the Metis Atlas (Martens, Bartlett, et al., 2010) there was a significantly higher age- and sex-adjusted prevalence of hypertension in Metis compared to All Other Manitobans (27.9% vs. 24.8%) in Manitoba. While Metis rates are similar to those for All Other Manitobans in Rural South and Mid aggregate areas, they are lower compared in North aggregate area, where there is a higher proportion of First Nations individuals, who tend to have relatively poorer health status in Manitoba. Within Winnipeg there was a higher prevalence of hypertension in Metis compared to All Other Manitobans in St. Vital (26.0% vs. 23.4%), Transcona (28.4% vs. 24.9%), River Heights (25.7% vs. 22.6), River East (27.5% vs. 24.0%), and Downtown (27.2% vs. 24.3%) CAs. The information in the Metis Atlas was not specific to those living with diabetes.

There are no comparative studies examining prevalence rates of hypertension for Metis with diabetes in the literature. In our study Metis with diabetes have a lower age- and sex-adjusted prevalence of hypertension compared to All Other Manitobans with diabetes in Manitoba (46.9% vs. 51.5%). In Burntwood RHA All Other Manitobans with diabetes are higher compared to their provincial average (64.4% vs. 51.5%). Higher rates of hypertension in this group may be related to the higher number of First Nations Peoples in that area. In all other RHAs (with the exception of Churchill) and in every Winnipeg CA the prevalence of hypertension for All Other Manitobans is lower than their provincial average.[6]

The difference in prevalence of hypertension in this study compared to the Metis Atlas suggests that there is some inconsistency that bears further examination and ongoing surveillance.

[6]During the statistical modeling phase of the analysis of hypertension prevalence, it was found that the average estimates for All Other Manitobans with diabetes for the northern RHAs and the corresponding North aggregate region differed more than would be expected due to statistical noise. Parameter estimates taken from different regression models can produce varying results, but in this case the estimate from the aggregate region model, compared to those from the RHA/WINNIPEG CA model, was much higher than was desired. To ensure that all estimated hypertension prevalence values fit well across the RHAs and aggregate regions, this was corrected using a weighted average of the northern RHA estimates (from the RHA/CA model) to calculate the North aggregate region estimate.

4.9 Acute Myocardial Infarction (AMI or Heart Attack) Incidence Rate

Acute myocardial infarction (AMI) or heart attack refers to the death of cardiac heart cells due to prolonged lack of blood to the heart (Boersma et al., 2003). Heart attacks account for 11% of all deaths in Canada annually (Fitchett, 2008).

The age- and sex-adjusted incidence of AMI for residents aged 40 and older with diabetes was measured in the five fiscal years 2002/03-2006/07. AMI was defined as:

- an inpatient hospitalization with the most responsible diagnosis of AMI and a length of stay of three or more days (unless the patient died in hospital)
- a death with AMI listed as the primary cause of death on the Vital Statistics death record

Diagnosis codes used to identify an AMI include ICD-9-CM code 410 and ICD-10-CA code I21. Hospitalizations for less than three days were excluded as likely 'rule out' AMI cases; transfers between hospitals were tracked to ensure all 'true' AMI cases staying at least three days in hospital(s) were counted.

The denominator includes all Manitoba residents with diabetes aged 40 and older as of December 31 of each year (2002-2006).

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.9.1):

- There is no difference in incidence of AMI for Metis compared to All Other Manitobans in Manitoba (10.7 vs. 9.1 per 1,000 residents)

Aggregate areas (Figure 4.9.1):

- There are no differences in incidence of AMI in aggregate areas
- There is a slight PMR gradient for incidence of AMI at the aggregate level in All Other Manitobans (incidence increases from the most healthy Rural South to the least healthy North aggregate areas) but not for Metis

RHAs (Figure 4.9.1):

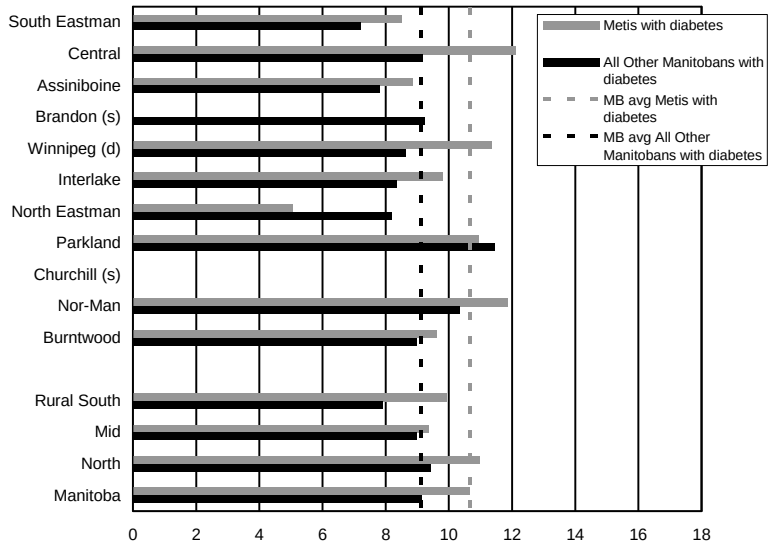
- Metis have a higher incidence of AMI compared to All Other Manitobans in Winnipeg RHA (11.4 vs. 8.6)
- There are no differences in incidence of AMI for Metis compared to All Other Manitobans in the remainder of the RHAs
- There is no PMR gradient (AMI incidence does not appear to be related to PMR at the RHA level)

Winnipeg Aggregate Areas (Figure 4.9.2):

- Metis have a higher incidence of AMI in the Winnipeg Least Healthy area compared to All Other Manitobans (13.4 vs. 9.2)
- Incidence of AMI is similar between Metis and All Other Manitobans in Winnipeg Most Healthy (8.4 vs. 8.1) and Winnipeg Average Health (12.0 vs. 9.4) areas
- There is a PMR gradient for Metis, with the Least Healthy area having the highest AMI rate and the Most Healthy area having the lowest AMI rate

Figure 4.9.1: Heart Attack (AMI) Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted annual rate of death or hospitalization (3+ days) for AMI, per 1,000 residents aged 40+ years

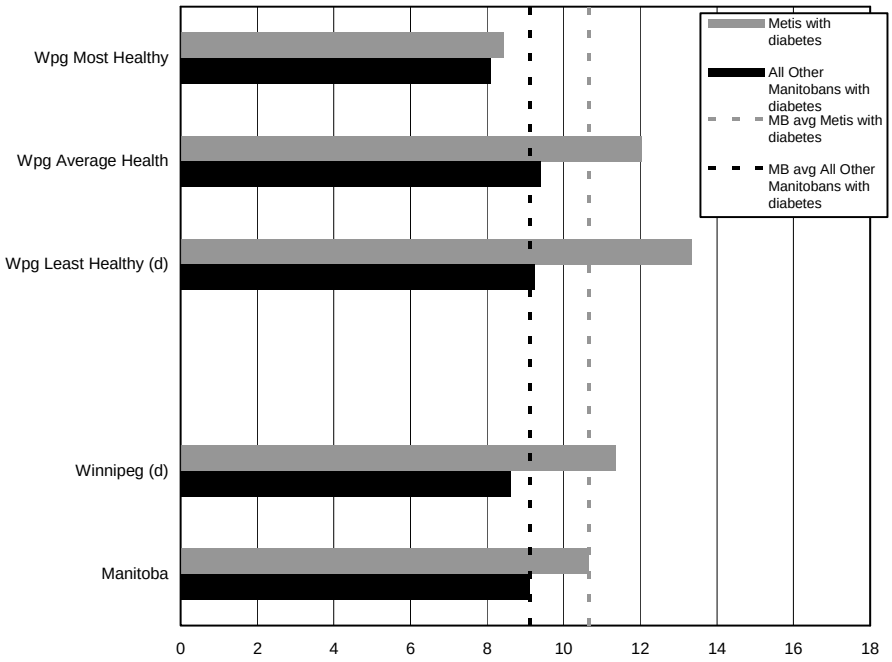


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.9.2: Heart Attack (AMI) Rate by Winnipeg Aggregate Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted annual rate of death or hospitalization (3+ days) for AMI, per 1,000 residents aged 40+ years



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'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

In the Metis Atlas (2010), Martens, Bartlett, et al. identified significantly higher rates of AMI in Metis compared to All Other Manitobans (5.4 vs. 4.3 per 1,000) in Manitoba. The information in that study was not specific to those living with diabetes.

Diabetes has been shown to be a risk factor for acute myocardial infarction (Poirier, 2008). It is estimated that approximately 30% of hospital admissions due to AMI are for individuals with diabetes (Fitchett, 2008). Between 65% and 80% of people with diabetes will die from heart disease (Poirier, 2008). Unfortunately a large proportion will have no noticeable symptoms before either a nonfatal or fatal AMI (Poirier, 2008). Those with diabetes will often suffer a recurrent MI and are prone to developing heart failure (Cohn, Fox, & Daly, 2003).

There are no comparative studies examining AMI rates for Metis with diabetes in the literature. In our study there is no significant difference in rates of AMI between Metis with diabetes and All Other Manitobans with diabetes at the provincial level (10.7 vs. 9.1 per 1,000). However, in Winnipeg RHA Metis with diabetes did have a significantly higher AMI rate compared to All Other Manitobans with diabetes (11.4 vs. 8.6 per 1,000). It is also worth noting that in Manitoba the AMI rate in Metis with diabetes was three times that of Metis who did not have diabetes (10.7 vs. 3.5 per 1,000).

There is a link between premature mortality rate and incidence of AMI in the Winnipeg aggregate areas in both the Metis Atlas (Martens, Bartlett, et al., 2010) and our study. In the Metis Atlas both Metis and All Other Manitobans follow a PMR pattern (with Winnipeg Least Healthy area having the highest AMI rate and Winnipeg Most Healthy the lowest), and in our study Metis with diabetes also follow this trend.

The Metis Atlas found that there were no statistical differences between the rates of AMI for Metis and All Other Manitobans in either the Winnipeg Most Healthy (4.2 vs. 3.8 per 1,000) and Average Healthy (6.1 vs. 4.7) aggregate areas; in our study the rates were also statistically similar for Metis with diabetes and All Other Manitobans with diabetes in Winnipeg Most Healthy (8.4 vs. 8.1) and Winnipeg Average Healthy (12.0 vs. 9.4) aggregate areas. However, in both the Metis Atlas and in the current study, rates of AMI are statistically higher for Metis in the 'Least Healthy' aggregate area. In the Metis Atlas the rate of AMI is higher for Metis compared to All Other Manitobans (7.0 vs. 5.0 per 1,000); in our study it is higher for Metis with diabetes compared to All Other Manitobans with diabetes (13.4 vs. 9.2).

The Metis Atlas (Martens, Bartlett, et al., 2010) indicated that Metis had a statistically higher AMI rate than All Other Manitobans in Winnipeg RHA, and particularly in Winnipeg Least Healthy aggregate area. Our study shows that this pattern remains when comparing Metis with diabetes and All Other Manitobans with diabetes. This trend may have implications for health providers in the least healthy areas of Winnipeg, including Downtown East and West, Inkster East, Point Douglas North and South, River East South, St. Boniface West, and St. James – Assiniboia East.

4.10 Stroke Incidence Rate

A stroke results from an interruption of the blood supply to the brain. This may be caused by either blockage of the blood supply by a clot (ischemic stroke) or bleeding occurring within the brain (hemorrhagic stroke). Diabetes is an important risk factor for stroke (Kuller, Dorman, & Wolf, 1985; WHO, 2010b). Adult Canadians with diabetes are hospitalized for stroke almost three times more often than those without diabetes (PHAC, 2009).

The age- and sex-adjusted incidence of stroke for residents with diabetes aged 40 and older was measured in five fiscal years: 2002/03-2006/07. Stroke was defined as:

- an inpatient hospitalization with the most responsible diagnosis of stroke and a length of stay of one or more days (unless the patient died in hospital)
- a death with stroke listed as the primary cause of death on the Vital Statistics death record

Diagnosis codes used to identify strokes include ICD-9-CM codes 431, 434, 436 and ICD-10-CA codes I61, I63, I64. Transfers between hospitals were tracked and only hospital episodes were counted, not individual separations, to reduce double-counting.

The denominator includes all Manitoba residents with diabetes aged 40 and older as of December 31 of each year (2002-2006).

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.10.1):

- There is no difference in incidence of stroke between Metis and All Other Manitobans in Manitoba (6.4 vs. 6.4 per 1,000)

Aggregate areas (Figure 4.10.1):

- All Other Manitobans in North aggregate area have a higher incidence of stroke compared to their provincial average (11.0 vs. 6.4 per 1,000) whereas All Other Manitobans in the Rural South aggregate area have a lower incidence of stroke compared to their provincial average (4.6 vs. 6.4)
- There appears to be a steep gradient mirroring PMR, with stroke incidence increasing from Rural South to North for both Metis and All Other Manitobans

RHAs (Figure 4.10.1):

- Metis have a higher incidence of stroke compared to All Other Manitobans in Assiniboine (10.8 vs. 3.9 per 1,000) and Brandon (16.4 vs. 3.8) RHAs
- Metis have a higher incidence of stroke compared to their provincial average in Burntwood RHA (15.0 vs. 6.4 per 1,000)
- All Other Manitobans have a higher incidence of stroke compared to their provincial average in Burntwood RHA (15.2 vs. 6.4 per 1,000) whereas All Other Manitobans are lower compared to their provincial average in Assiniboine (3.9 vs. 6.4) and Brandon (3.8 vs. 6.4) RHAs

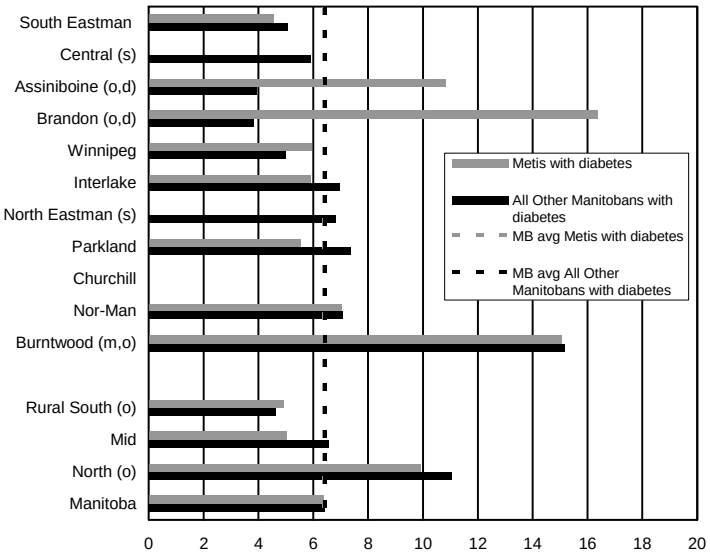
- There is no PMR gradient at the RHA level – that is, stroke incidence does not increase from most healthy to least healthy RHAs

Winnipeg Aggregate Areas (Figure 4.10.2):

- There is no statistical difference in incidence of stroke for Metis in any of Winnipeg Least Healthy, Average Health, or Most Healthy areas
- All Other Manitobans have a lower incidence of stroke compared to their provincial average in Winnipeg Most Healthy Area (4.7 vs. 6.4 per 1,000)
- While there is a slight PMR gradient for All Other Manitobans, with stroke rate highest in Winnipeg Least Healthy and lowest in Winnipeg Most Healthy, there is none for Metis

Figure 4.10.1: Stroke Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted annual rate of death or hospitalization for stroke, per 1,000 residents aged 40+ years

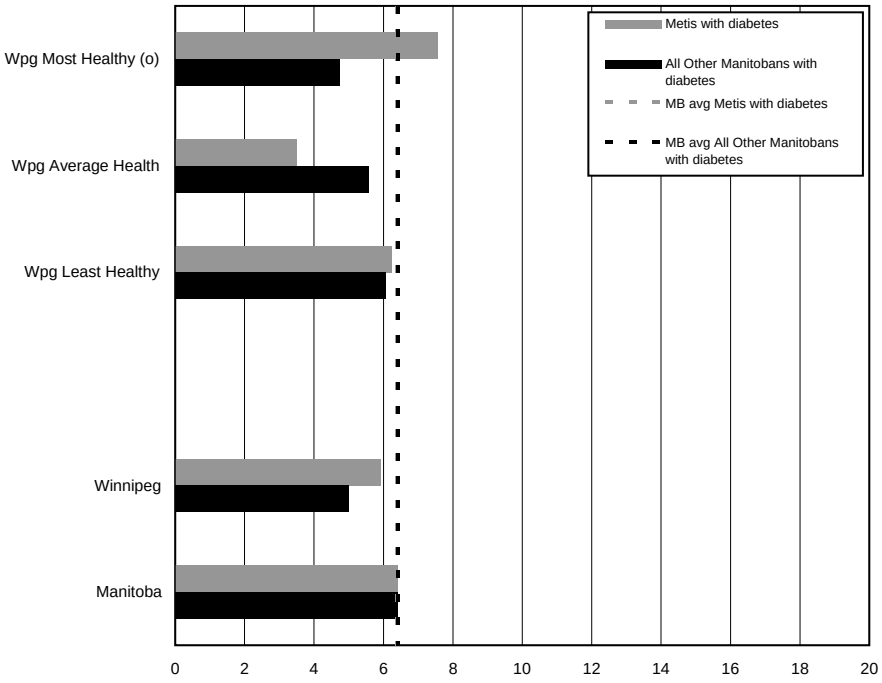


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.10.2: Stroke Incidence Rate by Winnipeg Aggregate Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted annual rate of death or hospitalization for stroke, per 1,000 residents aged 40+ years



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'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

While there are multiple causes of stroke, increased blood pressure is the strongest single risk factor for stroke in the general population, and people with diabetes are at increased risk for both hypertension and stroke (Kuller et. al., 1985). Prevention or reduction of risk for a stroke in individuals with diabetes is possible with aggressive efforts such as monitoring of blood pressure and blood lipoprotein levels and the reduction or cessation of smoking (Kuller et al., 1985).

In one British Columbia survey, 8.1% of Metis respondents identified themselves or a family member as having had a stroke (Hutchinson et al., 2007). In the Metis Atlas (Martens, Bartlett, et al., 2010) significantly higher incidence rates of stroke were seen in Metis compared to All Other Manitobans in Assiniboine (4.7 vs. 2.8 per 1,000), Brandon (5.3 vs. 2.0), and Winnipeg (3.5 vs. 2.7) RHAs. In Winnipeg RHA significantly higher incidence rates of stroke in Metis compared to All Other Manitobans were seen in Winnipeg Most Healthy (3.6 vs. 2.6 per 1,000) and Winnipeg Least Healthy (3.9 vs. 2.9) aggregate areas. The information in those studies was not specific to those living with diabetes.

There are no comparative studies involving Metis with diabetes and stroke reported in the literature. In our study there is no statistical difference in incidence of stroke between Metis with diabetes and All Other Manitobans with diabetes in Manitoba (6.4 vs. 6.4 per 1,000). There is some regional variation in rates of stroke with significantly higher rates being seen in Metis with diabetes compared to All Other Manitobans with diabetes in Assiniboine (10.8 per 1,000 vs. 3.9 per 1,000) and Brandon (16.4 vs. 3.8) RHAs. Metis with diabetes in Burntwood RHA have a higher rate than their provincial average (15.0 vs. 6.4 per 1,000). While the Metis Atlas found that stroke rates were higher for Metis compared to All Other Manitobans in Winnipeg Most Healthy and Winnipeg Least Healthy aggregate areas, this study – which focused specifically on individuals with diabetes – found no differences between Metis with diabetes and All Other Manitobans with diabetes in those same aggregate areas.

The rates of stroke in Manitoba Metis are higher in our study than in the Metis Atlas (6.4 vs. 3.6 per 1,000); the comorbid condition of diabetes may account for this difference in incidence of stroke in Metis in Manitoba.

4.11 Dialysis Initiation Rate

A serious complication associated with diabetes is kidney failure. Kidney failure requires initiation of dialysis treatments or kidney transplantation (Lok, Oliver, Rothwell, & Hux, 2004). An individual with diabetes is more likely to need dialysis compared to an individual without diabetes (474.4 per 100,000 per year with diabetes compared with 50.2 per 100,000 per year without diabetes) (Lok et al., 2004).

