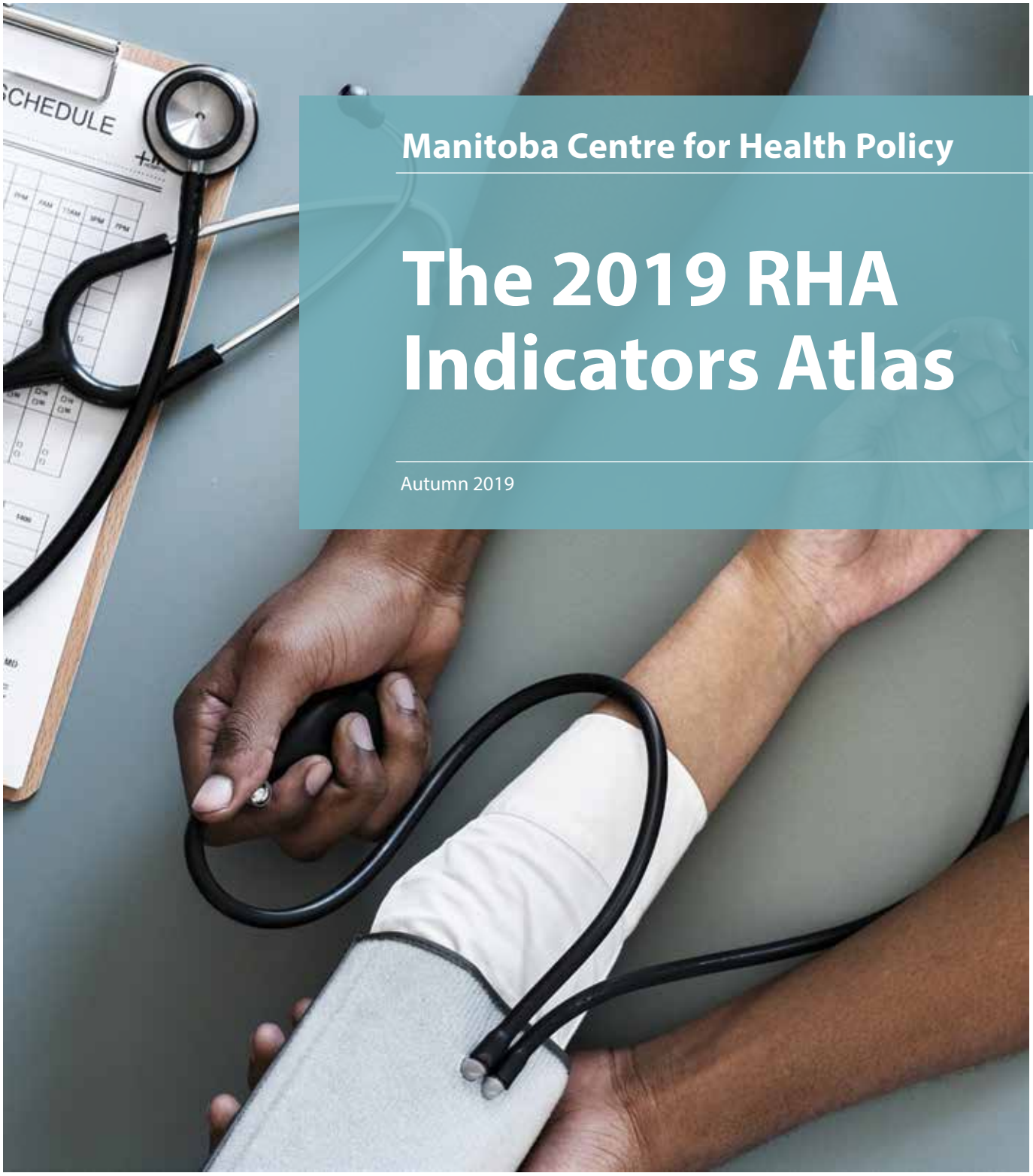

Manitoba Centre for Health Policy

The 2019 RHA Indicators Atlas

Autumn 2019

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About the Manitoba Centre for Health Policy

The Manitoba Centre for Health Policy (MCHP) is located within the Department of Community Health Sciences, Max Rady College of Medicine, Rady Faculty of Health Sciences, University of Manitoba. The mission of MCHP is to provide accurate and timely information to healthcare decision-makers, analysts and providers, so they can offer services which are effective and efficient in maintaining and improving the health of Manitobans. Our researchers rely upon the unique Manitoba Population Research Data Repository (Repository) to describe and explain patterns of care and profiles of illness and to explore other factors that influence health, including income, education, employment, and social status. This Repository is unique in terms of its comprehensiveness, degree of integration, and orientation around an anonymized population registry.

Members of MCHP consult extensively with government officials, healthcare administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards, enables MCHP to contribute to the health policy process. MCHP undertakes several major research projects, such as this one, every year under contract to Manitoba Health, Seniors and Active Living. In addition, our researchers secure external funding by competing for research grants. We are widely published and internationally recognized. Further, our researchers collaborate with a number of highly respected scientists from Canada, the United States, Europe, and Australia.

We thank the Research Ethics Board on the Bannatyne Campus at the University of Manitoba, for their review of this project. MCHP complies with all legislative acts and regulations governing the protection and use of sensitive information. We implement strict policies and procedures to protect the privacy and security of anonymized data used to produce this report and we keep the provincial Health Information Privacy Committee informed of all work undertaken for Manitoba Health, Seniors and Active Living.

The Manitoba Centre for Health Policy

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Table of Contents

List of Tables

List of Figures

Acronyms

ACS	Ambulatory Care Sensitive
ALC	Alternate Level of Care
AMI	Acute Myocardial Infarction
ATC	Anatomic, Therapeutic, Chemical
CA	Community Area
CCDSS	Canadian Chronic Disease Survaillance System
CCI	Canadian Classification of Interventions
CHAN	Community Health Assessment Network
CHF	Congestive Heart Failure
CIHI	Canadian Institute for Health Information
COPD	Chronic Obstructive Pulmonary Disease
CT	Computed Tomography
DA	Dissemination Area
DER-CA	Diabetes Education Resource for Children and Adolescents
DPIN	Drug Program Information Network
DSM	Diagnostic Services Manitoba
FP	Family Physician
GLM	Generalized Linear Model
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
IHD	Ischemic Heart Disease
LIMS	Laboratory Information Management System
LGA	Large for Gestational Age
MCHP	Manitoba Centre for Health Policy
MHSAL	Manitoba Health, Seniors and Active Living
MRI	Magnetic Resonance Imaging
NC	Neighbourhood Cluster
NP	Nurse Practitioner
NTK	The 'Need To Know' Team
PCH	Personal Care Home
PCI	Percutaneous Coronary Interventions
PHIN	Personal Health Identification Number
PMR	Premature Mortality Rate
PYLL	Potential Years of Life Lost
R-GINDEX	Revised-Graduated Prenatal Care Utilization Index
RHA	Regional Health Authority
SEFI	Socioeconomic Factor Index

SGA	Small for Gestational Age
TRM	Total Respiratory Morbidity
VBAC	Vaginal Birth After C-Section

Executive Summary

Major Findings and Implications

This section summarizes the high-level findings from this study. Each is described in more detail in the main body of the report.

Manitoba keeps growing, and aging

- Manitoba's population continues to grow slowly but steadily over time in all Regional Health Authorities (RHAs). Over the last five years, the percent of children decreased, and the percent of older adults increased.

The population is living longer – in all areas and across income groups

- The overall health status of Manitobans continues to improve over time, though we are living with higher rates of many chronic diseases. These paired findings are likely related to improvements in prevention, detection, and medical care, which have lowered mortality rates for many diseases, allowing residents to live longer – albeit with more health problems.
    - The improvements in health status shown in this report appear to be universal, in that improvements were seen across all geographic areas and among all income groups (though not all improvements were statistically significant).
    - This is an improvement compared to findings in the 2013 RHA Indicators Atlas [1].

Visits with doctors and nurse practitioners are stable

- Use of physicians and nurse practitioners was mostly stable over time, but not as well matched to need as hospital care and some other services. For example, residents of lower income areas did not have higher visit rates to match their higher illness level, as might be expected in a universal needs-based system.

Quality of care

- Analyses of the quality of primary care received by Manitobans revealed mixed results: for some indicators, the percent of residents receiving recommended care increased over time, while for others, rates decreased. Even among those that increased, the rates of many remain far below the ideal of 100%.

Hospital use continues to decrease over time and remains responsive to need

- There was a decrease in the use of hospitals over time, though many of the decreases were not statistically significant. This trend extends that seen in previous RHA Indicators Atlas reports, which have shown continuing decreases in hospital use over many years [1,2].
- Hospital care continues to be distinctly responsive to need: rates of hospital use are higher in areas where population health status is lower, and for residents of lower income areas. This progressive relationship is consistent with results in previous RHA Indicators Atlas reports [1,2].

Diagnostics and surgery

- The chapter on high-profile diagnostic and surgical procedures revealed mixed results: there were increases in the rates of many procedures, but decreases in others.
- The rates of MRI scans and hip replacements were lower among residents of low-income areas, which is the opposite of the trend expected in a universal healthcare system. These services should be reviewed to ensure appropriateness and equity in service provision.

Nursing homes

- The chapter on Personal Care Homes (PCH) showed decreased use rates and length of stay, but increased acuity among those admitted. These findings are consistent with and extend those in previous RHA Indicators Atlas reports [1,2].

Maternal and child health

- The results in this chapter show a mixed but overall positive picture of changes in maternal and child health indicators over time. Most notable was a sharp decrease in the rate of teen pregnancy, an indicator for which Manitoba has historically had very high rates compared to other provinces.

Not shown in this report

- Previous RHA Indicators Atlas reports have included indicators of mental illness and the use of home care services [1,2]. This report does not include these indicators, since separate MCHP reports are newly available on those topics [3,4].

Key Findings by Chapter

Chapter 2: Demographics

Manitoba's population grew from 1,261,261 in 2011 to 1,351,359 in 2016, a 7.1% increase. All regions had increases over time. The population also grew older: the growth rate among children (0 to 19 years) was 4.1%; among adults (20 to 64) it was 6.6%; and among older adults (65 and older), it was 15.1%. Each region's population structure was also different from the provincial average:

- Southern Health-Santé Sud had a higher percent of children, and lower percent of adults and older adults.
- Winnipeg RHA had a lower percent of children, a higher percent of adults, and an average percent of older adults.
- Prairie Mountain Health had slightly lower percent of children and adults, and a higher percent of older adults.
- Interlake-Eastern RHA had a lower percent of children, a slightly lower percent of adults, and a higher percent of older adults.
- Northern RHA had a much higher percent of children, a lower percent of adults, and a much lower percent of older adults.