The age- and sex-adjusted incidence of dialysis initiation for residents aged 19 and older was measured over five fiscal years: 2002/03-2006/07. Dialysis initiation was defined by one or more physician visits with one of the following Manitoba tariff codes:

- 9610 - chronic ambulatory peritoneal dialysis, in hospital, per day
- 9798 - acute renal failure initial hemodialysis
- 9799 - acute renal failure subsequent hemodialysis
- 9801 - chronic renal failure initial hemodialysis
- 9802 - chronic renal failure subsequent hemodialysis
- 9805 - acute renal failure initial peritoneal dialysis, complete medical management, up to two weeks
- 9806 - chronic renal failure initial peritoneal dialysis, first 24 hours
- 9807 - acute renal failure subsequent (peritoneal) dialysis, after two weeks
- 9819 - chronic renal failure intermittent subsequent (peritoneal) dialysis
- 9820 - home (peritoneal) dialysis and self-care dialysis weekly retainer for administration, routine visits, and supervision. This fee is not applicable if the patient is admitted to hospital as an in-patient
- 9821 - chronic renal failure home dialysis and self-care dialysis and self-care dialysis weekly retainer

The denominator includes all Manitoba residents with diabetes aged 19 and older as of December 31, 2004. Note that this indicator only captures individuals who began dialysis in the study period. Individuals who began their dialysis treatment prior to April 1, 2002 would not be included here.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.11.1):

- Provincially, there is no difference in dialysis initiation rate between Metis and All Other Manitobans (1.39% vs. 1.21%)

Aggregate areas (Figure 4.11.1):

- All Other Manitobans have a higher dialysis initiation rate compared to their provincial average in North aggregate area (2.27% vs. 1.21%)
- There is a PMR gradient for both Metis and All Other Manitobans, with dialysis initiation increasing from Rural South to North aggregate areas – however, this RHA gradient is more pronounced for All Other Manitobans than for Metis

RHAs (Figure 4.11.1):

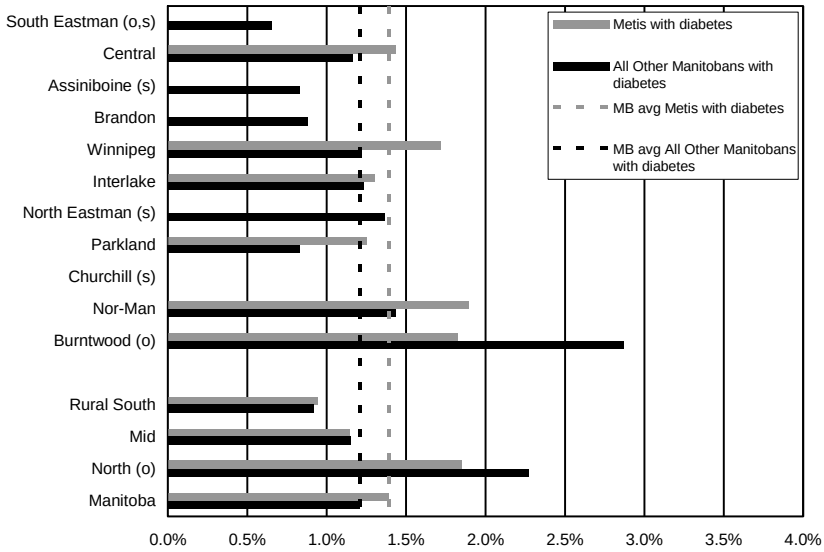
- All Other Manitobans have a higher rate of dialysis initiation compared to their provincial average in Burntwood RHA (2.87% vs. 1.21%)
- There is no PMR gradient at the RHA level, as there appears to be no relationship between dialysis initiation rate and PMR

Winnipeg Aggregate Areas (Figure 4.11.2):

- There is a PMR gradient for both populations, with dialysis initiation rates increasing from Most Healthy to Least Healthy aggregate areas

Figure 4.11.1: Dialysis Initiation Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



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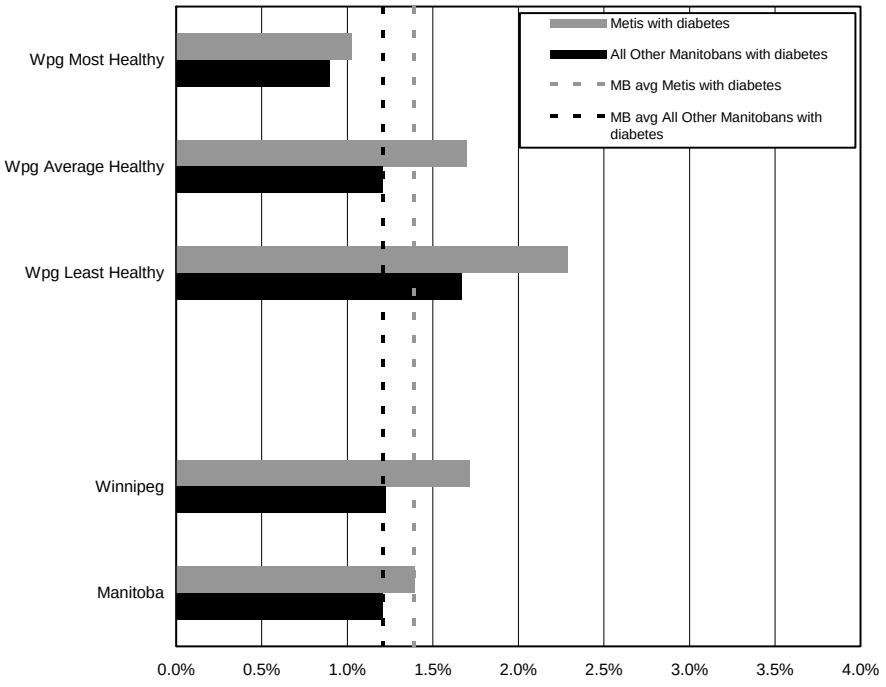
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.11.2: Dialysis Initiation Rate by Winnipeg Aggregate Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



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'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

In adults, diabetes is the leading cause of end-stage renal failure (Foley & Collins, 2007). Those with end-stage renal failure often require dialysis. In the Metis Atlas (Martens & Bartlett, 2010) the dialysis initiation rate was higher for Metis compared to All Other Manitobans (0.46% vs. 0.34%) in Manitoba. There was a higher dialysis initiation rate reported for Metis compared to All Other Manitobans in Winnipeg RHA (0.53% vs. 0.35%). Within Winnipeg RHA Martens, Bartlett, et al. (2010) noted a gradient consistent with PMR existed and observed that the Least Healthy Winnipeg area had the highest dialysis initiation rates. The information in the Metis Atlas was not specific to those with diabetes.

There are no comparative studies involving Metis with diabetes and dialysis initiation reported in the literature. In our study Metis with diabetes showed no statistical difference for dialysis initiation rate compared to All Other Manitobans with diabetes (1.39% vs. 1.21%) in Manitoba. Within our findings there was some regional variation. While not statistically significant, there appears to be a trend toward higher rates in the north, where dialysis initiation rates for Metis with diabetes are higher compared to the provincial average for Metis with diabetes in Nor-Man (1.89% vs. 1.39%) and Burntwood (1.82% vs. 1.39%) RHAs. Again, although not statistically significant (p=0.091), Metis with diabetes in Winnipeg have a higher dialysis initiation rate compared to All Other Manitobans with diabetes (1.72% vs. 1.22%).

These apparent geographical variations in rates of dialysis initiation for Metis with diabetes warrant further examination.

4.12 Lower Limb Amputation Rate for People with Diabetes

Non-healing foot ulcers can lead to lower limb amputations (removal of part or all of a lower limb) in people with diabetes. Minor trauma to the feet may lead to skin ulceration, infection, and ultimately gangrene, resulting in amputation (Meatherall et al., 2005). Approximately 15% of individuals with diabetes will develop foot ulcerations (Reiber, 1996).

The age- and sex-adjusted rate of lower limb amputations due to complications of diabetes was measured per 1,000 individuals with diabetes aged 19 and older in five fiscal years: 2002/03-2006/07. Amputation was defined by a hospitalization with a surgery for a lower limb amputation, identified by ICD-9-CM procedure codes 84.10-84.17 and CCI codes 1.VC.93, 1.VG.93, 1.VQ.93, 1.WA.93, 1.WE.93, 1.WJ.93, 1.WL.93 and 1.WM.93. This definition does not include all amputations, but only those for which there was an existing condition of diabetes coded with the amputation; therefore the hospital abstract for the amputation must also indicate a diagnosis of diabetes (defined by ICD-9-CM diagnosis code 250 and ICD-10-CA codes E10-E14). Amputations due to accidental injury (defined by ICD-9-CM diagnosis codes 895, 896, 897 and ICD-10-CA codes: S78, S88, S98, T05.3, T05.4, T05.5, T13.6) were excluded.

The denominator includes all Manitoba residents with diabetes aged 19 and older as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.12.1):

- Metis have a higher rate of lower limb amputations compared to All Other Manitobans in Manitoba (24.3 vs. 16.2 per 1,000)

Aggregate areas (Figure 4.12.1):

- While the differences are not significant, Rural South aggregate area shows a trend towards higher rates of lower limb amputations in Metis compared to All Other Manitobans (23.0 vs. 16.0 per 1,000) whereas in North aggregate area the opposite trend is seen (27.8 vs. 36.4)
- In both Mid (22.3 vs. 16.2 per 1,000) and North (36.4 vs. 16.2) aggregate areas All Other Manitobans have a higher rate of lower limb amputations compared to their provincial average
- There is a pronounced PMR gradient for All Other Manitobans (with lower limb amputations increasing markedly from Rural South to North aggregate areas) but none for Metis at the aggregate level

RHAs (Figure 4.12.1):

- Metis have a higher rate of lower limb amputations compared to All Other Manitobans in Winnipeg RHA (21.3 vs. 12.7 per 1,000)
- All Other Manitobans have a higher rate of lower limb amputations compared to their provincial average in Parkland (26.0 vs. 16.2 per 1,000) and Burntwood (46.1 vs. 16.2) RHAs whereas All Other Manitobans are lower compared to their provincial average in Brandon (9.4 vs. 16.2) and Winnipeg (12.7 vs. 16.2) RHAs

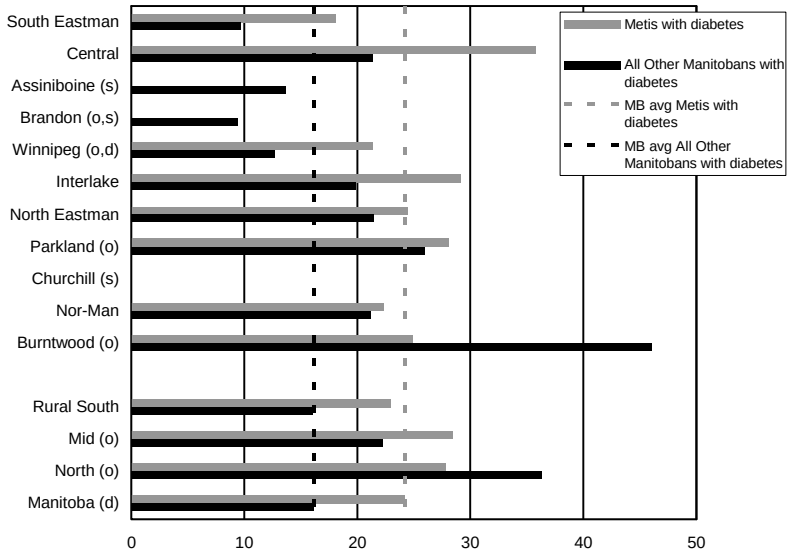
- There does not appear to be any relationship between PMR and lower limb amputation for either group at the RHA level

Winnipeg Aggregate Areas (Figure 4.12.2):

- Metis have a higher rate of lower limb amputations compared to All Other Manitobans in Winnipeg Average Health aggregate area (31.6 vs. 13.0 per 1,000)
- All Other Manitobans have a lower rate of lower limb amputations compared to their provincial average in Winnipeg Most Healthy aggregate area (7.9 vs. 16.2 per 1,000)
- While there is a PMR gradient for All Other Manitobans in Winnipeg (with lower limb amputations increasing steadily from Most Healthy to Least Healthy areas), there is none for Metis: there is a high rate of lower limb amputations in Metis in Winnipeg Average Health aggregate area

Figure 4.12.1: Diabetes-Related Lower Limb Amputation Rate by RHA for Metis and All Other Manitobans, 2002/03-2006/07

Age- & sex-adjusted annual rate per 1,000 people with diabetes aged 19+

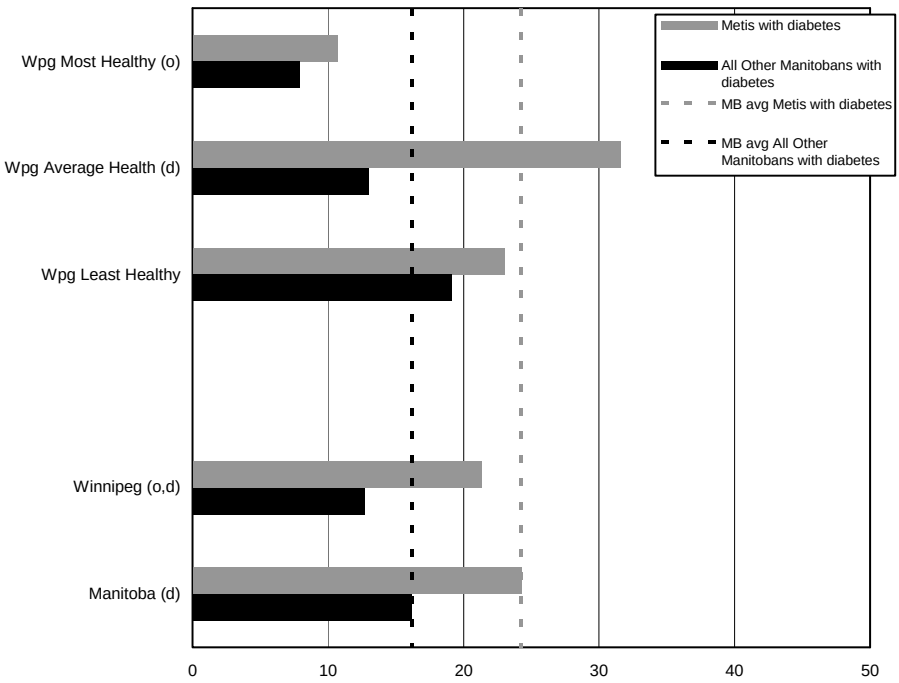


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.12.2: Diabetes-Related Lower Limb Amputation Rate by Winnipeg Aggregate Area for Metis and All Other Manitobans, 2002/03-2006/07

Age- & sex-adjusted annual rate per 1,000 people with diabetes aged 19+



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

4.13 Probability of Lower Limb Amputation

As was mentioned earlier, logistic regression is a statistical technique intended to 'predict' the probability of something occurring while taking into account other factors (Hassard, 1991). Use of logistic regression allows us to find out if any of a group of factors can uniquely predict a certain outcome. In the following logistic regression table, factors considered to determine the risk of lower limb amputations for those living are: income, sex, geographic area, age (linear and quadratic), mental and physical comorbidities, and continuity of care. In this study 'continuity of care' means that over a two year period, at least half of a person's physician visits are to the same doctor.

As noted in Section 1, it is important to remember that in the logistic regression tables, only the first factor – Metis (vs. All Other Manitobans) – compares Metis and All Other Manitobans. Each of the other factors applies to *all* Manitobans, Metis and All Other Manitobans combined.

Key observations (Table 4.13.1):

- Metis are at a similar risk for lower limb amputation compared to All Other Manitobans (aOR 1.13, 95% CI 0.91-1.41) after controlling for the other factors
- All Manitobans have an increased risk of lower limb amputation in Mid (aOR 1.22, 95% CI 1.06-1.40) and North (aOR 1.81, 95% CI 1.53-2.13) aggregate areas after controlling for the other factors
- All Manitobans are at a lower risk of lower limb amputation in Rural South aggregate area (aOR 0.85, 95% CI 0.73-0.99) and Brandon RHA (aOR 0.58, 95% CI 0.43-0.80) after controlling for the other factors
- Males are more at risk of lower limb amputation compared to females (aOR 1.94, 95% CI 1.71-2.21) after controlling for the other factors
- All Manitobans with a lower household income are at greater risk of lower limb amputation compared to those with a higher household income (aOR 0.79, 95% CI 0.76-0.82) after controlling for the other factors
- All Manitobans with a lower rates of continuity of care are at greater risk of lower limb amputation compared to those with higher rates of continuity of care (aOR 0.71, 95% CI 0.62-0.81) after controlling for the other factors
- Individuals living with major physical comorbidities are more at risk of a lower limb amputation (aOR 3.25, 95% CI 2.82-3.75) after controlling for the other factors

Table 4.13.1: Logistic Regression Modeling of the Risk of Lower Limb Amputation

Probability of Lower Limb Amputation by Aggregate Region2002/03-2006/07, all Manitoba residents with diabetes, aged 19+		
Variable	**Adjusted Odds Ratio (95% Confidence Interval)**	**p-value**
Metis (vs. All Other Manitobans)	1.135 (0.911 - 1.413)	0.2594
Aggregate Regions (ref=Manitoba)		
South	**0.851 (0.734 - 0.986)**	**0.0322**
Mid	**1.219 (1.063 - 1.398)**	**0.0046**
North	**1.805 (1.529 - 2.131)**	**<0.001**
Brandon	**0.585 (0.429 - 0.797)**	**<0.001**
Winnipeg	0.913 (0.812 - 1.026)	0.1264
Age, linear	**1.145 (1.106 - 1.184)**	**<0.001**
Age, quadratic	**0.999 (0.9988 - 0.9993)**	**<0.001**
Sex (Male vs. Female)	**1.944 (1.711 - 2.209)**	**<0.001**
Average Household income of Neighborhood (per $10,000)	**0.790 (0.757 - 0.823)**	**<0.001**
Continuity of Care	**0.709 (0.624 - 0.806)**	**<0.001**
Mental Illness ADGs	0.945 (0.808 - 1.107)	0.4849
Major Physical Illness ADGs	**3.253 (2.825 - 3.745)**	**<0.001**

Bold = statistically significant results

Note: Please see Glossary for definition of all variables. Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Foot complications account for approximately 20% of all diabetes-related hospital admissions in the North American population (Bowering, Ekoé, & Kalla, 2008). For those with diabetes unresolved foot or leg ulcers may lead to gangrene resulting in amputation. As Singh, Armstrong, & Lipsky (2005) show, over the lifetime of an individual with diabetes the risk of developing a foot ulcer could be as high as 25% (as cited in Boulton, Vileikyte, Ragnarson-Tennvall, & Apelqvist, 2005). Diabetes is the leading cause of non-traumatic amputation in Canadian adults (Meatherall et al., 2005). Canadians with diabetes have rates of lower limb amputations 23 times higher than those without diabetes (PHAC, 2009).

The results from our study are consistent with those found in the Metis Atlas (Martens, Bartlett, et al., 2010), which also measured lower limb amputations for individuals with diabetes. In our study Metis have a higher rate of lower limb amputations compared to All Other Manitobans (24.3 vs. 16.2 per 1,000) in Manitoba; the rates in the Metis Atlas were also significantly different (24.1 vs. 16.2). Both studies show a trend toward higher rates in the Metis compared to All Other Manitobans in the Rural South aggregate area and lower rates in the Metis compared to All Other Manitobans in North aggregate area. In our study the rates for Rural South were 23.0 vs. 16.0 per 1,000; in the Metis Atlas the rates were 22.8 vs. 16.0. In North aggregate area the rates were 27.8 vs. 36.4 per 1,000 in our study and 27.5 vs. 36.4 in the Metis Atlas. In our study Metis have a higher rate of lower limb amputations compared to All Other Manitobans in Winnipeg RHA (21.3 vs. 12.7 per 1,000); in the Metis Atlas the same significant difference was evident (21.3 vs. 12.7). In both studies higher rates of lower limb amputation were found in Metis compared to All Other Manitobans in the Winnipeg Average Health aggregate area. In our study rates of 31.6 vs. 13.0 per 1,000 were documented; in the Metis Atlas study the rates were 31.3 vs. 12.8.

In both the Metis Atlas (Martens, Bartlett, et al., 2010) and our study, the probability of an individual with diabetes requiring a lower limb amputation is similar regardless of whether they are Metis or All Other Manitoban. Sex appears to be a defining factor: males are more at risk than are females (aOR=1.94, CI 1.72-2.21, p<0.001). In both studies a higher rate of continuity of care is related to lower probability of requiring a lower limb amputation.

The results from this study indicate that there is a statistical difference in the rates of amputations between Metis with diabetes and All Other Manitobans with diabetes at the provincial level. While Metis have a higher rate of amputations compared to All Other Manitobans in our study, when we controlled for income, location, continuity of care, and other factors, the difference between Metis and All Other Manitobans was no longer present. The higher rates found in the Metis suggest that in addition to sex there are other factors that need to be considered in predicting probability of requiring a lower limb amputation.

4.14 Prevalence of Depression

"Depression is a mood disorder characterized by feelings of sadness, anger, frustration, and a lack of interest in activities that persists to the point that they interfere with daily life for an extended period of time" (Bartlett, Martens et al., 2010, p. 159). It is estimated that depression is the fourth leading cause of disease burden worldwide (Üstün, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004). One-quarter of Canadians living with diabetes are also diagnosed with the comorbid condition of depression (Woo, 2008).