Chapter 3: Population Health Status and Mortality

- The results in this chapter show that population health status has continued to improve in Manitoba, albeit gradually.
- Most indicators show improvement over time, though many of these changes were not statistically significant.
- The health status improvements shown in this report appear to be almost universal, in that they are evident across geographic areas and income groups, with only a few exceptions.
    - This contrasts with the 2013 RHA Indicators Atlas, which showed widening gaps: those in areas of better health had improvements, while those in areas of poorer health had no change or slight declines [1].
- The indicators for which 20-year trend analyses were done (premature mortality and life expectancy) clearly show significant improvement over time. These improvements mirror the decreases in total mortality and potential years of life lost.

Chapter 4: Physical Illness

- Overall, the results in this chapter suggest a slightly increasing burden of physical illness among Manitobans.
    - Increases in disease prevalence can result from a number of factors, primarily from prior increases in disease incidence rates, and/or from decreases in mortality – often due to improvements in available treatments (medical, surgical, or pharmaceutical).
- However, population demographics are also related, in that most physical diseases affect older residents more than younger ones, and Manitoba's population is aging.
- Of the seven chronic physical illnesses studied over time in this report, the prevalence of the two most common diseases (hypertension and arthritis) and one other (congestive heart failure) were unchanged, while three others (respiratory morbidity, diabetes, and ischemic heart disease) increased, and one (osteoporosis, the least common) decreased.
- The rates of the three key health events studied (heart attacks, strokes, and lower limb amputations) all decreased over time.

Chapter 5: Physician and Nurse Practitioner Services

- Most of the indicators in this report show stable rates of use of physician and nurse practitioner services over time.
- The percent of the population having at least one visit with a physician or nurse practitioner (NP) in a given year decreased slightly, but not significantly.
- The average rate of visits to physicians and NPs increased slightly, but not significantly.
- The rate of consultations to specialists increased slightly but not significantly.
    - Specialist consult rates were inversely related to need, in that residents in lower income and/or less healthy areas had lower rates of consults. This finding warrants further investigation to ensure rates of care provision are equitable.
- Continuity of care decreased slightly but not significantly over time.

Chapter 6: Quality of Primary Care

The results in this chapter reveal a mixed picture regarding the quality of primary care received by Manitobans:

- Rates of recommended physician follow-up after a new dispensation of antidepressants decreased over time.
- Appropriate asthma care rates did not change over time.
- Rates of eye examinations among Manitoba residents with diabetes increased over time, whereas rates of appropriate beta-blocker prescriptions decreased among heart attack patients.
- Potentially inappropriate use of benzodiazepines among older adults decreased, both among those living in nursing homes and those living in community settings.

Chapter 7: Hospital Services

- Almost all of the indicators in this chapter show a decrease in the use of hospitals over time, though many of the decreases were not statistically significant.
- The new indicators of acute days in hospital and alternate-level-of-care (ALC) days in hospital together reveal that the vast majority of days of hospital care provided to Manitobans are for acute care: 77% of the more than 1 million patient days of hospital care in 2016/17 were coded to acute care. That said, the rate of use of ALC days increased over time (though not statistically significantly).
- Results for all indicators in this chapter show that hospital care continues to be responsive to need: rates are higher in areas where population health status and income are lower.
- Analyses of the location of hospitalization of regional residents and the 'catchment' of regional hospitals show good and stable results: over 75% of all hospitalizations happen in the patient's home region, along with over 85% of their days of care. Similarly, over 75% of the hospitalizations, and over 85% of the days of hospital care provided by regional hospitals are to patients from that region.
- The most common causes of hospitalization were spread across many disease categories, and did not change much over time. Pregnancy and birth were the leading causes in all regions, followed by either circulatory diseases or digestive disorders, depending on the region. Analysis of days used revealed different rankings, as expected (e.g., hospitalization for child birth is common, but usually a very short number of days).

Chapter 8: High-Profile Surgical and Diagnostic Services

The indicators in this chapter reveal a mix of results across the services analyzed:

- Cardiac catheterization (diagnostic angiography) rates increased slightly, but not significantly; bypass surgery rates decreased significantly.
- Percutaneous Coronary Intervention (PCI) rates (angioplasty with or without coronary stent insertion) increased significantly.
- Hip replacement rates increased slightly, but not significantly.
- Knee replacement and cataract surgery rates decreased slightly, but not significantly.
- MRI scan rates increased significantly in all regions except Winnipeg.
- MRI scan rates and hip replacement were inversely related to need: rates were lower in areas with lower population health status and income – the opposite of the trends expected in a universal needs-based system. These findings warrant further investigation to ensure service provision is distributed equitably in the population.

Chapter 9: Use of Personal Care Homes (PCHs)

The results in this chapter indicate continued decreases in the rate at which Manitobans (age 75+) use PCHs:

- Admission rates decreased over time.
- The percent of older adults living in PCHs ('prevalence') decreased, though the change was not statistically significant.
- Wait times to PCH admission decreased among patients panelled in hospital, but increased (non-significantly) among those panelled in community settings.
- The level of care of PCH residents at the time of admission increased over time.
- The average length of stay for PCH residents decreased slightly over time.