The age- and sex-adjusted prevalence of depression was measured for residents with diabetes aged 19 and older in fiscal years 2002/03-2006/07. Residents were considered to have depression if they met one of the following conditions:

- one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression or adjustment reaction: ICD-9-CM codes 296.2-296.8, 300.4, 309 or 311; ICD-10-CA codes F31, F32, F33, F341, F38.0, F38.1, F41.2, F43.1, F43.2, F43.8, F53.0, F93.0
- one or more physician visits with a diagnosis for depressive disorder, affective psychoses or adjustment reaction: ICD-9-CM codes 296, 309 or 311
- one or more hospitalizations with a diagnosis for anxiety disorders: ICD-9-CM code 300; ICD-10-CA codes F32.0, F34.1, F40, F41, F42, F44, F45.0, F451, F452, F48, F68.0, or F99 AND one or more prescriptions for an antidepressant or mood stabilizer: ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A
- one or more physician visits with a diagnosis for anxiety disorders: ICD-9-CM code 300, AND one or more prescriptions for an antidepressant or mood stabilizer: ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A

The denominator includes all Manitoba residents with diabetes aged 19 and older in the 5 year time period who were continuously registered with Manitoba Health for at least one year in the 5 year time period.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.14.1):

- Metis have a higher prevalence of depression compared to All Other Manitobans in Manitoba (28.2% vs. 25.7%)

Aggregate areas (Figure 4.14.1):

- Metis in North aggregate area have a higher prevalence of depression compared to All Other Manitobans in North aggregate area (21.8% vs. 16.7%)
- Metis in North aggregate area have a lower prevalence of depression compared to their provincial average (21.8% vs. 28.2%)
- All Other Manitobans in North aggregate area have a lower prevalence of depression compared to their provincial average (16.7% vs. 25.7%)
- There is no relationship with PMR, as prevalence of depression does not increase from Rural South to North aggregate areas

RHAs (Figure 4.14.1):

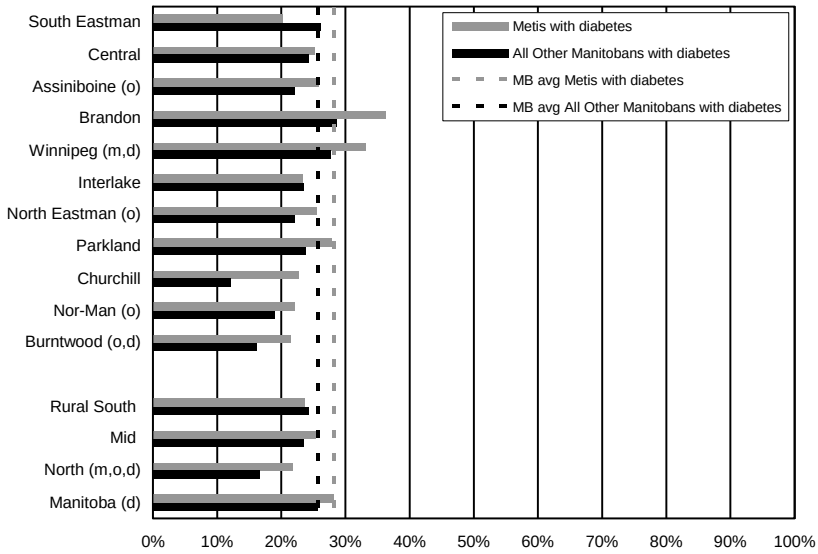
- Metis have a higher prevalence of depression compared to All Other Manitobans in Winnipeg (33.2% vs. 27.6%) and Burntwood (21.5% vs. 16.1%) RHAs
- Metis have a higher prevalence of depression compared to their provincial average in Winnipeg (33.2% vs. 28.2%)
- All Other Manitobans have a lower prevalence of depression compared to their provincial average in Assiniboine (22.1% vs. 25.7%), North Eastman (22.1% vs. 25.7%), Nor-Man (18.9% vs. 25.7%), and Burntwood (16.1% vs. 25.7%) RHAs
- There is no PMR gradient for prevalence of depression at the RHA level

Winnipeg CAs (Figure 4.14.2):

- Metis have a higher prevalence of depression compared to All Other Manitobans in Inkster (33.4% vs. 21.2%), Downtown (37.3% vs. 28.0%), and Point Douglas (37.4% vs. 30.2%) CAs
- All Other Manitobans have a higher prevalence of depression compared to their provincial average in River Heights (30.8% vs. 25.7%) and Point Douglas (30.2% vs. 25.7%) CAs whereas All Other Manitobans have a lower prevalence of depression compared to their provincial average in Inkster CA (21.2% vs. 25.7%)
- Prevalence of depression does not appear to be related to PMR gradient evident in the Winnipeg CAs

Figure 4.14.1: Prevalence of Depression by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age-& sex-adjusted percent for residents aged 19+ in a five-year period

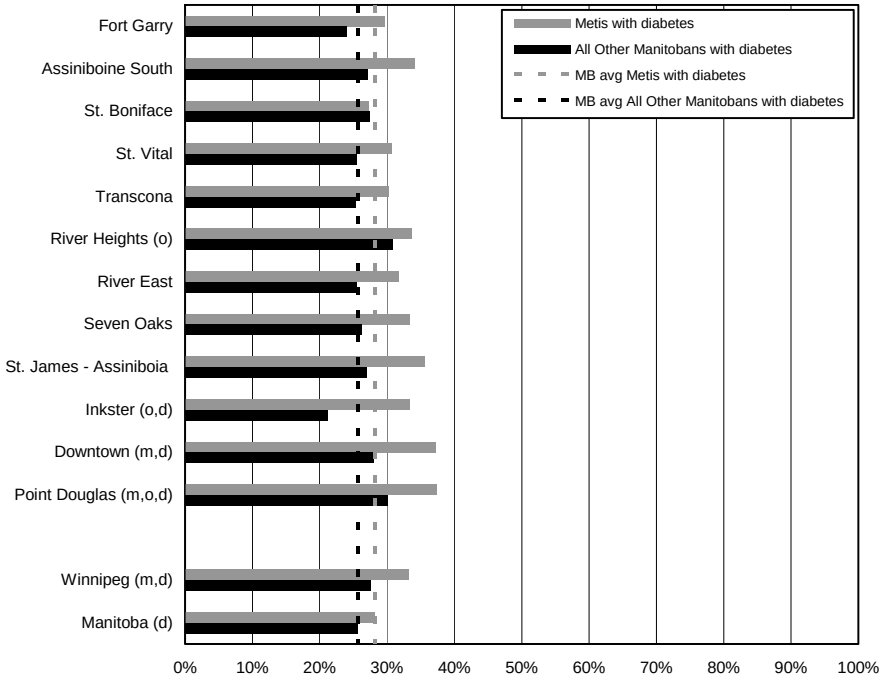


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.14.2: Prevalence of Depression by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent for residents aged 19+ in a five-year period



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'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

It is widely recognized that there is a relationship between diabetes and depression, but it is not clear whether depression leads to diabetes, if diabetes leads to depression, or if there is a bidirectional relationship between the two conditions (McIntosh, Kjernisted, & Hammond, 2008). Depression as a comorbidity with diabetes is associated with poorer clinical outcomes (Brown, Majumdar, Newman, & Johnson, 2006). Individuals with both diabetes and depression demonstrate difficulty adhering to regimen, poorer glycemic control, increased levels of stress, decreased social and family interactions and support, and poor coping skills (Jones, Hall, Simon, & Mitchell, 2008). They also have an increased risk of significant complications (Lin et al., 2010) including death (Katon et al., 2005).

Gender, race/ethnicity, age, and location all have been found to influence the prevalence of diabetes and depression (Li, Ford, Strine, & Mokdad, 2008). Li et al. (2008) found that there was a higher prevalence of depression in American Indians/Alaska Natives with diabetes compared to a non-Hispanic white sample with diabetes (27.8% vs. 9.5%).

In one British Columbia survey, 32.2% of Metis individuals identified themselves or a family member as having depression (Hutchinson et al., 2007). In the Metis Atlas (Martens, Bartlett, et al., 2010) the prevalence of depression was similar between Metis and All Other Manitobans (22.0% vs. 20.4%) in Manitoba. Significantly higher rates of depression were documented for Metis compared to All Other Manitobans in the urban areas of Winnipeg (25.5% vs. 21.7%) and Brandon (28.9% vs. 22.9%). The information in those studies was not specific to those living with diabetes.

There is no comparable literature on prevalence of depression in Metis with diabetes. In our study it was found that there is a statistical difference in prevalence of depression between Metis and All Other Manitobans in Manitoba (28.2% vs. 25.7%). There is also a higher prevalence in Metis compared to All Other Manitobans in North aggregate area (21.8% vs. 16.7%) as well as in Winnipeg (33.2% vs. 27.6%) and Burntwood (21.5% vs. 16.1%) RHAs. In Winnipeg Metis have a higher prevalence compared to All Other Manitobans in Inkster (33.4% vs. 21.2%), Downtown (37.3% vs. 28.0%), and Point Douglas (37.4% vs. 30.2%) CAs. There is an association with the PMR gradient for Metis with diabetes in Winnipeg.

Higher rates of depression in Metis, especially in the urban areas with higher PMR, are an area of concern given the association of depression with decreased attention to self care, glycemic control, and overall management of diabetes.

4.15 Prevalence of Anxiety Disorders

Anxiety disorders are one of the most common forms of mental illness in Canada. Anxiety disorders include a wide range of diseases: phobic anxiety disorders (e.g. agoraphobia, social phobia), panic disorders (e.g. generalized anxiety disorders), and obsessive-compulsive disorders. Anxiety is associated with decreased functioning and quality of life and has important consequences for glycemic control (Grigsby, Anderson, Freedland, Clouse, & Lustman, 2002).

The age- and sex-adjusted prevalence of anxiety disorders was measured for residents with diabetes aged 19 and older in fiscal years 2002/03-2006/07. Residents were considered to have an anxiety disorder if they met one of the following conditions:

- one or more hospitalizations with a diagnosis for anxiety states, phobic disorders or obsessive-compulsive disorders: ICD-9-CM codes 300.0, 300.2, 300.3; ICD-10-CA codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42
- three or more physician visits with a diagnosis for anxiety disorders: ICD-9-CM code 300

The denominator includes all Manitoba residents with diabetes aged 19 and older in the 5 year time period who were continuously registered with Manitoba Health for at least one year in the 5 year time period.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.15.1):

- Metis have a higher prevalence of anxiety disorders compared to All Other Manitobans in Manitoba (10.4% vs. 8.8%)

Aggregate areas (Figure 4.15.1):

- Metis have a higher prevalence of anxiety disorders compared to All Other Manitobans in the Mid (9.3% vs. 7.6%) and North (10.3% vs. 5.7%) aggregate areas
- Metis have a lower prevalence of anxiety disorders compared to their provincial average in Rural South aggregate area (7.1% vs. 10.4%)
- All Other Manitobans have a lower prevalence of anxiety disorders compared to their provincial average in the Rural South (7.4% vs. 8.8%), Mid (7.6% vs. 8.8%), and North (5.7% vs. 8.8%) aggregate areas
- While there is no PMR gradient for All Other Manitobans, there is a slight gradient for Metis, with prevalence of anxiety disorders increasing for Metis from Rural South to North aggregate areas

RHAs (Figure 4.15.1):

- Metis have a higher prevalence of anxiety disorders compared to All Other Manitobans in Brandon (18.8% vs. 10.5%), Winnipeg (11.7% vs. 9.8%), Nor-Man (13.9% vs. 9.6%), and Burntwood (7.0% vs. 4.1%) RHAs

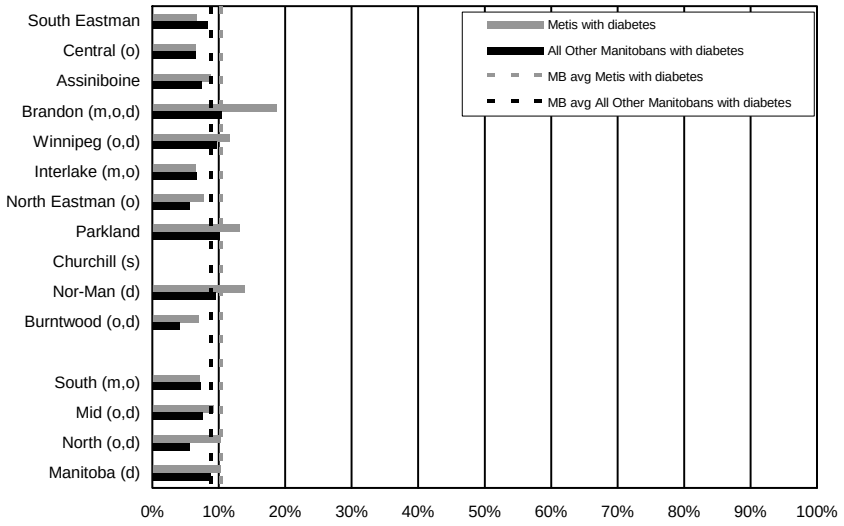
- Metis have a higher prevalence of anxiety disorders compared to their provincial average in Brandon RHA (18.8% vs. 10.4%) whereas Metis have a lower prevalence of anxiety disorders compared to their provincial average in Interlake RHA (6.5% vs. 10.4%)
- All Other Manitobans have a higher prevalence of anxiety disorders compared to their provincial average in Brandon (10.5% vs. 8.8%) and Winnipeg (9.8% vs. 8.8%) RHAs whereas All Other Manitobans have a lower prevalence of anxiety disorders compared to their provincial average in Central (6.5% vs. 8.8%), Interlake (6.7% vs. 8.8%), North Eastman (5.7% vs. 8.8%), and Burntwood (4.1% vs. 8.8%) RHAs
- There is no PMR relationship with anxiety prevalence at the RHA level for either Metis or All Other Manitobans

Winnipeg CAs (Figure 4.15.2):

- Metis have a higher prevalence of anxiety disorders compared to All Other Manitobans in Downtown CA (17.1% vs. 12.1%)
- Metis have a higher prevalence of anxiety disorders compared to their provincial average in Downtown CA (17.1% vs. 10.4%)
- All Other Manitobans have a higher prevalence of anxiety disorders compared to their provincial average in Transcona (12.5% vs. 8.8%) and Downtown (12.1% vs. 8.8%) CAs
- Prevalence of depression does not appear to increase from most to least healthy Winnipeg CAs in Winnipeg for either Metis or All Other Manitobans

Figure 4.15.1: Prevalence of Anxiety Disorders by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



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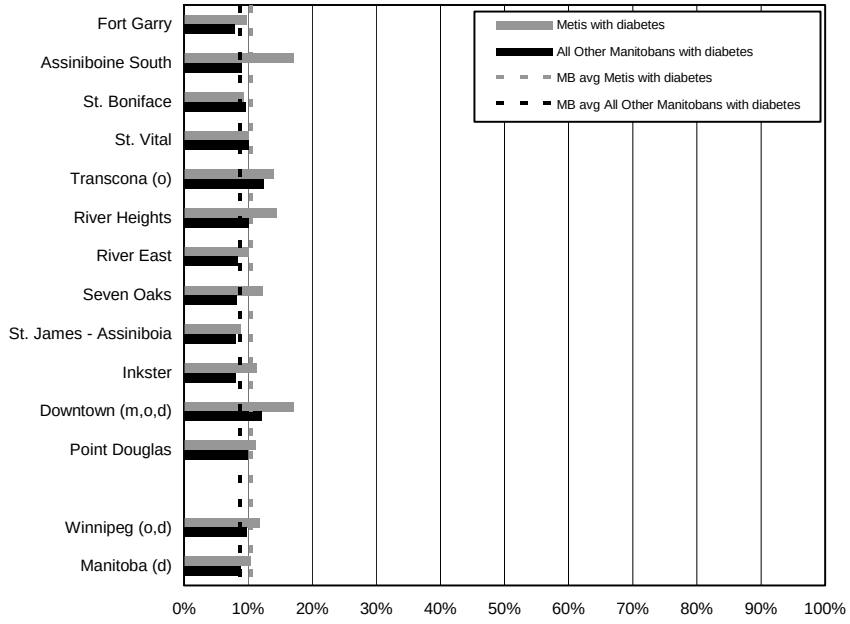
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.15.2: Prevalence of Anxiety Disorders by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

The Metis Atlas (Martens, Bartlett, et al., 2010) reported a higher rate of anxiety disorders in Metis compared to All Other Manitobans (9.4% vs. 8.0%) in Manitoba. It found a higher prevalence of anxiety disorders for Metis compared to All Other Manitobans in almost every RHA: South Eastman (7.8% vs. 6.5%); Assiniboine (7.3% vs. 5.7%); Brandon (14.6% vs. 9.8%); Winnipeg (11.0% vs. 8.9%); North Eastman (7.0% vs. 5.5%); Parkland (11.1% vs. 7.8%); Nor-Man (11.6% vs. 8.1%); and Burntwood (7.1% vs. 4.8%). The information in that study was not specific to those living with diabetes.

Grigsby et al. (2002) conducted a systematic review on the prevalence of anxiety in adults with diabetes. Of the eighteen studies reviewed, 14% of patients with diabetes had generalized anxiety disorders and elevated anxiety symptoms were found in 40% of those with diabetes (Grigsby et al., 2002).

There is no comparable literature on prevalence of anxiety disorders in Metis with diabetes. Our study revealed that there is a higher prevalence of anxiety disorders in Metis compared to All Other Manitobans (10.4% vs. 8.8%) in Manitoba. This higher prevalence is also seen in the Mid (9.3% vs. 7.6%) and North (10.3% vs. 5.7%) aggregate areas. In our study we found higher prevalence of anxiety disorders in Metis compared to All Other Manitobans in Brandon (18.8% vs. 10.5%), Winnipeg (11.7% vs. 9.8%), Nor-Man (13.9% vs. 9.6%), and Burntwood (7.0% vs. 4.1%) RHAs. Higher rates are also seen within Winnipeg RHA in Downtown CA, where Metis have higher rates of anxiety disorders compared to All Other Manitobans (17.1% vs. 12.1%) and to their provincial average (17.1% vs. 10.4%).

Given the impact of anxiety disorders on everyday functioning, quality of life, and glycemic control, the higher rates of anxiety documented in Metis with diabetes may indicate an area of focus for future policy and service delivery considerations.

4.16 Prevalence of Substance Abuse

"Substance abuse is the excessive use of and reliance on a drug, alcohol, or other chemical that leads to severe negative effects on the individual's health and well-being or the welfare of others" (Martens, Bartlett, et al., 2010, p. 167). For this indicator abuse of prescription drugs is not included.

The age- and sex-adjusted prevalence of substance abuse was measured for residents with diabetes aged 19 and older in fiscal years 2002/03-2006/07. Residents were considered to have substance abuse if they met one of the following conditions:

- one or more hospitalizations with a diagnosis for alcoholic or drug psychoses, alcohol or drug dependence or nondependent abuse of drugs: ICD-9-CM codes 291, 292, 303, 304 or 305; ICD-10-CA codes F10-F19, F55
- one or more physician visits with a diagnosis for alcoholic or drug psychoses, alcohol or drug dependence or nondependent abuse of drugs (ICD-9-CM codes as above)

The denominator includes all Manitoba residents with diabetes aged 19 and older in the 5 year time period who were continuously registered with Manitoba Health for at least one year in the 5 year time period.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 4.16.1):

- Metis have a higher prevalence of substance abuse compared to All Other Manitobans in Manitoba (8.3% vs. 6.6%)

Aggregate areas (Figure 4.16.1):

- Metis have a higher prevalence of substance abuse compared to their provincial average in North aggregate area (11.8% vs. 8.3%)
- All Other Manitobans have a higher prevalence of substance abuse compared to their provincial average in North aggregate area (12.1% vs. 6.6%) whereas All Other Manitobans have a significantly lower prevalence of substance abuse compared to their provincial average in Rural South aggregate area (5.6% vs. 6.6%)
- While the prevalence of substance abuse is higher in North than Rural South aggregate areas for both groups, Mid aggregate area is similar to Rural South, preventing a clear PMR pattern

RHAs (Figure 4.16.1):

- Metis have a higher prevalence of substance abuse compared to All Other Manitobans in Winnipeg RHA (9.4% vs. 6.4%)
- Metis have a higher prevalence of substance abuse compared to their provincial average in Burntwood RHA (16.7% vs. 8.3%)
- All Other Manitobans have a higher prevalence of substance abuse compared to their provincial average in Burntwood RHA (13.9% vs. 6.6%) whereas All Other Manitobans have a lower prevalence of substance abuse compared to their provincial average in Central (4.9% vs. 6.6%) and Interlake (4.9% vs. 6.6%) RHAs

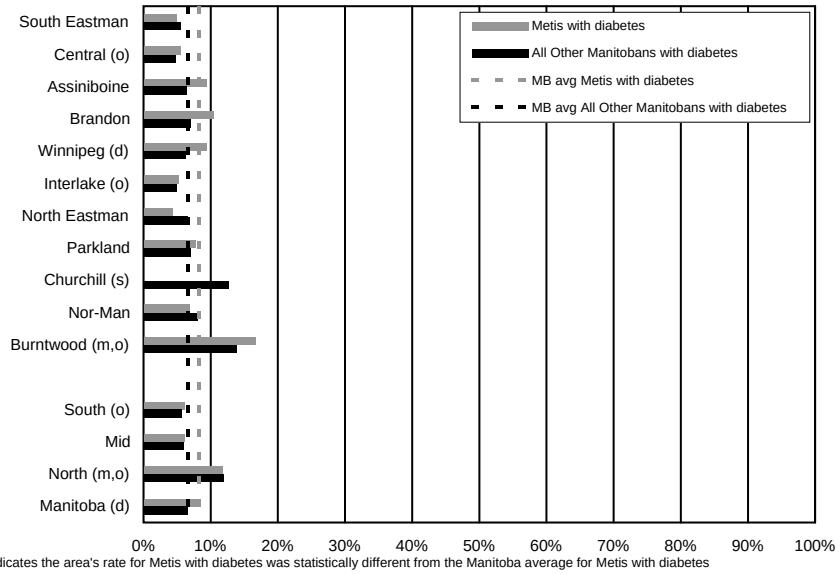
- There is no association with substance abuse prevalence with PMR at the RHA level

Winnipeg CAs (Figure 4.16.2):

- Metis have a higher prevalence of substance abuse compared to All Other Manitobans in Assiniboine South (15.5% vs. 4.8%), River Heights (12.1% vs. 6.5%), and River East (8.8% vs. 5.3%) CAs
- Metis have a higher prevalence of substance abuse compared to their provincial average in Downtown (16.2% vs. 8.3%) and Point Douglas (14.6% vs. 8.3%) CAs
- All Other Manitobans have a higher prevalence of substance abuse compared to their provincial average in Downtown (11.9% vs. 6.6%) and Point Douglas (11.6% vs. 6.6%) CAs whereas All Other Manitobans have a lower prevalence of substance abuse compared to their provincial average in Fort Garry (3.0% vs. 6.6%), Assiniboine South (4.8% vs. 6.6%), St. Boniface (4.9% vs. 6.6%), St. Vital (4.5% vs. 6.6%), Transcona (4.3% vs. 6.6%), River East (5.3% vs. 6.6%), Seven Oaks (4.9% vs. 6.6%), and St. James – Assiniboia (4.4% vs. 6.6%) CAs
- There is no association of substance abuse prevalence with PMR in Winnipeg

Figure 4.16.1: Prevalence of Substance Abuse by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period

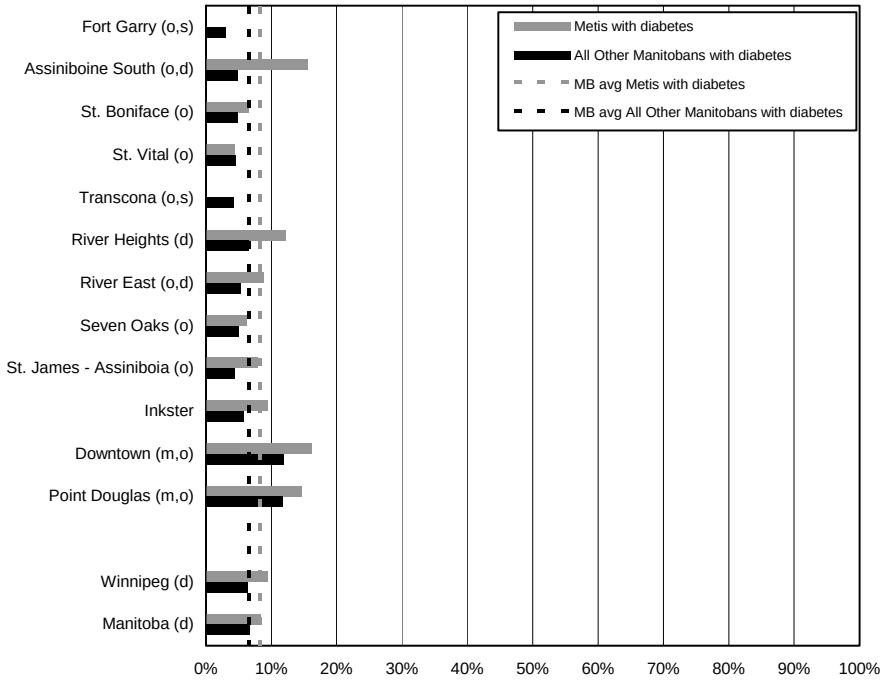


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 4.16.2: Prevalence of Substance Abuse by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2002/03-2006/07

Age- & sex-adjusted percent of residents aged 19+ in a five-year period



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Substances such as psychoactive drugs are used by many individuals for their ability to enhance moods, to escape or relieve psychic distress, and/or as part of the dependency process (Health Officers Council of British Columbia, 2005). In one survey in British Columbia 49.7% of Metis respondents identified themselves or a family member as having had used alcohol in the previous year (amount unspecified), and 19.7% reported that they or a family member had used illegal drugs in the previous year (Hutchinson et al., 2007). In the Metis Atlas (Martens, Bartlett, et al., 2010) it was found that 7.2% of Metis had a diagnosis of substance abuse. In that study the prevalence of substance abuse was found to be significantly higher in Metis compared to All Other Manitobans in Manitoba (7.2% vs. 4.9%) and in Winnipeg RHA (8.1% vs. 4.8%). This statistical difference between Metis and All Other Manitobans was seen in every Winnipeg CA, with the greatest differences in Downtown (14.5% vs. 8.0%) and Point Douglas (12.8% vs. 8.7%) CAs. The information in those studies was not specific to those living with diabetes.

There is no comparable literature on prevalence of substance abuse for Metis with diabetes. Similar to the findings in the Metis Atlas (Martens, Bartlett, et al., 2010) in our study the prevalence of substance abuse for Metis was higher compared to All Other Manitobans (8.3% vs. 6.6%) in Manitoba. Higher rates compared to their provincial averages were seen in North aggregate area for both Metis (11.8% vs. 8.3%) and All Other Manitobans (12.1% vs. 6.6%). In Winnipeg RHA a higher rate of substance abuse is seen in Metis compared to All Other Manitobans (9.4 vs. 6.4%). Unlike the Metis Atlas this difference is not seen across all CAs, but is present in Assiniboine South (15.5% vs. 4.8%), River Heights (12.1% vs. 6.5%), and River East (8.8% vs. 5.3%) CAs. Metis are also significantly higher than their provincial average in Downtown (16.2% vs. 8.3%) and Point Douglas (14.6% vs. 8.3%) CAs.

The higher rate of substance abuse found for Metis with diabetes is an area of concern for ongoing glycemic control and self management of their diabetes.

4.17 Comorbidities among Specified Illnesses

As mentioned at the outset of this report, individuals with diabetes are at a higher risk for developing other diseases. Comorbidity is defined as the occurrence of one or more chronic conditions (e.g., hypertension) in addition to the primary disease (e.g., diabetes); this occurs more often in people with diabetes (Struijs, Baan, Schellevis, Wester, & van den Bos, 2006). They are at an increased risk for both high blood pressure and stroke (Kuller et al., 1985). Higher rates of heart attack and fatal heart attack are also seen in individuals with diabetes (Poirier, 2008). Many people with diabetes are diagnosed with depression (Woo, 2008) and have higher rates of anxiety disorders (Grigsby et al., 2002). Often, people with diabetes live with multiple comorbidities.

In the following table, the crude percentages of Manitoba Metis with diabetes that also have a certain combination of other disorders (IHD, hypertension, depression, anxiety, and/or substance abuse) are shown. If there is check-mark (√) it indicates the presence of the morbidity indicator. The column 'Count of Metis with diabetes' indicates the number of Metis with diabetes who had that specific grouping of comorbidities; however, if there were 5 or fewer Metis with diabetes who had that specific grouping of comorbidities the data was suppressed, as indicated as 's' in Table 4.17.1. These numbers are not age- or sex-adjusted, but are observed counts.

Key observations (Table 4.17.1):

Metis with diabetes and All Other Manitobans with diabetes

- Using crude prevalence, nearly one-fifth of Metis in Manitoba (19.65%) did not have a diagnosis of IHD, hypertension, depression, anxiety disorders, or substance abuse (compared to 21.84% of All Other Manitobans)
- 38.79% of Metis (compared to 42.40% of All Other Manitobans) had one diagnosed comorbidity. The most frequent combinations were: Metis 28.83% hypertension (31.55% All Other Manitobans); 5.25% depression (5.10% All Other Manitobans); 3.26% IHD (4.01% All Other Manitobans); 0.94% substance abuse (1.06% All Other Manitobans); 0.51% anxiety disorders (0.68% All Other Manitobans)
- 28.10% of Metis (compared to 25.76% of All Other Manitobans) had two diagnosed comorbidities. The most frequent combinations of diagnosis were: Metis 14.11% IHD and hypertension (13.04% All Other Manitobans); 7.83% hypertension and depression (7.10% All Other Manitobans); 2.23% depression and anxiety disorders (1.70% All Other Manitobans); 1.51% hypertension and substance abuse (1.03% others); 1.03% IHD and depression (1.20% All Other Manitobans)
- 10.11% of Metis (compared to 7.94% of All Other Manitobans) had three diagnosed comorbidities. The most frequent combinations of diagnoses were: Metis 4.13% IHD, hypertension, and depression (3.53% All Other Manitobans); 2.80% hypertension, depression, and anxiety disorders (2.08% All Other Manitobans)
- 2.70% of Metis (compared to 1.88% of All Other Manitobans with diabetes) had four diagnosed comorbidities. The most frequent combination was: Metis 1.44% IHD, hypertension, depression, and anxiety disorders(1.12% All Other Manitobans)

- 0.30% of Metis (compared to 0.17% of All Other Manitobans) had five diagnosed comorbidities: IHD, hypertension, depression, anxiety disorders, and substance abuse

Table 4.17.1: Comorbidities among Specified Illnesses for Metis with Diabetes and All Other Manitobans with Diabetes aged 19+, 2002/03-2006/07[7]

Ischemic heart disease	Hypertension	Depression	Anxiety	Substance abuse	Count of Metis with diabetes	Percent of Metis with diabetes	Percent of All Other Manitobans with diabetes
					1109	19.65	21.84
√					184	3.26	4.01
	√				1627	28.83	31.55
		√			296	5.25	5.10
			√		29	0.51	0.68
				√	53	0.94	1.06
√	√				796	14.11	13.04
√		√			58	1.03	1.20
√			√		0	0.00	0.11
√				√	s	0.00	0.15
	√	√			442	7.83	7.10
	√		√		32	0.57	0.76
	√			√	85	1.51	1.03
		√	√		126	2.23	1.70
		√		√	46	0.82	0.62
			√	√	s	0.00	0.05
√	√	√			233	4.13	3.53
√	√		√		31	0.55	0.45
√	√			√	41	0.73	0.46
√		√	√		28	0.50	0.26
√		√		√	6	0.11	0.12
√			√	√	s	0.00	0.00
	√	√	√		158	2.80	2.08
	√	√		√	39	0.69	0.59
	√		√	√	s	0.00	0.03
		√	√	√	34	0.60	0.42
√	√	√	√		81	1.44	1.12
√	√	√		√	25	0.44	0.31
√	√		√	√	s	0.00	0.02
√		√	√	√	s	0.00	0.03
	√	√	√	√	46	0.82	0.40
√	√	√	√	√	17	0.30	0.17

Source: MMF, 2010

[7] The sample size (population cohort) of 5,622 Metis with diabetes and 79,708 All Other Manitobans with diabetes in this comorbidity table is different from the sample size (population cohort) used to develop the population pyramid and to measure morbidity, health services use, and quality of primary care (5,168 Metis with diabetes and 70,915 All Other Manitobans with diabetes). This is because each indicator in the Metis diabetes study is based on a different total number of years of data. When combined for comparison in a comorbidity table the sample size was changed to accommodate these different years of measurement. Mental health variables (depression, anxiety, and substance abuse) and hypertension are based on five-year prevalence data while ischemic heart disease is based on one-year prevalence data.

Findings from Literature Review

(compared to the results in this study – *in italics*):

As noted previously, comorbidity occurs more often in people with diabetes (Struijs et al., 2006). The Aboriginal Peoples Survey (2006) found that just over half (54%) of all Metis aged 15 and over reported being diagnosed with a chronic condition; more than half of these (28% of all Metis) had two or more chronic conditions (Janz et al., 2009). The most commonly reported chronic conditions were arthritis and/or rheumatism (21% Metis vs. 13% total Canadian population), high blood pressure (16% Metis vs. 12% total Canadian population), asthma (14% Metis vs. 8% total Canadian population), and diabetes (7% Metis vs. 4% total Canadian population). Metis women were more likely than Metis men to report having more than one chronic condition (Janz et al., 2009). While this information is not specific to diabetes it does provide some insight into the overall burden of comorbidity reported in the Metis population.

There is no comparable literature on prevalence of physical and mental comorbidities in Metis with diabetes. In our study we found that 19.65% of Metis with diabetes and 21.84% of All Other Manitobans with diabetes did not have any of the five identified comorbidities (substance abuse, anxiety disorders, depression, hypertension, or ischemic heart disease). A smaller proportion of Metis had one comorbidity compared to All Other Manitobans (38.79% vs. 42.40%). A larger proportion of Metis with diabetes had two comorbidities (28.10% vs. 25.76%), three comorbidities (10.11% vs. 7.94%), four comorbidities (2.70% vs. 1.88%), and five comorbidities (0.30% vs. 0.17%) compared to All Other Manitobans with diabetes.

These proportions show a possible trend toward more comorbidities in Metis with diabetes compared to All Other Manitobans with diabetes in Manitoba and suggest a higher burden of illness in Metis in this study.

References

Alder, A. I., Stratton, I. M., & Neil, H. A. (2000). Association of systolic blood pressure with macrovascular and microvascular complication of type 2 diabetes (UKPDS 36): prospective observational study. *British Medical Journal, 321*(7258), 412-419.

Boersma, E., Mercado, N., Poldermas, D., Gardien, M., Vos, J., & Simoons, M. L. (2003). Acute myocardial infarction. *Lancet, 361*(9360), 847-858.

Booth, G. L., Kapral, M. K., Fung, K., & Tu, J. V. (2006). Relation between age and cardiovascular disease in men and women with diabetes compared with non-diabetic people: A population-based retrospective cohort study. *Lancet, 368*(9529), 29-36.

Boulton, A. J., Vileikyte, L., Ragnarson-Tennvall, G., & Apelqvist, J. (2005). The global burden of diabetic foot disease. *Lancet, 366*(9498), 1719-1724.

Bowering, K., Ekoé, J. M., & Kalla, T. P. (2008). Foot care. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S143-S146.

Bruce, S. (2000). The impact of diabetes mellitus among the Métis of Western Canada. *Ethnicity & Health, 5*(1), 47-57.

Brown, L. C., Majumdar, S. R., Newman, S. C., & Johnson, J. A. (2006). Type 2 diabetes does not increase risk of depression. *Canadian Medical Association Journal, 175*(1), 42-46.

Culleton, B., Drouin, D., LaRochelle, P., Leiter, L. A., McFarlane, P., & Tobe, S. (2008). Treatment of hypertension. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S115-S118.

Cohn, P. F., Fox, K. M., & Daly, C. (2003). Silent myocardial ischemia. *Circulation, 108*(10), 1263-1277.

Dannenbaum, D., Dawson, G. D., Harris, B. S., & Wortman, J. (2008). Type 2 diabetes in Aboriginal peoples. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S187-S190.

Deshpande, A. D., Harris-Hayes, M., & Schootman, M. (2008). Epidemiology of diabetes and diabetes-related complications. *Physical Therapy, 88*(11), 1254-1264.

Fitchett, D. (2008). Management of acute coronary syndromes. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S119-S122.

Foley, R. N., & Collins, A. J. (2007). End-stage renal disease in the United States: An update from the United States renal data system. *Journal of the American Society of Nephrology, 18*(10), 2644-2648.

Gordis, L. (1996). *Epidemiology*. Toronto, ON: W.B. Saunders.

Grigsby, A. B., Anderson, R. J., Freedland, K. E., Clouse, R. E., & Lustman, P. J. (2002). Prevalence of anxiety in adults with diabetes: A systematic review. *Journal of Psychosomatic Research, 53*(6), 1053-1060.

Harvey, E., Harris, B. S., & Sohol, P. (2008). Type 2 diabetes in high-risk ethnic populations. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S191-S193.

Hassard, T. (1991). *Understanding biostatistics*. St. Louis, MO: Mosby.

Health Officers Council of British Columbia. (2005). *A public health approach to drug control in Canada: Discussion paper*. Retrieved from http://www.keepingthedooropen.com/Portals/0/hoc_paper_media_backgrounder.pdf

Hutchinson. P,, Evans. M,, & Reid. C, (2007). *Report on the statistical description and analysis of the 2006 Métis Nation of British Columbia Provincial Survey*. Retrieved from http://www.mpcbc.bc.ca/health/pdf/mnbc_survey_results.pdf

Janz, T., Seto, J., & Turner, A. (2009). *Aboriginal Peoples Survey, 2006: An overview of the health of the Métis population*. Ottawa, ON: Minister of Industry.

Jones, H., Hall, P., Simon, B., & Mitchell, B. (2008). Psychological aspects of diabetes. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S82-S85.

Katon, W. J., Rutter, C., Simon, G., Lin, E. H. B., Ludman, E., Ciechanowski, P., ...Von Korff, M. (2005). The association of comorbid depression with mortality in patients with type 2 diabetes. *Diabetes Care, 28*(11), 2668-2672.

Kuller, L. H., Dorman, J. S., & Wolf, P. A. (1985). Cerebrovascular disease and diabetes. In M. I. Harris & R. F. Hamman (Eds.), *Diabetes in America* (pp. 1468-1501). Bethesda, MD: National Institutes of Health.

Li, C., Ford, E. S., Strine, T. W., & Mokdad, A. H. (2008). Prevalence of depression among U.S. adults with diabetes: Findings from the 2006 Behavioral Risk Factor Surveillance System. *Diabetes Care, 31*(1), 105-107.

Lin, E. H. B., Rutter, C. M., Katon, W., Heckbert, S. R., Ciechanowski, P., Oliver, M. M., ...Von Korff, M. (2010). Depression and advanced complications of diabetes: A prospective cohort study. *Diabetes Care, 33*(2), 264-269.

Lin, Y. & Sun, Z. (2010). Current views on type 2 diabetes. *Journal of Endocrinology, 204*(1), 1-11.

Lloyd-Jones, D. M., Leip, E. P., Larson, M. G., D'Agostino, R. B., Beiser, A., Wilson, P. W. F., Levy, D. (2006). Prediction of lifetime risk of cardiovascular disease by risk factor burden at 50 years of age. *Circulation, 113*(6), 791-798.

Lok, C. E., Oliver, M. J., Rothwell, D. M., & Hux, J. E. (2004). The growing volume of diabetes-related dialysis: A population based study. *Nephrology Dialysis Transplantation, 19*(12), 3098-3103.

Martens, P. J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study.* Winnipeg, MB: Manitoba Centre for Health Policy.

McFarlane, P. A., Holden, R., Harris, S. B., & Tobe, S. W. (2003). Nephropathy. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S66-S71.

McIntosh, D., Kjernisted, K., & Hammond, J. (2008). Diabetes and depression: What is the association between these common, chronic illnesses? *Canadian Journal of Diabetes, 21*(1), 3-7.

Meatherall, B. L., Garrett, M. R., Kaufert, J., Martin, B. D., Fricke, M. W., Arneja, A. S., ...Embil, J. M. (2005). Disability and quality of life in Canadian Aboriginal and Non-Aboriginal diabetic lower-extremity amputees. *Archives of Physical Medicine and Rehabilitation, 86*(8), 1594-1602.

Oster, R. T., & Toth, E. L. (2009). Differences in the prevalence of diabetes risk-factors among First Nation, Metis and non-aboriginal adults attending screening clinics in rural Alberta, Canada. *Rural and Remote Health, 9*(2), 1170-1177.

Public Health Agency of Canada (2007). *Diabetes in Canada: Facts and figures.* Retrieved from http://origin.phac-aspc.gc.ca/publicat/2008/ndfs-fnrd-08/pdf/ndfs_ff-fnrd_fc-eng.pdf

Public Health Agency of Canada. (2009). *Report from the National Diabetes Surveillance System: Diabetes in Canada, 2008*. Ottawa, ON: PHAC.

Public Health Agency of Canada. (2010). *What is diabetes?* Retrieved from http://www.atlantique.phac.gc.ca/cd-mc/diabetes-diabete/index-eng.php

Poirier, P. (2008). Screening for the presence of coronary artery disease. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S99-S101.

Quinn, R. R., Hemmelgarn, B. R., Padwal, R. S., Myers, M. G., Cloutier, L., Bolli, P., ...Canadian Hypertension Education Program. (2010). The 2010 Canadian Hypertension Education Program recommendations for the management of hypertension: Part 1 – blood pressure measurement, diagnosis and assessment of risk. *Canadian Journal of Cardiology, 26*(5), 241-248.