Chapter 10: Maternal and Child Health

The results in this chapter show a mixed but overall positive picture of changes in maternal and child health indicators over time:

- The birth rate decreased slightly in Manitoba over time. In particular, the rate of births to teen mothers decreased significantly, following an even larger decrease in the rate of teen pregnancies.
- The percent of women receiving inadequate prenatal care also decreased, though only slightly.
- The rate of preterm births was stable over time.
- The percent of babies born small-for-gestational-age increased, while those born large-for-gestational-age decreased.
- The Caesarean section rate increased over time, and the rate of vaginal births after C-sections (VBAC) decreased over time, though only slightly.
- There was marked stability in the location of births in Manitoba: the vast majority occurred in a designated maternity hospital in the mother's home RHA or in Winnipeg.
- The rate of breastfeeding initiation in hospital increased significantly.
- The infant mortality rate (0-12 months) decreased significantly during the study period and over a 20-year span.
- The child mortality rate (1-19 years) was stable over time, and injury & poisoning remained the dominant cause of child deaths.
- The rate of surgery for the extraction of multiple teeth affected by dental caries among children age 0-5 decreased significantly over time.
- The prevalence of asthma among children and youth (age 5-19) increased over time.
- For almost all indicators in this chapter, there were significant associations with health status and area-level income: those from more disadvantaged areas had significantly poorer outcomes.

Appendix 2

The results in Appendix 2 show the 20-year time trend for the prevalence of mood and anxiety disorders (from 1997 to 2016). Overall, prevalence increased from 18.8% to 21.3%, but this trend was not statistically significant. However, the trends differed by RHA, and the increases in Prairie Mountain Health and Interlake-Eastern RHA were significant.

Chapter 1: Introduction and Methods

1.1 Background

This report is the latest in a series of similar reports produced by the Manitoba Centre for Health Policy (MCHP) to provide indicators of population health status, healthcare use, and quality of care for all residents of the five Regional Health Authorities (RHAs also known as the 'health regions') in Manitoba. This report includes over 80 indicators covering many aspects of health status and healthcare use. It is intended primarily to assist the regions in preparing their fifth comprehensive Community Health Assessment reports. Key data sources include a number of other MCHP reports, along with data from Manitoba Health, Seniors and Active Living (MHSAL), Diagnostic Services Manitoba, Winnipeg RHA, and Vital Statistics Agency.

Many of the indicators in this report update those in previous MCHP reports, most notably the Manitoba RHA Indicators Atlas 2013 (hereinafter referred to as 'the 2013 Atlas') [1]. Like that report, this one provides results for two time periods to allow some assessment of change over time. This report also provides results over a 20-year time span for a small number of key indicators to allow long-term trend analysis.

The analyses in this kind of Atlas report are descriptive, not explanatory. That is, the report shows what the data reveal, not how or why those results came about. Answering the latter questions requires information about context, history, and local circumstances, which are not available in administrative data.

1.2 The Collaborative Networks Involved

Two collaborative networks were involved in creating this report: The Need To Know Team (NTK), and the Community Health Assessment Network (CHAN). The NTK team was intimately involved in all aspects of this report since its inception, including determining which indicators were included, how they were analyzed and reported, and how they can be used to influence regional health planning and service provision. The NTK team is a collaborative researcher/planner group which includes representatives from all Manitoba health regions, Shared Health, MHSAL, and MCHP. The NTK team was established in 2001 through a five-year grant from the Canadian Institutes of Health Research (CIHR).

CHAN includes representation from every health region in Manitoba and from several units within MHSAL, along with representatives from other stakeholder groups, including MCHP, CancerCare Manitoba, and others. CHAN confirmed the need for population-based indicators to inform each region's upcoming Community Health Assessment and produced the list of indicators to be included in the Community Health Assessment reports.

1.3 The Geographical Boundaries Used in This Report

This report provides data at multiple levels: by RHA, zone, and district, by community area (CA) and neighbourhood cluster (NC) in Winnipeg, and then separately by Rural and Urban Income Quintile areas. The printed report shows only regional results, but all other results are available in the online supplement for this report[1], which can be downloaded in Microsoft Excel format. Figure 1.1 shows all the health regions in Manitoba. Figures 1.2–1.5 show the zones and districts within each RHA. Figure 1.6 shows Winnipeg's CAs and NCs.