Reiber, G. E. (1996). The epidemiology of diabetic foot problems. *Diabetic Medicine, 13*(S1), S6-S11.

Struijs, J. N., Baan, C. A., Schellevis, F. G., Wester, G. P., & van den Bos, G. A. (2006). Comorbidity in patients with diabetes mellitus: Impact on medical health care utilization. *BMC Health Services Research, 6*(84). Retrieved from http://www.biomedcentral.com/1472-6963/6/84

Tobe, S., Vincent, L., Wentworth, J., Hildebrandt, D., Kiss, A., Perkins, N., ...Pylypchuk, G. (2010). Blood pressure two years after a chronic disease management intervention study. *International Journal of Circumpolar Health, 69*(1), 50-60.

Ur, E. (2008). Definition, classification and diagnosis of diabetes and other dysglycemic categories. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32(*Suppl. 1), S10-13.

Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C., & Murray, C. J. L. (2004). Global burden of depressive disorders in the year 2000. *British Journal of Psychiatry, 184*(5), 386-392.

Woo, V. (2008). Introduction. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32(*Suppl. 1), S1-S4.

World Health Organization. (2006). *Definitions and diagnosis of diabetes mellitus and intermediate hyperglycemia.* Geneva, Switzerland: World Health Organization. Retrieved from http://www.idf.org/webdata/docs/WHO_IDF_definition_diagnosis_of_diabetes.pdf

World Health Organization. (2010a). *Diabetes.* Retrieved from http://www.who.int/mediacentre/factsheets/fs312/en/index.html

World Health Organization. (2010b). WHO health topics: Stoke, cerebrovascular accident. Retrieved from http://www.who.int/topics/cerebrovascular_accident/en/

Section 5: Health Services Use

Health services use is the use of medical health services available to individuals and populations, including routine blood tests and complex treatments such as renal dialysis. In 2005 $5.6 billion dollars was spent to treat people with diabetes and its complications, accounting for 10% of the annual cost of the Canadian health care system (Woo, 2008). It is anticipated that by 2016 health care expenditures related to diabetes will reach $8.14 billion in Canada, as the number of individuals with diabetes reaches 2.4 million (Ohinmaa, Jacobs, Simpson, & Johnson, 2004). In Manitoba, people with diabetes have health care costs more than four times greater compared to people without diabetes even after controlling for age, sex, and hypertension and other comorbidities (Finlayson, Ekuma, Yogendran, Burland, & Forget, 2010). Health services use accounts for most of this cost.

This section includes the following indicators:

- Ambulatory visit rate
- Ambulatory consultation rate
- Total hospital separation rate
- Hospital separations by cause
- Hospital days used in short stays
- Hospital days used in long stays
- Number of different drug types dispensed per user

All definitions used in this section have been developed by the Manitoba Centre for Health Policy for the Metis Atlas (Martens, Bartlett, et al., 2010) unless otherwise cited. In this section Metis with diabetes are compared to All Other Manitobans with diabetes. As noted in Section 1, unless otherwise indicated any mention of 'lower' or 'higher' refers to results that are statistically significant.

Overall Key Findings (Table 5.0):

- In this study the rates of ambulatory visits (8.8 vs. 8.0 per resident), total hospital separations (408 vs. 336 per 1,000), short stay hospital days (1048 vs. 824 per 1,000), and number of different drug types dispensed (8.1 vs. 7.1 per resident with one/more prescriptions) are higher in Metis compared to All Other Manitobans
- Rates of long hospital days is similar for both Metis and All Other Manitobans

Table 5.0: Overall Key Findings of Health Services Use Indicators*

Indicator (age of inclusion for this indicator)	Provincial difference between Metis with diabetes and All Other Manitobans with diabetes (age- and sex-adjusted prevalence in %, unless otherwise stated), with RR (relative rate) for Metis with diabetes	Statistically 'better off' regions for Metis with diabetes compared to provincial average for Metis with diabetes NOTE: Although this may or may not be a correct assumption, a high rate will be considered 'better off' for this indicator, i.e., possibly good access	Statistically 'worse off' regions for Metis with diabetes compared to provincial average for Metis with diabetes NOTE: Although this may or may not be a correct assumption, a low rate will be considered 'worse off' for this indicator, i.e., possible lack of access."
Ambulatory Visit Rate, all ages	8.8 vs. 8.0 (per resident) RR = 1.10	South Eastman RHA; Central RHA; Assiniboine RHA; Interlake RHA; Burntwood RHA; Assiniboine South CA	Winnipeg RHA; Inkster CA; Downtown CA; Point Douglas CA
Ambulatory Consultation Rate, all ages	0.50 vs. 0.51 (per resident) RR = 0.98, NS	Assiniboine RHA; Parkland RHA; Nor-Man RHA	Winnipeg RHA; St. James – Assiniboia CA; Inkster CA
Total Hospital Separation Rate, all ages	408 vs. 336 (per 1,000 residents) RR = 1.21	Winnipeg RHA; St. Boniface CA; River Heights CA; St. James – Assiniboia CA	Parkland RHA; Burntwood RHA
Short Hospital Days, all ages	1,048 vs. 824 (per 1,000 residents) RR = 1.27	South Eastman RHA; Winnipeg RHA; St. Boniface CA; St. Vital CA; Transcona CA; River East CA; St. James – Assiniboia CA	Parkland RHA; Nor-Man RHA; Burntwood RHA
Long Hospital Days, all ages	1,667 vs. 1,749 (per 1,000 residents) RR = 0.95, NS	None	None
Number of Different Drug Types Dispensed per User, all ages	8.1 vs. 7.1 (per resident with one/more prescriptions dispensed) RR = 1.14	South Eastman RHA; St. Boniface CA; St. James – Assiniboia CA	Parkland RHA; Burntwood RHA; Inkster CA; Point Douglas CA

NS = Not statistically different between Metis and All Other Manitobans

*This table is somewhat different from 'overall key findings' tables in other sections due to the need for careful interpretation of the context. Rather than state which regions are 'worse' or 'better' off, this table states which regions are lower or higher. While Metis in one region may have lower hospital separations, this must be examined together with other indicators for Metis regional health to see if this lower rate is appropriate given health status (Martens, Bartlett, et al., 2010)

5.1 Ambulatory Visit Rate

Ambulatory visit rates include almost all contacts with physicians (General Practitioners/Family Practitioners and specialists): office visits, walk-in clinic visits, home visits, personal care home (nursing home) visits, visits to outpatient departments, and some emergency room visits (where data is recorded). Excluded are services provided to patients while admitted to hospital and visits for pre-natal care.

The age- and sex-adjusted ambulatory visit rate per resident was measured for fiscal year 2006/07. The denominator includes all Manitoba residents with diabetes as of December 31, 2006. There is a possibility that there is missing data for this indicator because of an inability to pick up nursing station visits, especially in First Nations communities. Although nurse practitioners and salaried physicians are expected to 'shadow bill', incomplete billings can result in visits to these professionals being undercounted.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.1.1):

- Metis have a higher ambulatory visit rate compared to All Other Manitobans in Manitoba (8.8 vs. 8.0 visits)

Aggregate areas (Figure 5.1.1):

- Metis have a higher ambulatory visit rate compared to Other Manitobans in Mid (8.7 vs. 7.8 visits) and North (8.1 vs. 6.5) aggregate areas
- Metis have a lower ambulatory visit rate compared to their provincial average in Rural South (7.4 vs. 8.8 visits) aggregate area
- All Other Manitobans have a lower ambulatory visit rate compared to their provincial average in Rural South (7.3 vs. 8.0 visits) and North (6.5 vs. 8.0) aggregate areas
- Ambulatory visit rate does not appear to be associated with PMR at the aggregate level

RHAs (Figure 5.1.1):

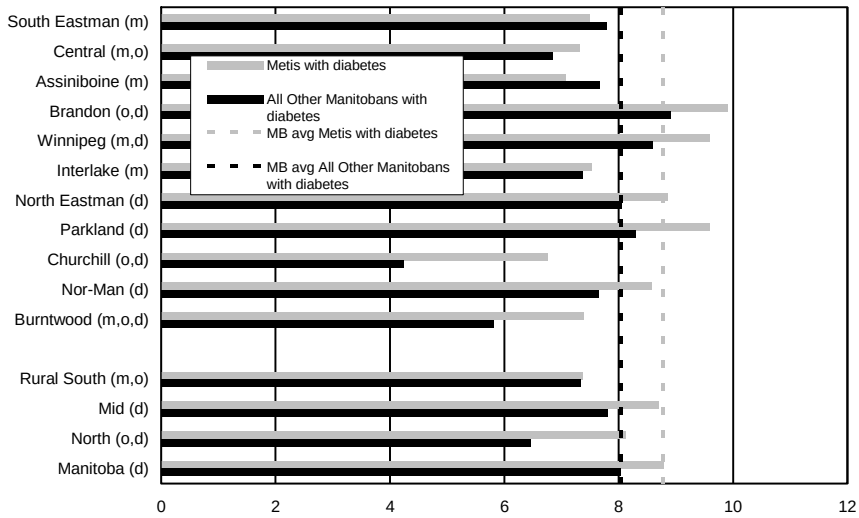
- Metis have a higher ambulatory visit rate compared to All Other Manitobans in Brandon (9.9 vs. 8.9 visits), Winnipeg (9.6 vs. 8.6), North Eastman (8.9 vs. 8.1), Parkland (9.6 vs. 8.3), Churchill (6.8 vs. 4.2), Nor-man (8.6 vs. 7.6), and Burntwood (7.4 vs. 5.8) RHAs
- All Other Manitobans have a higher ambulatory visit rate compared to their provincial average in Brandon RHA (8.9 vs. 8.0 visits) whereas All Other Manitobans have a lower rate compared to their provincial average in Central (6.8 vs. 8.0), Churchill (4.2 vs. 8.0), and Burntwood (5.8 vs. 8.0) RHAs
- There is no PMR gradient, as ambulatory visits do not increase from most healthy to least healthy RHAs

Winnipeg CAs (Figure 5.1.2):

- Metis have a higher ambulatory visit rate compared to All Other Manitobans in St. Vital (9.6 vs. 8.6 visits), Transcona (8.9 vs. 7.9), Seven Oaks (9.1 vs. 7.7), Inkster (11.2 vs. 8.2), and Point Douglas (10.3 vs. 9.3) CAs whereas Metis have a lower ambulatory visit rate compared to All Other Manitobans in Assiniboine South CA (7.1 vs. 8.5)
- Metis have a higher ambulatory visit rate compared to their provincial average in Inkster (11.2 vs. 8.8 visits), Downtown (10.2 vs. 8.8), and Point Douglas (10.3 vs. 8.8) CAs whereas Metis have a lower rate compared to their provincial average in Assiniboine South CA (7.1 vs. 8.8)
- All Other Manitobans have a higher ambulatory visit rate compared to their provincial average in River Heights (8.9 vs. 8.0 visits), Downtown (9.7 vs. 8.0), and Point Douglas (9.3 vs. 8.0) CAs
- There is no PMR gradient indicating a pattern of ambulatory visits from most healthy to least healthy Winnipeg CAs

Figure 5.1.1: Ambulatory Visit Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate of ambulatory visits to all physicians, per resident

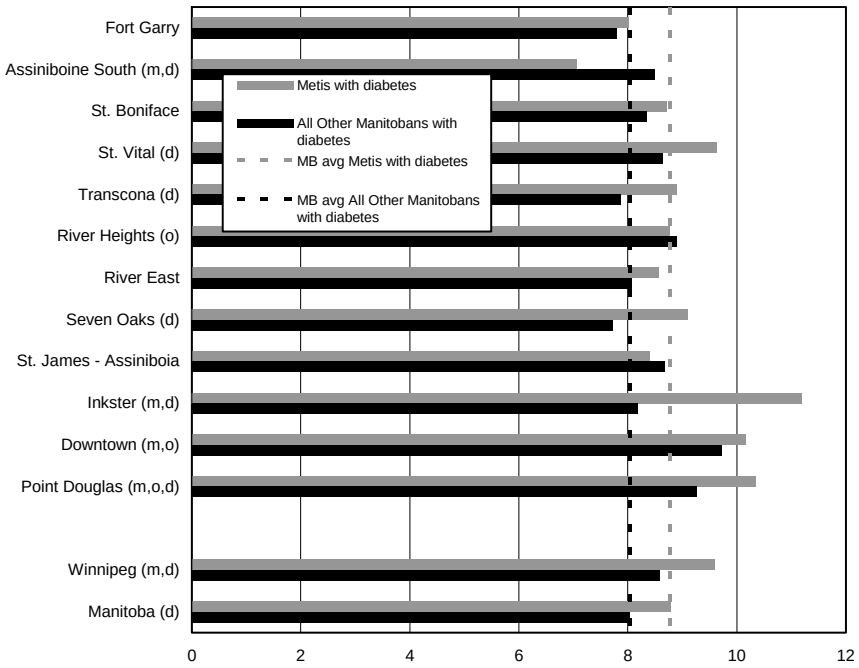


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 5.1.2: Ambulatory Visit Rate by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate of ambulatory visits to all physicians, per resident



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

The ability to engage on a regular basis with a care provider is fundamental to managing chronic disease effectively – or preventing its development. Physician visits comprise an important part of health care. The family physician plays a unique role in diabetes care, often serving as the principal medical contact for individuals with diabetes, providing continuity of care within the family, and helping in the early identification of type 2 diabetes in other family members at high risk of developing the disease (Ludwig, Clement, Dunbar, & Johnson, 2008). In Canada, 96% of individuals with diabetes 12 years of age and older reported having a regular medical doctor and 42% of this group reported that they consulted with another physician or specialist (Canadian Institute for Health Information [CIHI], 2009).

As reported in the *2006 Profile of Aboriginal Children, Youth and Adults*, 21% of Metis respondents in Manitoba rated the availability of a doctor or physician in their community as poor and 21% rated it as fair; even more (28%) rural Metis in Manitoba rated availability as poor while 19% reported it as fair (Statistics Canada, 2009). The 2009 RHA Indicator Atlas reported that the ambulatory visit rate for Manitobans was slightly less than five visits per resident per year in 2000/01 and 2005/06. However, there were higher rates documented for residents in Winnipeg RHA and Brandon RHA (Fransoo et al., 2009). Martens, Bartlett, et al. (2010) found that Metis had a higher ambulatory visit rate compared to All Other Manitobans at the provincial level (5.4 vs. 4.8 visits per year). The information in those studies was not specific to those living with diabetes.

People with diabetes are more likely to use physician services more frequently compared to those without diabetes (Harris, 1998; Rendell, Kimmel, Bamisedun, O'Donnell, & Fulmer 1993). Younger Canadian adults (aged 20 to 49) with diabetes have twice as many visits to a family physician compared to those of the same age without diabetes (Public Health Agency of Canada [PHAC], 2009). Furthermore, in Canada across all age groups the rate of visits to a family physician was higher in people with diabetes compared to people without diabetes (PHAC, 2009).

There is no comparable literature on rates of ambulatory consultations in Metis with diabetes. In our study Metis with diabetes have a higher age- and sex -adjusted ambulatory visit rate compared to All Other Manitobans with diabetes at the provincial level (8.8 vs. 8.0 visits) and in every RHA except South Eastman, Central, Assiniboine, and Interlake.

5.2 Ambulatory Consultation Rate

Consultations are a subset of ambulatory visits: they occur when one physician refers a patient to another physician (usually a specialist or surgeon) because of the complexity, obscurity, or seriousness of the condition, or when the patient requests a second opinion. A consultation can be with either a General Practitioner/Family Practitioner (GP/FP) or a specialist, after which the patient usually returns to their GP/FP for ongoing management.

The rate of consultations is a measure of 'initial' access to specialist care. People in urban areas often have much higher overall rates of specialist care, since they may continue to see the specialist rather than being referred back to their GP/FP. That is why the consultation rate, rather than the overall specialist visit rate, is used as an indicator for access to specialist care.

The age- and sex- adjusted ambulatory consultation rate per resident was measured for fiscal year 2006/07. Consultations to GP/FPs and specialists are counted. The definition of a consultation is an ambulatory physician visit with one of the following physician tariff codes:

- 8440 orthopaedic spinal consultation
- 8449 extended ophthalmology consultation for the assessment and/or treatment of uveitis
- 8550 consultation
- 8552 developmental assessment and report per 15 minute period or portion thereof
- 8553 psychiatry consultation - adult
- 8554 psychiatry consultation - child
- 8556 ophthalmology consultation, including refraction and other necessary tests (doctor or optometrist)
- 8557 otorhinolaryngology (ENT) consultation

The denominator includes all Manitoba residents with diabetes as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.2.1):

- There is no difference in the ambulatory consultation rate between Metis and All Other Manitobans in Manitoba (0.50 vs. 0.51 visits)

Aggregate areas (Figure 5.2.1):

- Metis have a lower ambulatory consultation rate compared to their provincial average in Rural South aggregate area (0.39 vs. 0.50 visits)
- All Other Manitobans have a lower ambulatory consultation rate compared to their provincial average in Rural South (0.36 vs. 0.51 visits), Mid (0.45 vs. 0.51), and North (0.44 vs. 0.51) aggregate areas
- Ambulatory visit rate is not associated with PMR at the aggregate level

RHAs (Figure 5.2.1):

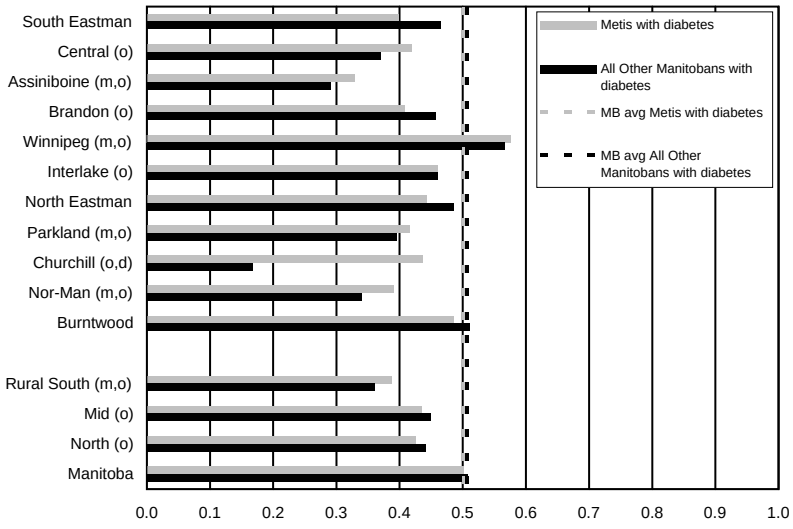
- Metis have a higher ambulatory consultation rate compared to All Other Manitobans in Churchill RHA (0.44 vs. 0.17 visits)
- Metis have a higher ambulatory consultation rate compared to their provincial average in Winnipeg (0.58 vs. 0.50 visits) whereas Metis have a lower ambulatory consultation rate than their provincial average in Assiniboine (0.33 vs. 0.50), Parkland (0.42 vs. 0.50), and Nor-Man (0.39 vs. 0.50) RHAs
- All Other Manitobans have a higher ambulatory consultation rate compared to their provincial average in Winnipeg RHA (0.57 vs. 0.51 visits) whereas All Other Manitobans have a lower ambulatory consultation rate compared to their provincial average in Central (0.37 vs. 0.51), Assiniboine (0.29 vs. 0.51), Brandon (0.46 vs. 0.51), Interlake (0.46 vs. 0.51), Parkland (0.40 vs. 0.51), Churchill (0.17 vs. 0.51), and Nor-Man (0.34 vs. 0.51) RHAs
- There is no PMR gradient at the RHA level, as the ambulatory consultation rate does not increase from most healthy to least healthy RHAs

Winnipeg CAs (Figure 5.2.2):

- Metis have a higher ambulatory consultation rate compared to All Other Manitobans in St. James – Assiniboia (0.74 vs. 0.58 visits) and Inkster (0.76 vs. 0.54) CAs
- Metis have a higher ambulatory consultation rate compared to their provincial average in St. James – Assiniboia (0.74 vs. 0.50 visits) and Inkster (0.76 vs. 0.50) CAs
- All Other Manitobans have a higher ambulatory consultation rate compared to their provincial average in Fort Garry (0.57 vs. 0.51 visits), Assiniboine South (0.58 vs. 0.51), St. Vital (0.57 vs. 0.51), River Heights (0.63 vs. 0.51), and St. James – Assiniboia (0.58 vs. 0.51) CAs
- There is no association between PMR and ambulatory consultation rate in Winnipeg

Figure 5.2.1: Ambulatory Consultation Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate, per resident

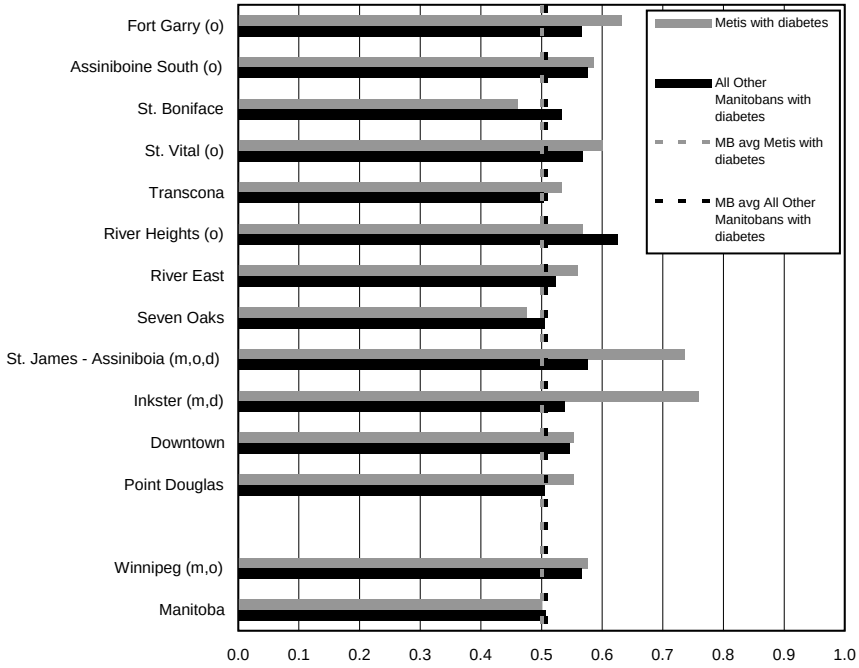


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 5.2.2: Ambulatory Consultation Rate by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate, per resident



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Fransoo et al. (2009) found that the rates of ambulatory consultations for all Manitobans remained unchanged at approximately 0.275 visits per resident per year over two measurement periods (2000/01 and 2005/06). In the Metis Atlas (Martens, Bartlett, et al., 2010) it was found that Metis in Manitoba had a higher ambulatory consultation rate compared to All Other Manitobans (0.30 vs. 0.28 visits per year). The information in that study was not specific to those living with diabetes.

For people with diabetes rates of specialist visits across all age groups are higher compared to people without diabetes (PHAC, 2009). In particular, younger adults (aged 20 to 49) with diabetes are two to three times more likely to visit a specialist; children and adolescents are four times more likely to visit a specialist compared to those without diabetes (PHAC, 2009). In a recent study using Alberta Health and Wellness administrative data, a statistically higher number of GP and specialist visits were recorded in the status Aboriginal population with diabetes compared to the status Aboriginal population that did not have diabetes (Oster et al., 2009).

There is no comparable literature on rates of ambulatory consultations in Metis with diabetes. In our study at the provincial level there is no difference in ambulatory consultation rate between Metis with diabetes and All Other Manitobans with diabetes (0.50 vs. 0.51 visits). Reflecting the Metis Atlas (Martens, Bartlett, et al., 2010) results, in our study there is a lower rate of referral for All Other Manitobans with diabetes in the Rural South aggregate area compared to their provincial average (0.36 vs. 0.51 visits). There is a similar difference in rates of referral for Metis with diabetes in that aggregate area compared to their provincial average (0.39 vs. 0.50 visits).

Metis with diabetes appear to receive ambulatory consultations at a rate similar to All Other Manitobans with diabetes.

5.3 Total Hospital Separation Rate

A separation from a health care facility occurs anytime a patient (or resident) leaves because of death, discharge, or transfer. The number of separations is the most commonly used measure of utilization of hospital services. Separations, rather than admissions, are used because hospital abstracts for patient care are based on information gathered at the time of discharge. The words 'separation', 'discharge', and 'stay' are used interchangeably.

The age- and sex-adjusted rate of hospitalizations per 1,000 residents was measured in fiscal year 2006/07. Both inpatient hospital stays and surgical outpatient records were included; newborn (birth) hospitalizations were excluded. Multiple admissions of the same person were counted as separate events. All Manitoba hospitals were included; PCHs and Long-term Care facilities (Riverview, Deer Lodge, Rehabilitation Centre for Children, and Adolescent Treatment Centre) were excluded. For consistency over time, outpatient hospital separations with a principal procedure code for a biopsy were also excluded. Surgical outpatients only attending the hospital for a biopsy did not require a hospital abstract as of April 1, 2001.

The denominator includes all Manitoba residents with diabetes as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.3.1):

- Metis have a higher total hospital separation rate compared to All Other Manitobans in Manitoba (408 vs. 336 per 1,000)

Aggregate areas (Figure 5.3.1):

- Metis have a higher total hospital separation rate compared to their provincial average in North aggregate area (598 vs. 408 per 1,000)
- All Other Manitobans have a higher total hospital separation rate compared to their provincial average in Mid (411 vs. 336 per 1,000) and North (570 vs. 336) aggregate areas
- There is a distinct PMR pattern for both Metis and All Other Manitobans at the aggregate level, with hospital separation rates rising from Rural South to North aggregate areas

RHAs (Figure 5.3.1):

- Metis have a higher total hospital separation rate compared to All Other Manitobans in Central (508 vs. 395 per 1,000), Winnipeg (313 vs. 262), Parkland (576 vs. 481), and Churchill (654 vs. 279) RHAs whereas Metis have a lower total hospital separation rate compared to All Other Manitobans in North Eastman (301 vs. 405) RHA
- Metis have a higher total hospital separation rate compared to their provincial average in Parkland (576 vs. 408 per 1,000) and Burntwood (707 vs. 408) RHAs whereas Metis have a lower total hospital separation rate compared to their provincial average in Winnipeg (313 vs. 408) RHA

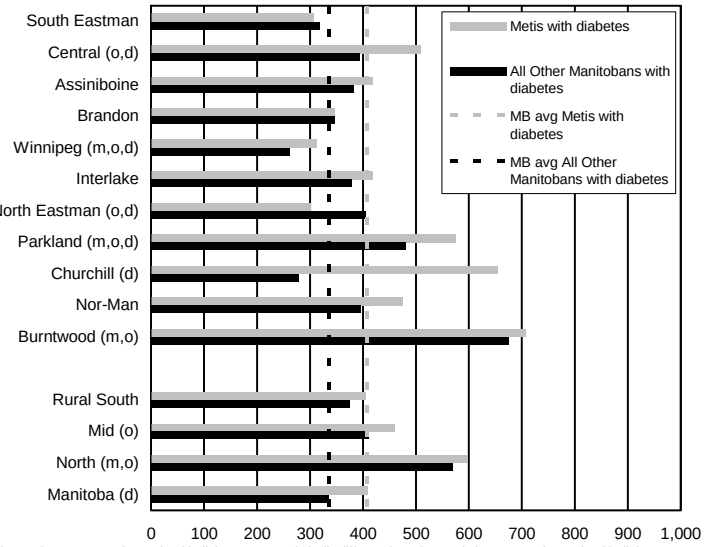
- All Other Manitobans have a higher total hospital separation rate compared to their provincial average in Central (395 vs. 336 per 1,000), North Eastman (405 vs. 336), Parkland (481 vs. 336), and Burntwood (675 vs. 336) RHAs whereas All Other Manitobans have a lower total hospital separation rate compared to their provincial average in Winnipeg (262 vs. 336) RHA
- There is no PMR gradient for Metis or All Other Manitobans at the RHA level, as hospital separations do not increase from most to least healthy RHAs

Winnipeg CAs (Figure 5.3.2):

- Metis have a higher total hospital separation rate compared to All Other Manitobans in Inkster CA (483 vs. 235 per 1,000)
- Metis have a lower total hospital separation rate compared to their provincial average in St. Boniface (294 vs. 408 per 1,000), River Heights (246 vs. 408), and St. James – Assiniboia (214 vs. 408) CAs
- All Other Manitobans have a lower total hospital separation rate compared to their provincial average in Fort Garry (244 vs. 336 per 1,000), Assiniboine South (224 vs. 336), St. Boniface (234 vs. 336), St. Vital (262 vs. 336), Transcona (268 vs. 336), River Heights (261 vs. 336), River East (286 vs. 336), Seven Oaks (251 vs. 336), St. James – Assiniboia (244 vs. 336), and Inkster (235 vs. 336) CAs
- Hospital separations do not appear to increase with PMR in Winnipeg

Figure 5.3.1: Total Hospital Separation Rate by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate of hospital separations per 1,000 residents

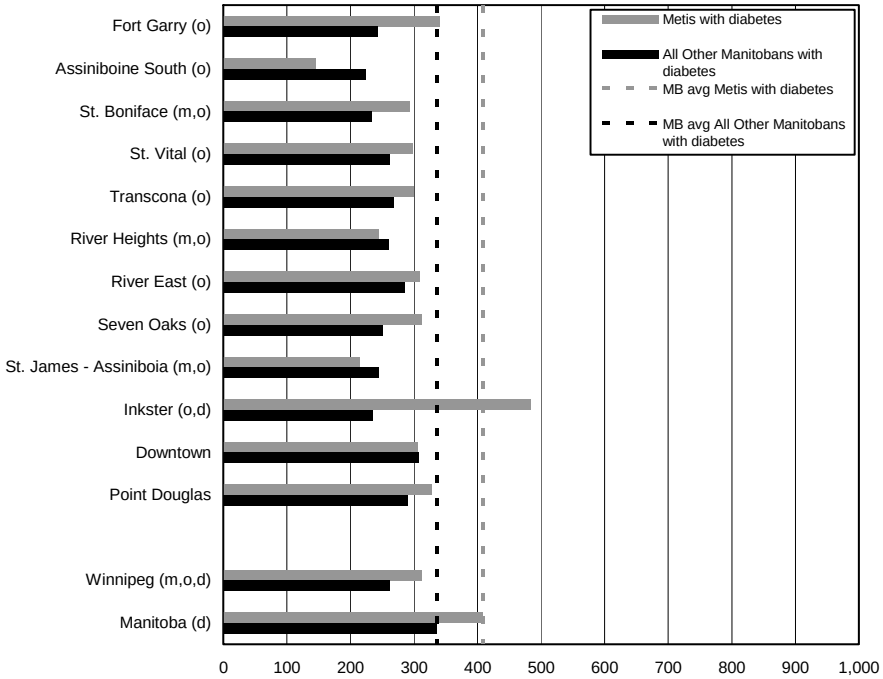


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 5.3.2: Total Hospital Separation Rate by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate of hospital separations per 1,000 residents



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

In the Metis Atlas (Martens, Bartlett, et al., 2010), Metis had a statistically higher hospital separation rate compared to All Other Manitobans (193 vs. 154 per 1,000 per year). The information in that study was not specific to those living with diabetes.

People with diabetes are more likely to be hospitalized, and are hospitalized more often, than those without diabetes (Aro, Kangas, Reunanen, Salinto, & Koivisto, 1994; Aubert, Geiss, Ballard, Cocanougher, & Herman, 1995). They have also been associated with higher costs for in-patient care compared to people without diabetes (Kangas et al., 1996). In Canada, diabetes and related complications (microvascular and macrovascular) are responsible for 10% of all admissions to Canadian acute care hospitals (Woo, 2008). Age, race/ethnicity, and income are factors that influence the number of hospitalizations of individuals with diabetes (Jiang, Stryer, Friedman, & Andrews, 2003).

There is no comparable literature on total hospital separation rates in Metis with diabetes. In our study Metis with diabetes have a higher hospital separation rate compared to All Other Manitobans with diabetes in Manitoba (408 vs. 336 per 1,000). In particular Metis with diabetes in Central (508 vs. 395 per 1,000), Parkland (576 vs. 481), Churchill (654 vs. 279), and Winnipeg (313 vs. 262) RHAs have higher rates; only North Eastman RHA has a lower rate (301 vs. 405). Looking at Winnipeg CAs, Metis with diabetes are higher compared to All Other Manitobans with diabetes in Inkster CA (483 vs. 235 per 1,000).

The higher rates of hospital separations for Metis with diabetes in some areas may have policy implications for service providers.

5.4 Hospital Separations by Cause

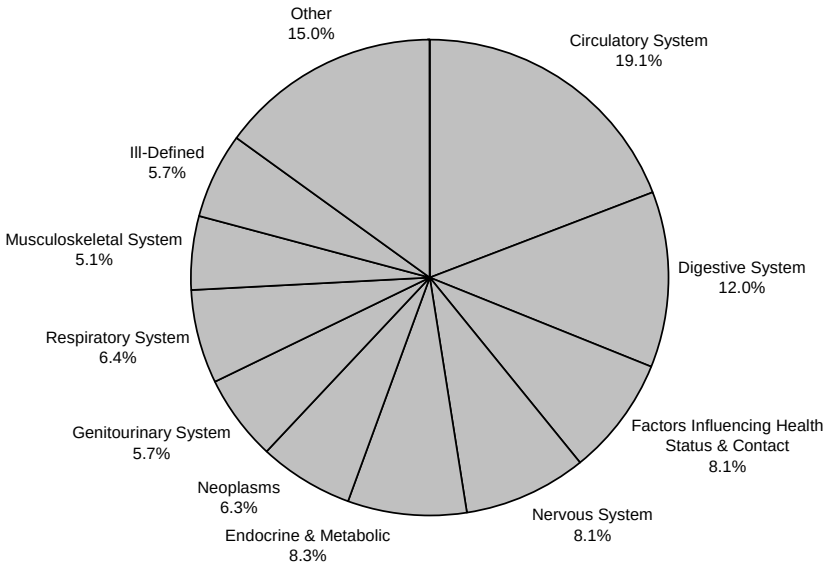
This health information is based on all hospital separations (both inpatient and outpatient) and describes the percentages attributed to each group of causes during hospitalization, based on the 'Most Responsible' diagnoses. These are coded in ICD-10-CA. Note that this data is not age- and sex-adjusted, so the underlying differences in age distribution between Metis and All Other Manitobans may affect the results (e.g., hospital separations for conditions generally affecting mid-aged and older people, such as circulatory system disorders, may be lower due to the lower number of older Metis adults with diabetes).

Key observations:

Metis with diabetes and All Other Manitobans with diabetes (Figure 5.4.1 and Figure 5.4.2)

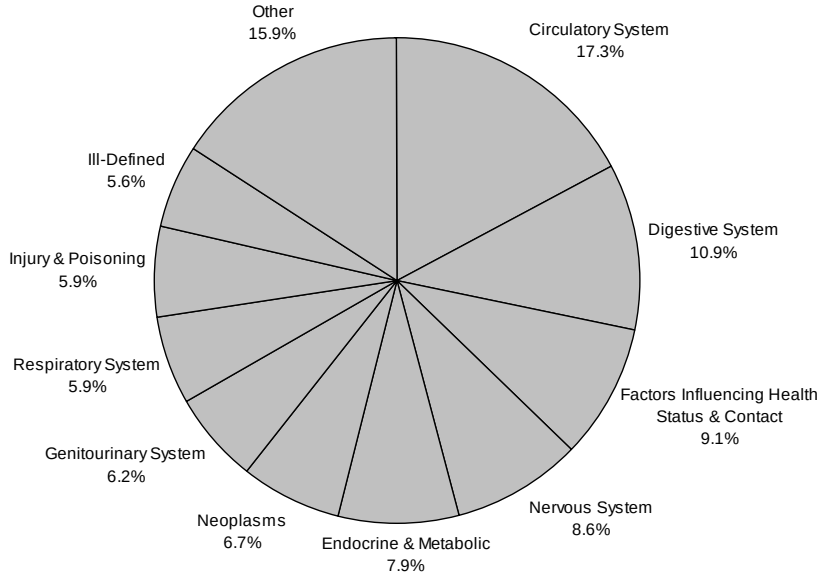
- 19.1% of hospital separations for Metis are for circulatory system compared to 17.3% for All Other Manitobans
- 12.0% of hospital separation for Metis are for digestive system compared to 10.9% for All Other Manitobans
- 8.3% of hospital separations for Metis are for endocrine and metabolic system compared to 7.9% for All Other Manitobans
- 8.1% of hospital separations for Metis are for factors influencing health status and contacts compared to 9.1% for All Other Manitobans
- 8.1% of hospital separations for Metis are for nervous system compared to 8.6% for All Other Manitobans

Figure 5.4.1: Hospital Separations by Cause (ICD-9 CM) for Metis with Diabetes, 2006/07



Source: MMF, 2010

Figure 5.4.2: Hospital Separations by Cause (ICD-9 CM) for All Other Manitobans with Diabetes, 2006/07



Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

According to the Metis Atlas (Martens, Bartlett, et al., 2010) the top five causes of hospitalization for Metis in 2006/07 were pregnancy and birth (13.4%), digestive (12.1%), circulatory (10.2%), health status & contact (9.3%), and injury and poisoning (7.6%), whereas for All Other Manitobans the top causes of hospital separation were: digestive (12.0%), pregnancy and birth (11.2%), circulatory (10.6%), health status & contact (10.0%), and genitourinary (7.4%). The information in that study was not specific to those living with diabetes.

There is no comparable literature on hospital separations by cause for Metis with diabetes. In our study the top five causes of hospitalization for Metis with diabetes are circulatory system (19.1%), digestive system (12.0%), endocrine and metabolic (8.3%), factors influencing health status and contacts (8.1%), and nervous system (8.1%). These results differ from those in the Metis Atlas (Martens, Bartlett, et al., 2010) suggesting that individuals with diabetes are hospitalized for much different causes compared to those without diabetes in Manitoba.

5.5 Hospital Days Used in Short Stays (1-13 days)

In this study an inpatient hospitalization lasting from one day to 13 days was considered a short hospital stay. Newborn (birth) hospitalizations were excluded. All Manitoba hospitals were included; PCHs and Long-term Care facilities were excluded (e.g., Deer Lodge and Riverview).

In this study the number of hospital days used in short stays (less than 14 days) was measured per 1,000 residents per year. If a resident had more than one short hospitalization in the period, then the days used in all short hospitalizations were totalled. Rates were calculated and age- and sex-adjusted for 2006/07.

This definition was developed by the Manitoba Centre for Health Policy for the RHA Atlas (Fransoo et al., 2009).

The denominator includes all Manitoba residents with diabetes as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.5.1):

- Metis have a higher rate of short stay hospital days compared to All Other Manitobans (1,048 vs. 824 days per 1,000)

Aggregate areas (Figure 5.5.1):

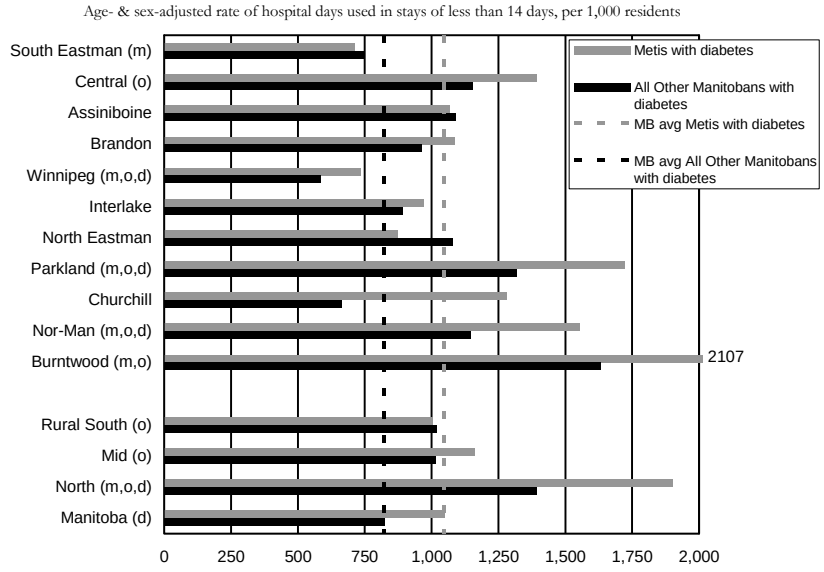
- Metis have a higher rate of short stay hospital days compared to All Other Manitobans in North aggregate area (1,903 vs. 1,394 per 1,000)
- Metis have a higher rate of short stay hospital days compared to their provincial average in North aggregate area (1,903 vs. 1,048 per 1,000)
- All Other Manitobans have a higher rate of short stay hospital days compared to their provincial average in Rural South (1,018 vs. 824 per 1,000), Mid (1,014 vs. 824), and North (1,394 vs. 824) aggregate areas
- There is a relationship between short stay hospital days and PMR for Metis in aggregate areas, with stays increasing from Rural South to North aggregate areas

RHAs (Figure 5.5.1):

- Metis have a higher rate of short stay hospital days compared to All Other Manitobans in Winnipeg (733 vs. 583 per 1,000), Parkland (1,721 vs. 1,318), and Nor-Man (1,554 vs. 1,147) RHAs
- Metis have a higher rate of short stay hospital days compared to their provincial average in Parkland (1,721 vs. 1,048 per 1,000), Nor-Man (1,554 vs. 1,048), and Burntwood (2,107 vs. 1,048) RHAs whereas Metis are lower compared to their provincial average in South Eastman (714 vs. 1,048) and Winnipeg (733 vs. 1,048) RHAs
- All Other Manitobans have a higher rate of short stay hospital days compared to their provincial average in Central (1,153 vs. 824 per 1,000), Parkland (1,318 vs. 824), Nor-Man (1,147 vs. 824), and Burntwood (1,631 vs. 824) RHAs whereas All Other Manitobans have a lower rate of short stay hospital days compared to their provincial average in Winnipeg (583 vs. 824) RHA

- There is no association with PMR at the RHA level, as short stay hospital days do not appear to increase from most healthy to least healthy RHAs

Figure 5.5.1: Hospital Days Used for Short Stays by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Diabetes is a significant factor that influences the length of hospital stay. In Canada, adults with diabetes aged 20 to 29 and 35 to 49 years have lengths of stay four to six times longer compared to adults of the same age without diabetes; hospitalized children and adolescents with diabetes have eight to eleven times greater lengths of stay compared to those without diabetes (PHAC, 2009). In an Alberta study Oster et al. (2009) found that status Aboriginal peoples with diabetes had statistically more hospital days on average compared to the general population, with the largest difference in the younger age groups.