1 http://mchp-appserv.cpe.umanitoba.ca/deliverablesList.html

Figure 1.1: Map of Manitoba Regional Health Authorities

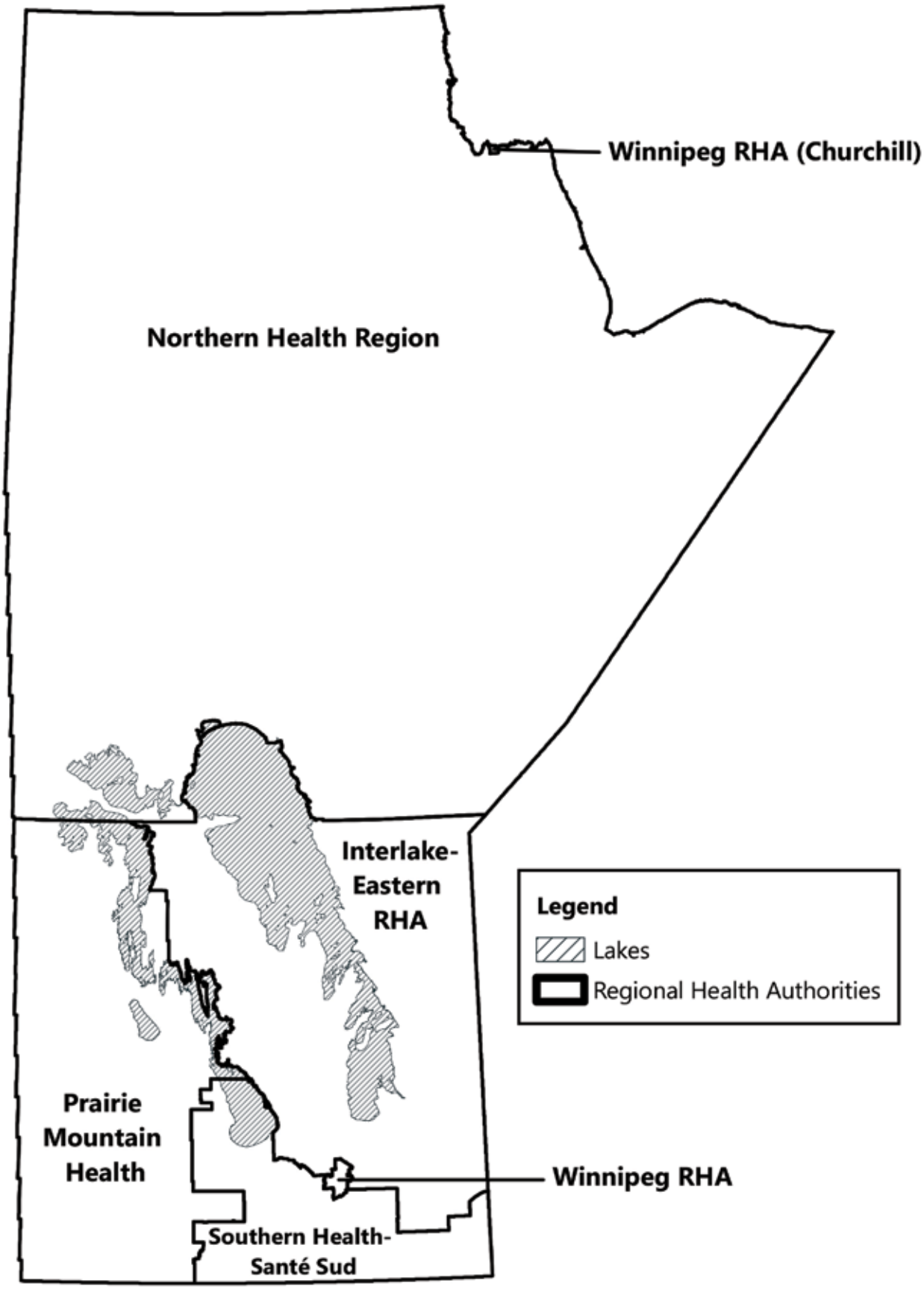


Figure 1.2: Map of Southern Health-Santé Sud, Showing Zones and Districts

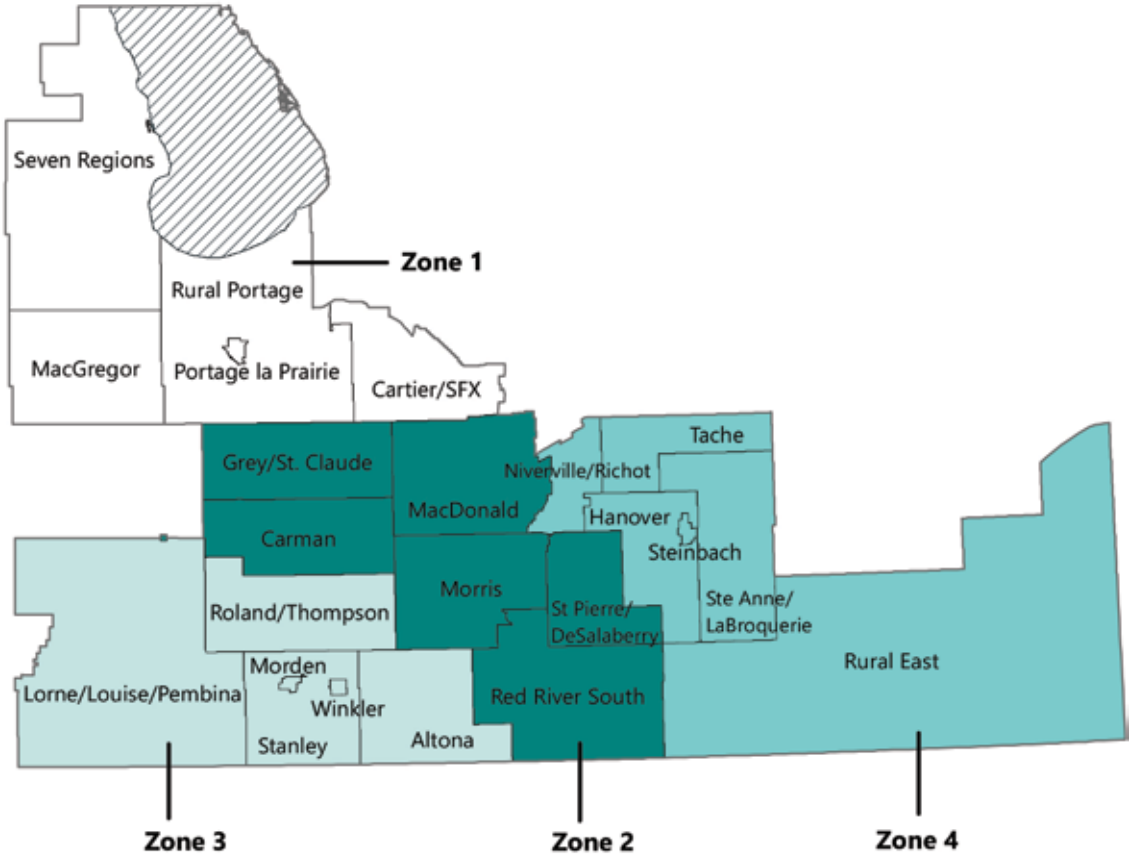


Figure 1.3: Map of Prairie Mountain Health, Showing Zones and Districts

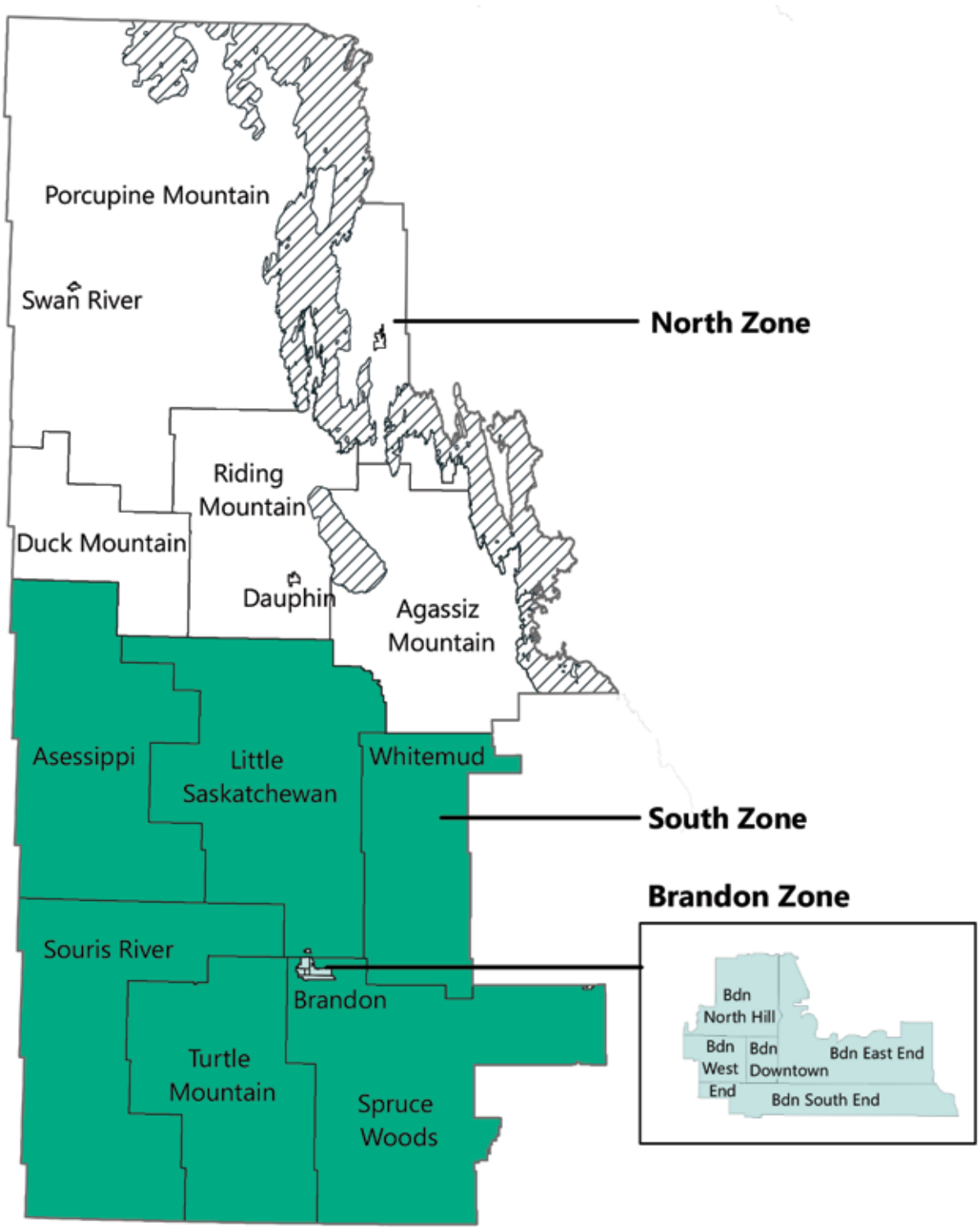


Figure 1.4: Map of Interlake-Eastern RHA, Showing Zones and Districts

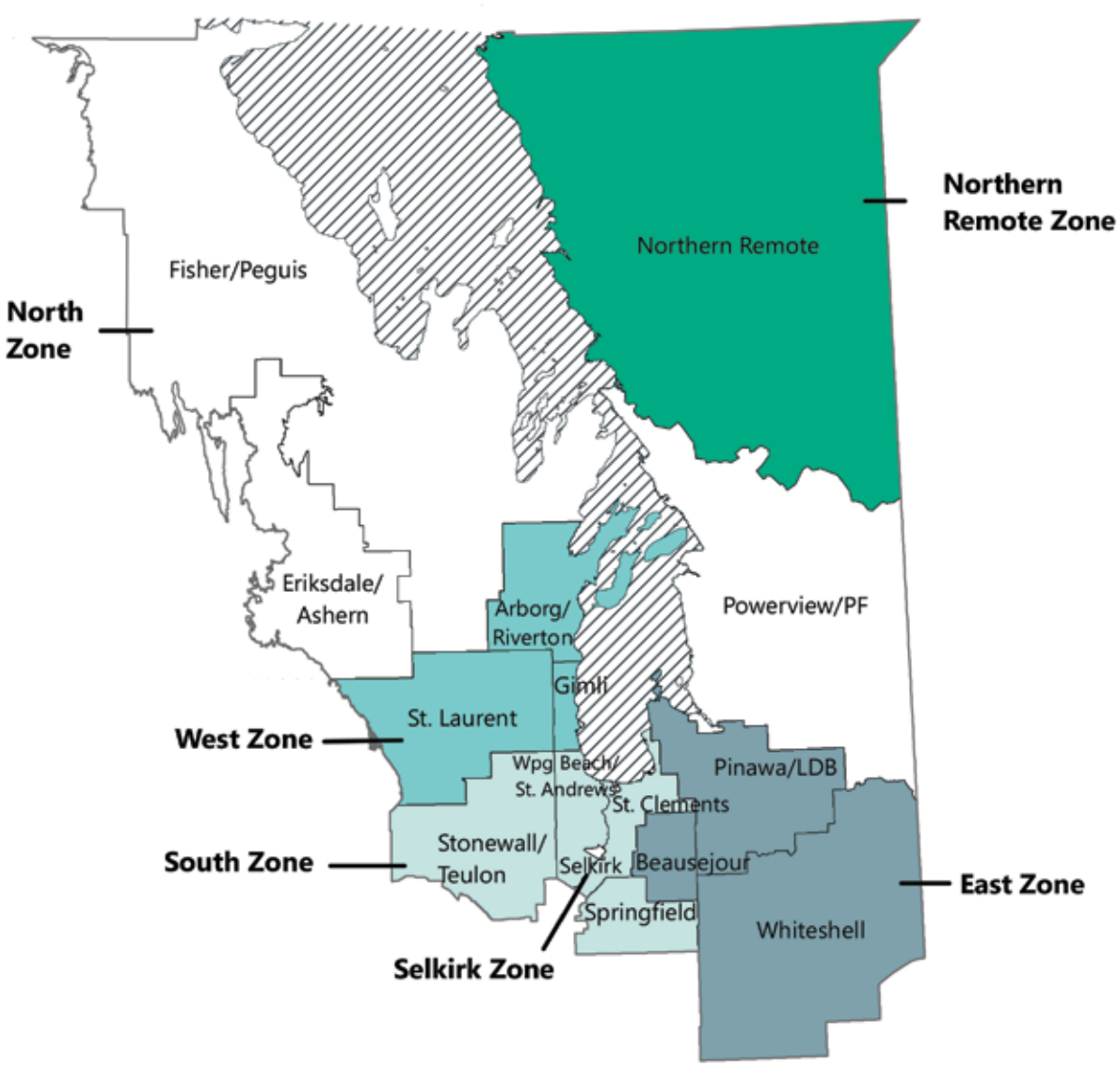


Figure 1.5: Map of Northern Health Region, Showing Zones and Districts

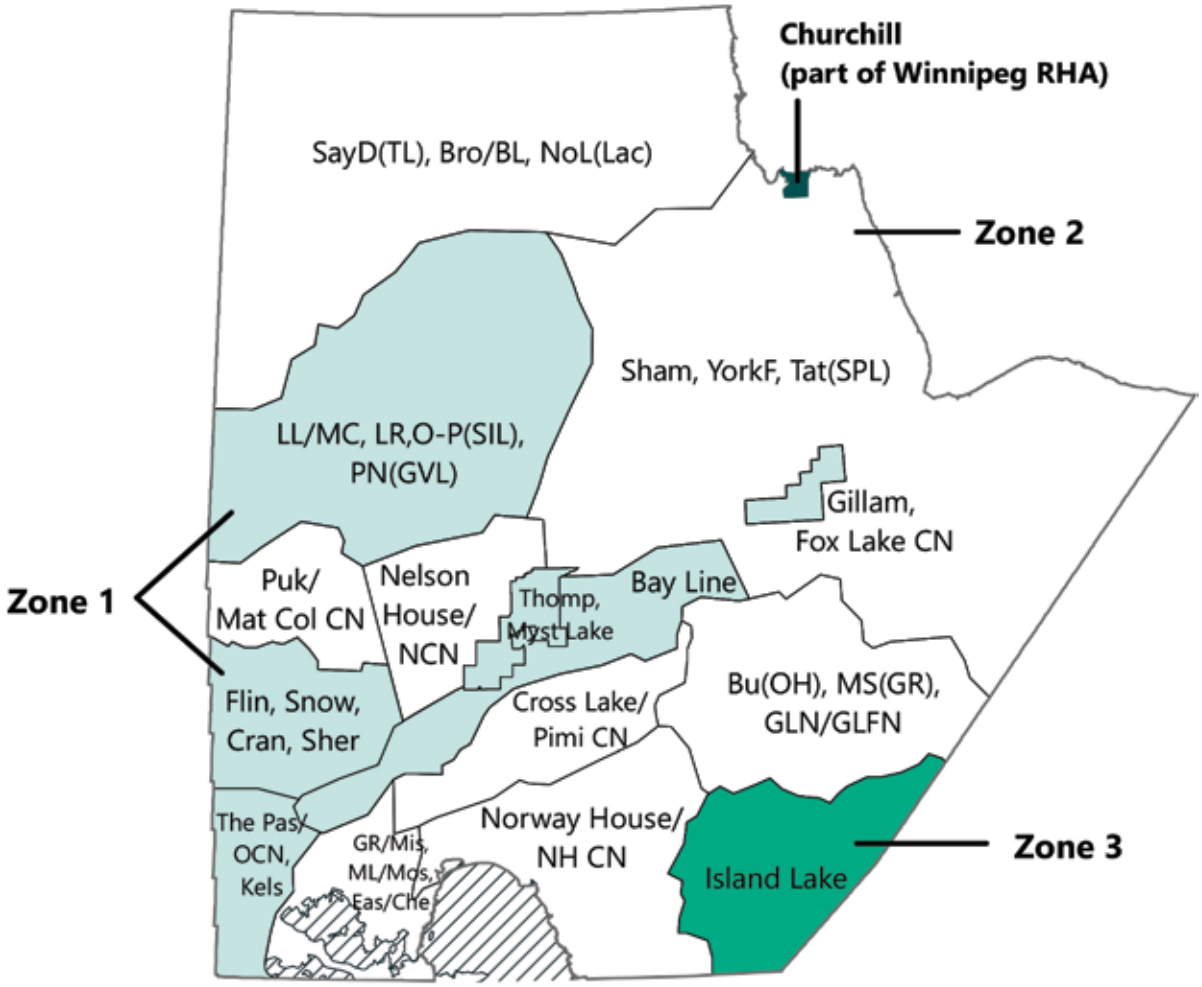


Figure 1.6: Map of Winnipeg RHA*, Showing Community Areas and Neighbourhood Clusters

* Churchill (not shown on this map) is also part of the Winnipeg RHA.