There is no comparable information on short stay hospital days in Metis with diabetes. In our study Metis with diabetes have a higher number of short stay hospital days compared to All Other Manitobans with diabetes (1,048 vs. 824 per 1,000). The rate is higher for Metis compared to All Other Manitobans in the North aggregate area (1,903 vs. 1,394 per 1,000) and in Winnipeg (733 vs. 583), Parkland (1,721 vs. 1,318), and Nor-Man (1,554 vs. 1,147) RHAs.

Awareness of these differences in the length of hospital stays for those with diabetes can provide direction for program planning and delivery.

5.6 Hospital Days Used in Long Stays (14+ days)

In this study an in-patient hospitalization lasting 14 days or longer was considered a long hospital stay. Newborn (birth) hospitalizations were excluded. All Manitoba hospitals were included; PCHs and Long-Term Care facilities were excluded.

In this study the number of hospital days used in long stays (14 or more days) was measured per 1,000 area residents per year. If a resident had more than one long hospitalization in the period, then the days used in all long hospitalizations were summed. Each hospitalization was limited to 365 days maximum length of stay. Rates were calculated and age- and sex-adjusted for 2006/07.

The definition used for this indicator was developed by the Manitoba Centre for Health Policy for the RHA Atlas (Fransoo et al., 2009).

The denominator includes all Manitoba residents with diabetes as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.6.1):

- There is no difference in rates of long stay hospital days between Metis and All Other Manitobans in Manitoba (1,667 vs. 1,749 days per 1,000)

Aggregate areas (Figure 5.6.1):

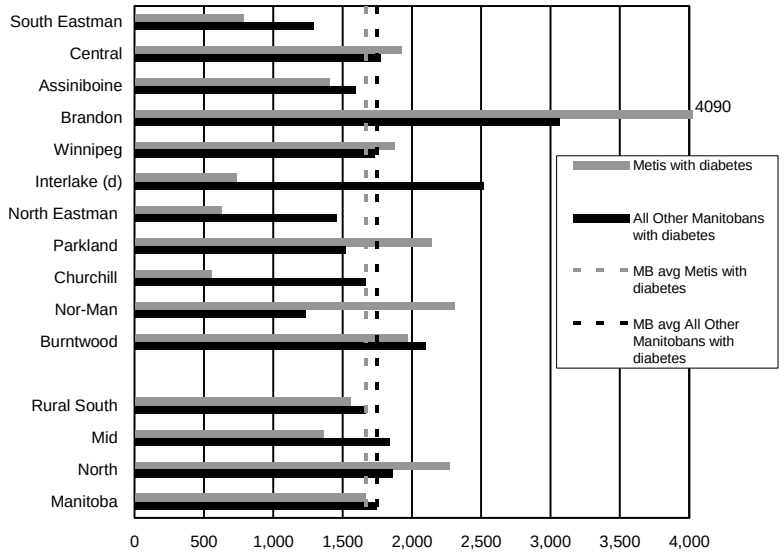
- There are no differences in long stay hospital day rates for Metis or All Other Manitobans at the aggregate level
- There is no relationship between long stay hospital days and PMR for Metis or All Other Manitobans in aggregate areas

RHAs (Figure 5.6.1):

- Metis have a lower rate of long stay hospital days compared to All Other Manitobans in Interlake (735 vs. 2,517 per 1,000) RHA
- There are no differences in long stay hospital days between Metis and All Other Manitobans in the other RHAs
- There is no PMR gradient in the RHAs, as the least healthy RHAs do not have higher rates of long hospital stays compared to the most healthy RHAs

Figure 5.6.1: Hospital Days Used for Long Stays by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- & sex-adjusted rate of hospital days used in stays of 14 days or more, per 1,000 residents



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

In the Manitoba RHA Indicators Atlas there did not seem to be an association between long stay days and population health status, though rates varied across RHAs and Winnipeg CAs (Fransoo et al., 2009). The information in that study was not specific to those living with diabetes.

According to the National Diabetes Surveillance System (NDSS) Canadians with diabetes in the general population between the ages of 20 and 29 and between the ages of 35 and 49 had lengths of hospitals stays that were four to six times longer compared to the population who did not have diabetes (PHAC, 2009).

There is no comparable literature on hospital days used in long stays for Metis with diabetes. In our study there is no difference in rates of long stay hospital days between Metis with diabetes and All Other Manitobans with diabetes in Manitoba. While rates for Metis in the RHAs were generally not significantly different compared to All Other Manitobans, in the Interlake RHA Metis had a lower *number of hospital days used in long stays than All Other Manitobans with diabetes (735 vs. 2,517 per 1,000).*

The three-fold lower rate in Interlake RHA suggests a need for further investigation.

5.7 Number of Different Drug Types Dispensed per User

In this study, the average number of different types of drugs dispensed to each resident who had at least one prescription in the year was measured. A 'different' drug type was determined by fourth-level class of the Anatomical Therapeutic Chemical (ATC) Drug Classification System. This level essentially separates drugs used for different health problems. A person could have several prescriptions for drugs in the same fourth-level ATC class, but this would only count as one drug type in that year. Values were calculated for 2006/07 and were age- and sex- adjusted.

The definition used for this indicator was developed by the Manitoba Centre for Health Policy for the RHA Atlas (Fransoo et al., 2009).

The denominator includes all Manitoba residents with diabetes as of December 31, 2006.

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 5.7.1):

- Metis have a higher number of different drug types dispensed per user compared to All Other Manitobans in Manitoba (8.1 vs. 7.1 per resident with one/more prescriptions)

Aggregate areas (Figure 5.7.1):

- Metis have a higher number of different drug types dispensed per user compared to All Other Manitobans in Mid (8.6 vs. 8.0 per resident with one/more prescriptions) and North (8.8 vs. 7.9) aggregate areas
- Metis have a higher number of different drug types dispensed per user compared to their provincial average in North aggregate area (8.8 vs. 8.1 per resident with one/more prescriptions) whereas Metis have a lower number of different drug types compared to their provincial average in Rural South aggregate area (7.1 vs. 8.1)
- All Other Manitobans have a higher number of different drug types dispensed per user compared to their provincial average in Mid (8.0 vs. 7.1 per resident with one/more prescriptions) and North (7.9 vs. 7.1) aggregate areas
- There is a slight association with PMR at the aggregate level for Metis (with number of different drugs dispensed increasing from Rural South to North aggregate areas), but none for All Other Manitobans

RHAs (Figure 5.7.1):

- Metis have a higher number of different drug types dispensed per user compared to All Other Manitobans in Brandon (8.8 vs. 7.5 per resident with one/more prescriptions), Winnipeg (7.9 vs. 6.8), Parkland (10.0 vs. 8.6), Churchill (8.8 vs. 7.3), Nor-Man (8.0 vs. 7.3), and Burntwood (9.8 vs. 8.3) RHAs
- Metis have a higher number of different drug types dispensed per user compared to their provincial average in Parkland (10.0 vs. 8.1 per resident with one/more prescriptions) and Burntwood (9.8 vs. 8.1) RHAs
- All Other Manitobans have a higher number of different drug types dispensed per user compared to their provincial average in Interlake (7.8 vs. 7.1 per resident with

one/more prescriptions), North Eastman (7.8 vs. 7.1), Parkland (8.6 vs. 7.1), and Burntwood (8.3 vs. 7.1) RHAs

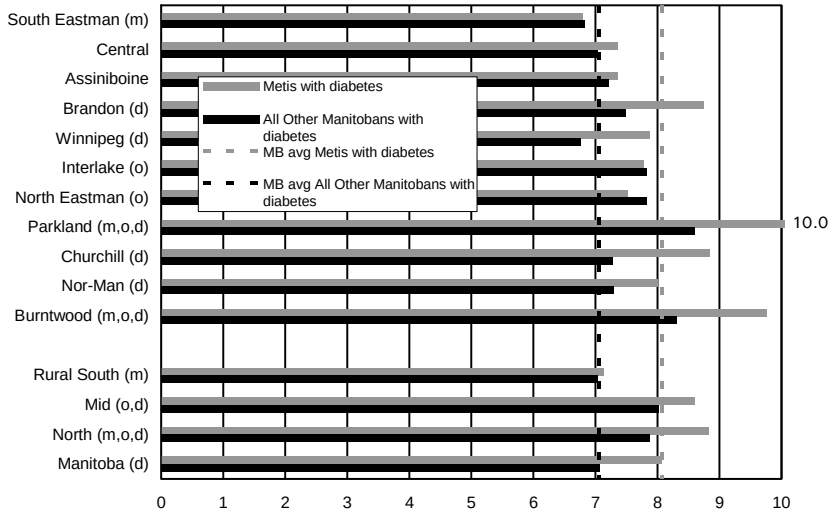
- There is no relationship between number of different drug types dispensed and PMR at the RHA level

Winnipeg CAs (Figure 5.7.2):

- Metis have a higher number of different drug types dispensed per user compared to All Other Manitobans in Fort Garry (7.6 vs. 6.0 per resident with one/more prescriptions), St. Vital (7.4 vs. 6.5), Transcona (7.6 vs. 6.2), River Heights (7.8 vs. 6.7), River East (7.6 vs. 6.4), Seven Oaks (7.6 vs. 6.5), Inkster (9.3 vs. 6.8), Downtown (8.6 vs. 7.7), and Point Douglas (9.7 vs. 8.1) CAs
- Metis have a higher number of different drug types dispensed per user compared to their provincial average in Inkster (9.3 vs. 8.1 per resident with one/more prescriptions) and Point Douglas (9.7 vs. 8.1) CAs whereas Metis have a lower number of different drug types dispensed per user compared to their provincial average in St. Boniface (6.8 vs. 8.1) and St. James – Assiniboia (7.1 vs. 8.1) CAs
- All Other Manitobans have a higher number of different drug types dispensed per user compared to their provincial average in Downtown (7.7 vs. 7.1 per resident with one/more prescriptions) and Point Douglas (8.1 vs. 7.1) CAs whereas All Other Manitobans have a lower number of different drug types dispensed per user compared to their provincial average in Fort Garry (6.0 vs. 7.1), Assiniboine South (6.5 vs. 7.1), Transcona (6.2 vs. 7.1), River East (6.4 vs. 7.1), and Seven Oaks (6.5 vs. 7.1) CAs
- There is no PMR gradient in Winnipeg – that is, number of different drug types dispensed does not increase from most healthy to least healthy Winnipeg CAs

Figure 5.7.1: Number of Different Drug Types Dispensed per User by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- and sex-adjusted average number of different drugs used per resident with one or more prescriptions dispensed

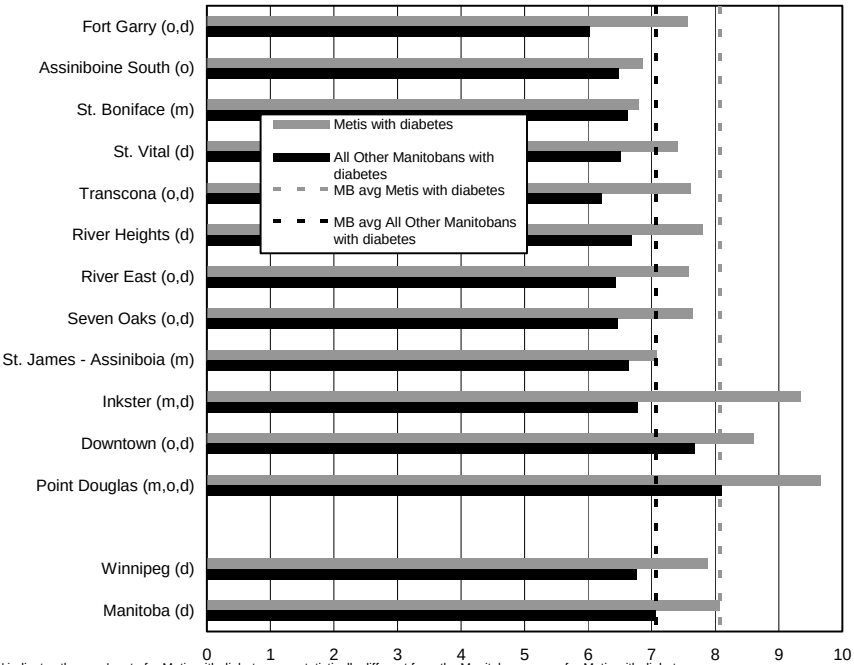


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 5.7.2: Number of Different Drug Types Dispensed per User by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Age- and sex-adjusted average number of different drugs used per resident with one or more prescriptions dispensed



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*):

Fransoo et al. (2009) reported that the number of different drug types dispensed per user was 'strongly related' to income in both rural and urban areas; those living in areas with a lower income had a greater number of drugs dispensed. They concluded that this may have been related to the relationship between income and poorer health status (Fransoo et al., 2009). The information in that study was not specific to those living with diabetes.

There is no comparable literature on the number of different drug types dispensed per user for Metis with diabetes. In our study Metis have a higher number of different drugs dispensed compared to All Other Manitobans (8.1 vs. 7.1 per resident with one/more prescriptions).

The higher numbers of drugs dispensed to Metis with diabetes will be of interest to policy and decision makers. The higher rates may suggest that Metis are being diagnosed later after onset of disease, experience a heavier burden of diseases (either chronic or acute), or these rates may indicate a link between income and poorer health status.

References

Aro, S., Kangas, T., Reunanen, A., Salinto, M., & Koivisto, V. (1994). Hospital use among diabetic patients and the general population. *Diabetes Care, 17*(11), 1320-1329.

Aubert, R. E., Geiss, L. S., Ballard, D. J., Cocanougher, B., Herman, W. H. (1995). Diabetes-related hospitalization and hospital utilization. In M. I. Harris, C. C. Cowie, M. Stern, E. J. Boyko, G. E. Reiber, & P. H. Bennett (Eds.), *Diabetes in America* (2nd ed.) (pp. 553-570). Bethesda, MD: National Institutes of Health.

Canadian Institute for Health Information. (2009). *Diabetes care gaps and disparities in Canada.* Retrieved from http://secure.cihi.ca/cihiweb/products/Diabetes_care_gaps_disparities_aib_e.pdf

Finlayson, G. S., Ekuma, O., Yogendran, M., Burland, E., & Forget, E. (2010). *The additional cost of chronic disease in Manitoba.* Winnipeg, MB: Manitoba Centre for Health Policy. Retrieved from http://mchp-appserv.cpe.umanitoba.ca/reference/Chronic_Cost.pdf

Fransoo, R., Martens, P. J., Burland, E., The Need to Know Team, Prior, H., & Burchill, C. (2009). *Manitoba RHA indicators atlas 2009*. Winnipeg, MB: Manitoba Centre for Health Policy.

Harris, M. I. (1998). Diabetes in America: Epidemiology and scope of the problem. *Diabetes Care, 21*(Suppl. 3), C11-C14.

Jiang, H. J., Stryer, D., Friedman, B., & Andrews, R. (2003). Multiple hospitalizations for patients with diabetes. *Diabetes Care, 26*(5), 1421-1426.

Kangas, T., Aro, S., Koivisto, V. A., Salinto, M., Laakso, M., & Reunanen, A. (1996). Structure and costs of health care of diabetic patients in Finland. *Diabetes Care, 19*(5), 494-497.

Ludwig, S., Clement, M., Dunbar, P., & Johnson, A. J. (2008). Organization of diabetes care. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S20-S24.

Martens, P. J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study.* Winnipeg, MB: Manitoba Centre for Health Policy.

Ohinmaa, A., Jacobs, P., Simpson, S., & Johnson, J. A. (2004). The projection of prevalence and cost of diabetes in Canada: 2000 to 2016. *Canadian Journal of Diabetes, 28*(2), 1-8.

Oster, R. T., Hemmelgarn, B. R., Toth, E. L., King, M., Crowshoe, L., & Ralph-Campbell, K. (2009). Diabetes and the status Aboriginal population in Alberta. In J. A. Johnson (Ed.), *Alberta diabetes atlas* (pp. 189-212). Edmonton, AB: Institute of Health Economics. Retrieved from http://www.albertadiabetes.ca/pdf/atlas/09/Atlas-10(web).pdf

Public Health Agency of Canada. (2009). *Report from the National Diabetes Surveillance System: Diabetes in Canada, 2008*. Ottawa, ON: Chronic Disease Surveillance Division. Retrieved from http://www.phac-aspc.gc.ca/publicat/2008/ndssdic-snsddac-08/pdf/ndssdic-snsddac-08_eng.pdf

Rendell, M., Kimmel, D. B., Bamisedun, O., O'Donnell, E. T., & Fulmer, J. (1993). The health care status of the diabetic population as reflected by physician claims to a major insurer. *Archives of Internal Medicine, 153*(11), 1360-1366.

Statistics Canada. (2009). *2006 profile of Aboriginal children, youth and adults*. Retrieved from http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/89-635/P4.cfm?Lang=eng&age=3&ident_id=5&B1=0&geocode1=048&geocode2=046

Woo, V. (2008). Introduction. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S1-S9.

Section 6: Quality of Care and Prevention

In Canada diabetes is the leading cause of blindness in adults (Boyd & Altomare, 2008). Loss of vision for people with diabetes is generally caused by diabetic retinopathy: damage that occurs to the blood vessels of the retina (the part of the eye involved in forming images). Diabetic retinopathy is diagnosed and treated based on the extent of the damage to the retina. Early screening for complications is an important part of care (Boyd & Altomare, 2008).

In this study, the crude percentage of people with diabetes aged 19 and older that had at least one eye exam was measured in fiscal year 2006/07. Eye exams were identified through physician tariff codes in the medical claims data, and as such only those ophthalmologists or optometrists who billed Manitoba Health for visits would be captured here. People with diabetes who paid the physician for eye examination directly, or through third-party insurance, are not counted here. However, all people with diabetes are eligible for a free eye examination as required or at the discretion of the physician (Government of Manitoba, 2010).

Indicators in this section:

- Annual eye exams

The definition used in this section was developed by the Manitoba Centre for Health Policy for the Metis Atlas (Martens, Bartlett, et al., 2010). In this section Metis with diabetes are compared to All Other Manitobans with diabetes. As noted in Section 1, unless otherwise indicated any mention of 'lower' or 'higher' refers to results that are statistically significant.

Table 6.0: Overall Key Findings of Quality of Care and Prevention Indicators

Indicator (age of inclusion for this indicator)	Provincial difference between Metis and All Other Manitobans RR (relative rate) for Metis with diabetes	Statistically 'better off' regions for Metis with diabetes compared to provincial average for Metis with diabetes	Statistically 'worse off' regions for Metis with diabetes compared to provincial average for Metis with diabetes
Annual Eye Exams, 19+	33.7% vs. 36.2% (Crude rate) RR = 0.93	Nor-Man RHA	None

6.1 Diabetes Care: Annual Eye Exams

Key observations:

Metis with diabetes and All Other Manitobans with diabetes

Manitoba (Figure 6.1.1):

- Metis have a lower rate of annual eye exams compared to All Other Manitobans in Manitoba (33.7% vs. 36.2%)

Aggregate areas (Figure 6.1.1):

- Metis have a higher rate of annual eye exams compared to All Other Manitobans in the North aggregate area (35.2% vs. 28.7%) whereas Metis have a lower rate of annual eye exams compared to All Other Manitobans in Rural South (34.8% vs. 41.0%) and Mid aggregate areas (32.0% vs. 35.2%)
- There is a clear pattern with PMR for both Metis and All Other Manitobans, with rates of eye exams decreasing from Rural South to North aggregate areas for both groups

RHAs (Figure 6.1.1):

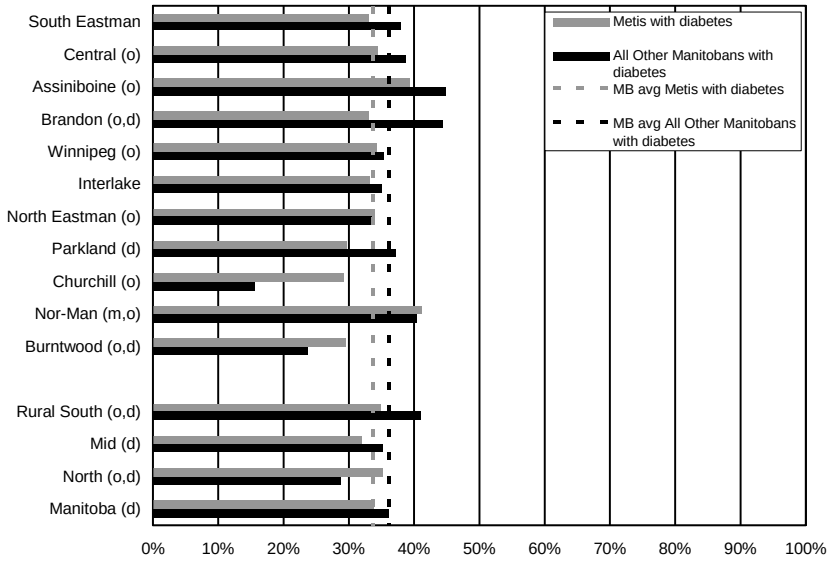
- Metis have a higher rate of annual eye exams compared to All Other Manitobans in Burntwood RHA whereas Metis have a lower rate of annual eye exams compared to All Other Manitobans in Brandon (33.1% vs. 44.3%) and Parkland RHAs (29.6% vs. 37.1%)
- Metis have a higher rate of eye exams compared to their provincial average in Nor-Man RHA (41.1% vs. 33.7%)
- All Other Manitobans have a higher rate of annual eye exams compared to their provincial average in Central (38.7% vs. 36.2%), Assiniboine (44.8% vs. 36.2%), Brandon (44.3% vs. 36.2%), and Nor-Man (40.4% vs. 36.2%) RHAs whereas All Other Manitobans have a lower rate of annual eye exams compared to their provincial average in Winnipeg (35.4% vs. 36.2%), North Eastman (33.4% vs. 36.2%), Churchill (15.6% vs. 36.2%), and Burntwood (23.7% vs. 36.2%) RHAs
- There is no clear association between eye exam rates and PMR at the RHA level

Winnipeg CAs (Figure 6.1.2):

- Metis have a lower rate of annual eye exams compared to All Other Manitobans in River Heights CA (29.4% vs. 39.5%)
- All Other Manitobans have a higher rate of annual eye exams compared to their provincial average in St.Vital (40.0% vs. 36.2%), River Heights (39.5% vs. 36.2%), River East (38.6% vs. 36.2%), and St. James – Assiniboia CAs (38.2% vs. 36.2%), whereas All Other Manitobans have a lower rate of annual eye exams compared to their provincial average in Seven Oaks (33.2% vs. 36.2%), Inkster (29.8% vs. 36.2%), Downtown (29.1% vs. 36.2%), and Point Douglas (28.1% vs. 36.2%) CAs
- Eye exam rates do not steadily increase or decrease from the most healthy to the least healthy Winnipeg CAs

Figure 6.1.1.: Diabetes Care: Annual Eye Exams by RHA for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Crude percent of individuals with diabetes who had an annual eye examination

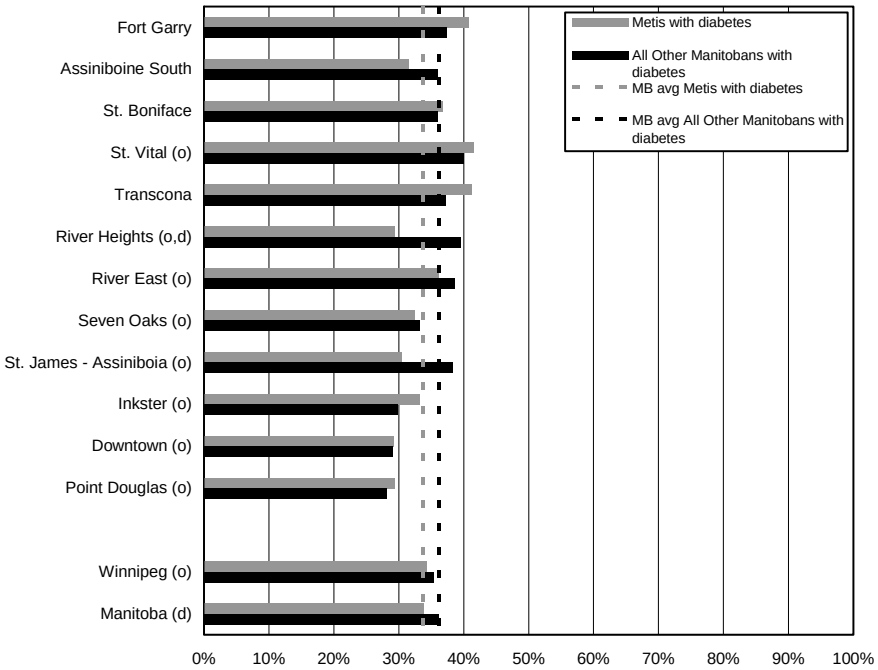


'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Figure 6.1.2: Diabetes Care: Annual Eye Exams by Winnipeg Community Area for Metis with Diabetes and All Other Manitobans with Diabetes, 2006/07

Crude percent of individuals with diabetes who had an annual eye examination



'm' indicates the area's rate for Metis with diabetes was statistically different from the Manitoba average for Metis with diabetes
'o' indicates the area's rate for All Other Manitobans with diabetes was statistically different from the Manitoba average for All Other Manitobans with diabetes
'd' indicates the difference between the two groups' rates was statistically significant for this area
's' indicates data suppressed due to small numbers

Source: MMF, 2010

Findings from Literature Review

(compared to the results in this study – *in italics*)

Visual impairment can have a detrimental impact on an individual's quality of life and can compromise their ability to manage their health successfully. In Canada diabetes is the leading cause of blindness in adults (Boyd & Altomare, 2008). Screening is important for early detection and treatment of diabetic retinopathy (Boyd & Altomare, 2008). Eye exams are an essential part of the screening process. In those with diabetes who survive more than 20 years, nearly all persons with type 1 diabetes and more than 60% of those with type 2 diabetes will develop diabetic retinopathy (Klein, Klein, Moss, Davis, & DeMets, 1984).

In Canada, rates of annual eye exams for people with diabetes fall short of recommended rates. Fewer than 70% of Canadians with diabetes (aged 18 years or older) self-reported that they had *ever* received an eye exam (Shields, 2006). Rates of dilated eye exams ranged from 82% in the Northwest Territories to 46% in Manitoba (Canadian Institute for Health Information [CIHI], 2009). Contributing factors to the lack of eye exams among people with diabetes include lack of health insurance coverage, younger age, lack of symptoms, less education, recent diagnosis of diabetes (and therefore not yet receiving regular eye care), and difficulties with distance to ophthalmologist's or optometrist's offices and with making appointments outside normal working hours (Moss, Klein, & Klein, 1995). When compared to Australia, New Zealand, the United Kingdom, the United States, and Germany on four fundamental indicators of diabetes care (HbA1C within previous 6 months, eye examination, foot examination, and cholesterol level within last twelve months), Canada ranked behind at least one other country for each of the indicators. In that study only 38% of Canadians with diabetes received care consistent with accepted clinical practice guidelines (Morgan, Zamora, & Hindmarsh, 2007). In another study it was found that while most of the respondents (81%) had received an HbA1C test and 74% had their urine tested for protein, only 66% had received a dilated eye exam within the past two years (CIHI, 2009).

There is limited literature on eye care in the Metis population with diabetes. After controlling for age and sex, Bruce (2000) found that Metis with diabetes had a statistically higher percentage of sight impairment compared to Metis without diabetes (12% vs. 5%). Bruce (2000) also reported that 47% of respondents with diabetes in the 1991 Aboriginal People's Survey described having visited an eye doctor within the previous twelve months. In the Metis Atlas the percentage of Metis people in Manitoba with diabetes who had an annual eye examination in the year 2006/2007 was 32.5% compared to a rate of 34.0% for All Other Manitobans with diabetes (Martens, Bartlett, et al., 2010). The lower rate is consistent with our study's finding in which the Metis provincial rate of 33.7% was lower than the rate for All Other Manitobans (36.2%). This is an area of concern given the clear correlation between careful vision screening and early identification of retinopathy leading to blindness.

Geography may also play a role in access to eye care. Rural residents may be at risk for not receiving appropriate eye care due to the extensive travel time (between two and six hours) to larger urban centres that have specialist care (Martens, Bartlett, et al., 2010). Rates of annual eye exams for Metis in both the Metis Atlas and in our study were lower than the rate in All Other Manitobans in the Rural South aggregate area. However, in the Metis Atlas rates were found to be similar between Metis and All Other Manitobans in the Mid aggregate area, while in our study there is a lower rate of eye exams in the Metis with diabetes compared to All Other Manitobans with diabetes (32.0% vs. 35.2%) in that same area. In both studies there were higher rates of annual eye exams reported in Metis compared to All Other Manitobans in the North aggregate area.

Similar to findings in the Metis Atlas, there is no obvious association between PMR and annual eye exams in this study. Although Downtown and Point Douglas are not statistically different from other Winnipeg CAs in our study, fewer than 30% of Metis with diabetes in these CAs had an annual eye exam. This finding is consistent with results from the Metis Atlas, which pointed out that those living in the least healthy CAs (Downtown and Point Douglas) 'appeared' to have lower rates of annual eye exams (Martens, Bartlett, et al., 2010).

While the Metis Atlas reported a lower rate of eye exams for Metis compared to All Other Manitobans in St. James – Assiniboia (27.7% vs. 35.9%) and no significant difference between these two groups in River Heights, in our study there is no significant difference between these groups in St. James – Assiniboia while Metis living in River Heights have a lower rate than All Other Manitobans (29.4% vs. 39.5%). This inconsistency is likely due to the use of different samples in the two studies.

The causes of eye examination barriers need to be further explored in the Metis population.

References

Boyd, S. R., & Altomare, F. (2008). Retinopathy. In Canadian Diabetes Association Clinical Practice Guidelines Expert Committee (Ed.), *Canadian Journal of Diabetes, 32*(Suppl. 1), S134-S139.

Bruce, S. (2000). The impact of diabetes mellitus among the Métis of Western Canada. *Ethnicity & Health, 5*(1), 47-57.

Canadian Institute for Health Information. (2009). *Diabetes care gaps and disparities in Canada.* Retrieved from http://secure.cihi.ca/cihiweb/products/Diabetes_care_gaps_disparities_aib_e.pdf

Government of Manitoba. (2010). *The health services insurance act (C.C.S.M. c. H35): Optometric services insurance regulation.* Retrieved from http://web2.gov.mb.ca/laws/regs/pdf/h035-050.93.pdf

Klein, R., Klein, B. E., Moss, S. E., Davis, M. D., & DeMets, D. L. (1984). The Wisconsin epidemiologic study of diabetic retinopathy. II. Prevalence and risk of diabetic retinopathy when age at diagnosis is less than 30 years. *Archives of Ophthalmology, 102*(4), 520-526.

Martens, P. J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study.* Winnipeg, MB: Manitoba Centre for Health Policy.

Morgan, M. W., Zamora, N. E., & Hindmarsh, M. F. (2007). An inconvenient truth: A sustainable healthcare system requires chronic disease prevention and management transformation. *Healthcare Papers, 7*(4), 6-23.

Moss, S. E., Klein, R., & Klein, B. E. (1995). Factors associated with having eye examinations in persons with diabetes. *Archives of Family Medicine, 4*(6), 529-534.

Shields, M. (2006). *Smoking and diabetic care: Results from the CCHS cycle 3.1 (2005).* Ottawa, ON: Statistics Canada. Retrieved from http://www.statcan.gc.ca/pub/82-621-x/82-621-x2006002-eng.pdf

Glossary

Age Linear and Age Quadratic

Age linear and age quadratic are factors that are used in the logistic regression models presented in this research study (see Table: 4.4.1 and Table: 4.13.1). The age linear factor indicates the relationship between the outcome of interest (e.g., probability of diabetes) and age of an individual Manitoban (including Metis *and* All Other Manitobans). For example, in Table 4.4.1 the age-linear adjusted Odds Ratio is 1.191 ($p<0.001$), indicating that the probability of developing diabetes increases as Manitobans age.

The age quadratic factor indicates whether the age relationship plateaus at some point; that is, if at some point an increase in age no longer increases or decreases the likelihood of the outcome of interest (e.g., probability of developing diabetes). In Table 4.4.1 the age quadratic adjusted Odds Ratio of 0.998 ($p<0.001$) indicates that at some point an increase in age no longer increases the risk of developing diabetes.

Aggregated Diagnostic Groups (ADG)

Mental illness ADGs and major physical illness ADGs are often used in logistic regression modelling. As noted in Martens, Bartlett, et al. (2010), both categories of ADGs "measure the illness burden (morbidity) of individual patients by grouping individuals based on their age, sex, and all known medical diagnoses assigned by their health care providers over a defined time period (typically one year)" (p. 503). ADGs account for all hospitalizations and physician visits for each Manitoban in a given year. If an individual had a diagnosis for a mental illness or disorder, for example, they are be assigned one of the three mental illness ADGs depending on the severity of their illness. Similarly, if an individual has been diagnosed with an unstable illness (e.g., tuberculosis) or a major illness (e.g., cancer) they are assigned one of the major physical Illness ADGs. For the logistic regression, individuals were classified as having a mental or major physical ADG if they had been assigned at least one of the relevant ADGs. For the most part, the ADGs were identified and assigned in the year prior to the event in the regression (Martens, Bartlett, et al., 2010).

All Other Manitobans

All Other Manitobans are all individuals living in a geographical area who were not identified as Metis using the Metis Population Database.

Average Household Income of Neighborhood

The average household income is the mean income of a household at the neighborhood level from the 2006 Canadian Census.

Factors Influencing Health Status and Contacts

Factors influencing health status and contacts is one of the causes of hospitalization measured in Section 5.4: Hospital Separations by Cause. This classification includes physician visits not recorded as 'diagnoses' (i.e., not included in the ICD-9 categories). It is used when a person who is not sick is hospitalized (e.g., to donate an organ or tissues or to receive a prophylactic vaccination) or when a person returns to the hospital for specific treatment of a known disease or injury (e.g., dialysis, chemotherapy, or a cast change).

International Classification of Disease (ICD)

The ICD is a classification system of medical diagnoses used internationally by clinicians, health managers, and epidemiologists. It was developed by the World Health Organization as a classification system of diseases, symptoms, injuries, and other health problems (WHO, 2011).

Manitoba Metis Federation (MMF) Membership

At the MMF, Metis identity is verified by self-identification, Metis ancestry, and community acceptance through membership application and a confirmation process. Through a genealogy with supporting evidentiary documents, an individual and his or her family are able to determine whether or not a Metis ancestral connection can be established. Supporting evidentiary documents many include Federal Census records, sacramental records, Manitoba and Northwest scrip affidavits, post records and journals. All individuals seeking membership in the MMF are required to have a genealogy completed by a recognized institution in order to objectively verify the applicant's historic Metis nation ancestry. Application for membership begins at the receiving Local in the area in which an individual resides (Manitoba Metis Federation, 2010).

Metis

The Metis are descendents of early 17th-century relationships between North American Indian and Europeans (Sprague & Frye, 1993). The Metis coalesced into a distinct nation in Manitoba in the late 18th century. After the 1885 fall of Batoche "Metis were denied a separate identity and ignored for a century" (McMillan, 1995, pp.312-313). By the 1967, with formation of the Manitoba Metis Federation, the Metis in Manitoba were again asserting their capacity to advocate and function once more in a collective manner. In the 1982 amendment to the Canadian Constitution Metis were named as one of the three Aboriginal peoples of Canada (Government of Canada, 1982).

Mid

Mid aggregate area is one of three rural aggregate areas in Manitoba. It includes the rural RHAs of central Manitoba: Parkland, Interlake, and North Eastman RHAs (see Figure 1.5.1: Geographical distribution of the MMF Regions, RHAs, and Winnipeg CAs).

Most Responsible Diagnosis

The most responsible diagnosis is the single diagnosis that best accounts for a patient's stay in the hospital. When more than one diagnosis may be assigned to a patient, the one deemed as the cause of the longest hospital stay is considered 'most responsible' (Manitoba Centre for Health Policy [MCHP], 2007).

North

North aggregate area is one of three rural aggregate areas in Manitoba. It includes the rural RHAs of northern Manitoba: Nor-Man, Burntwood, and Churchill RHAs (see Figure 1.5.1: Geographical distribution of the MMF Regions, RHAs, and Winnipeg CAs).

Premature Mortality Rate (PMR)

PMR is defined as the number of deaths occurring before age 75, and is usually described as the age-adjusted number of deaths per 1,000 persons under the age of 75. PMR is one of the most commonly used indicators in a public health research. This is because it provides

an overall indication of population health which can be easily compared with many health indicators (Eyles & Birch, 1993).

Premature Mortality Rate (PMR) gradient:

Throughout this report, the RHAs and Winnipeg CAs in the graphs are ordered by ten-year premature mortality rate (PMR). In each graph PMR increases from top to bottom, with the most healthy areas at the top of the graph and the least healthy areas at the bottom. This gradual slope in increasing PMR is referred to as the PMR gradient. It is expected that many indicators of morbidity, mortality, and health services use will reflect this PMR gradient, increasing from top to bottom of each graph.

Rural South

Rural South aggregate area is one of three rural aggregate areas in Manitoba. It includes the rural RHAs of southern Manitoba: Assiniboine, Central, and South Eastman RHAs (see Figure 1.5.1: Geographical distribution of the MMF Regions, RHAs, and Winnipeg CAs).

Shadow Billing

Shadow billings are records of health services provided by physicians not paid according to a fee-for-service model. They are submitted to Manitoba Health only for the purposes of health system administration (MCHP, 2008).

Vital Statistics

Vital Statistics is an agency of the provincial government that maintains records of key life events, including births, stillbirths, marriages, name changes, and deaths in Manitoba. Access to these records is limited by provincial privacy legislation (Vital Statistics Agency, n.d.).

Winnipeg Average Health

Winnipeg Average Health is one of the three aggregate geographical areas in Winnipeg. It includes all Winnipeg Neighbourhood Clusters with a PMR statistically similar to the PMR for Winnipeg overall in the 1996-2005 period: River Heights East, Seven Oaks North, Seven Oaks East, Seven Oaks West, St. Vital North, and Transcona (Martens, Bartlett, et al., 2010).

Winnipeg Least Healthy

Winnipeg Least Healthy is one of the three aggregate geographical areas in Winnipeg. It includes all Winnipeg Neighbourhood Clusters with a PMR statistically lower than the PMR for Winnipeg overall in the 1996-2005 period: Downtown East, Downtown West, Inkster East, Point Douglas North, Point Douglas South, River East South, St. Boniface West, and St. James – Assiniboia East (Martens, Bartlett, et al., 2010).

Winnipeg Most Healthy

Winnipeg Most Healthy is one of the three aggregate geographical areas in Winnipeg. It includes all Winnipeg Neighbourhood Clusters with a PMR statistically higher than the PMR for Winnipeg overall in the 1996-2005 period: Assiniboine South, Fort Garry North, Fort Garry South, Inkster West, River East North, River East East, River East West, River Heights West, St. Boniface Eat, St.James – Assiniboia West and St.Vital South (Martens, Bartlett, et al., 2010).

References

Eyles, J., & Birch, S. (1993). A population needs-based approach to health-care resource allocation and planning in Ontario: A link between policy goals and practice? *Canadian Journal of Public Health, 84*(2), 112-117.

Government of Canada. (1982). *Constitution Act: Section 35*. Retrieved June 17, 2011 from http://laws.justice.gc.ca/eng/Const/page-12.html#anchorsc:7-bo-ga:l_II

Manitoba Centre for Health Policy. (2007). *Glossary definition: Most responsible diagnosis*. Retrieved from http://mchp-appserv.cpe.umanitoba.ca/viewDefinition.php?definitionID=103120

Manitoba Centre for Health Policy. (2008). *Glossary definition: Shadow billing*. Retrieved from http://mchp-appserv.cpe.umanitoba.ca/viewDefinition.php?definitionID=103569

Manitoba Metis Federation. (2010). *Membership application and confirmation package*. Retrieved Sept 30, 2010 from http://mmf.mb.ca/images/pdf/membership/mmf_membership_package.pdf

Martens, P.J., Bartlett, J., Burland, E., Prior, H., Burchill, C., Huq, S., Romphf, L., Sanguins, J., Carter, S., & Bailly, A. (2010). *Profile of Metis health status and healthcare utilization in Manitoba: A population-based study*. Winnipeg, MB: Manitoba Centre for Health Policy.

McMillan, A.D. (1995). *Native peoples and cultures of Canada*. Toronto, ON: Douglas & McIntyre.

Sprague, D.N., & Frye, R. P. (1983). *The genealogy of the first Metis nation: The development and dispersal of the Red River Settlement, 1820-1900*. Winnipeg, MB: Pemmican Publications.

Vital Statistics Agency. (n.d.). *What we do*. Retrieved January 31, 2011, from http://vitalstats.gov.mb.ca/

World Health Organization. (2011). *Classifications: International Classification of Diseases (ICD)*. Retrieved from http://www.who.int/classifications/icd/en/