Table 1.1 lists the names of the districts in each zone of each RHA (except Winnipeg, which is shown in Figure 1.6). The labels used for some districts start with a letter or two which indicate which zone that district is in. Appendix 1 contains a complete listing of all the cities, towns, municipalities, and First Nation communities in each of the districts of the rural regions. The districts in Northern RHA each contain several communities, so the district names are highly abbreviated; see Appendix 1 for a full listing.

Finally, for most indicators we also provide results by socioeconomic status. For each indicator, the online supplement for this report on the MCHP website includes results by area-level income quintile groups, separately calculated for urban (Winnipeg and Brandon) and rural (all other) areas. These are also mapped in Figures 1.7–1.8. In most cases, the district-level results provide more detailed data, and should be referred to when considering variations/inequalities. Income quintile information is not available for residents of personal care homes (PCHs).

Table 1.1: Zones and Districts in Non-Winnipeg Health Regions

Zone	District	Graph Label
Southern Health-Santé Sud		
Zone 1	Seven Regions	Seven Regions
	MacGregor	MacGregor
	Rural Portage	Rural Portage
	Cartier/SFX	Cartier/SFX
	City of Portage	City of Portage
Zone 2	Grey/St. Claude	Grey/St. Claude
	Carman	Carman
	MacDonald	MacDonald
	Morris	Morris
	St. Pierre/DeSalaberry	St. Pierre/DeSalaberry
	Red River South	Red River South
Zone 3	Lorne/Louise/Pembina	Lorne/Louise/Pembina
	Stanley	Stanley
	Altona	Altona
	Morden	Morden
	Winkler	Winkler
	Roland/Thompson	Roland/Thompson
Zone 4	Niverville/Ritchot	Niverville/Ritchot
	Taché	Taché
	Ste Anne/LaBroquerie	Ste Anne/LaBroquerie
	Steinbach	Steinbach
	Hanover	Hanover
	Rural East	Rural East
Prairie Mountain Health		
North	Duck Mountain	N Duck Mountain
	Porcupine Mountain	N Porcupine Mountain
	Riding Mountain	N Riding Mountain
	Agassiz Mountain	N Agassiz Mountain
	Dauphin	N Dauphin
	Swan River	N Swan River
Brandon	Bdn West End	Bdn West End
	Bdn North Hill	Bdn North Hill
	Bdn Downtown	Bdn Downtown
	Bdn South End	Bdn South End
	Bdn East End	Bdn East End
South	South Asessippi	S Asessippi
	Little Saskatchewan	S Little Saskatchewan
	Turtle Mountain	S Turtle Mountain
	Souris River	S Souris River
	Whitemud	S Whitemud
	Spruce Woods	S Spruce Woods

Table 1.1: Continued

Zone	District	Graph Label
Interlake-Eastern RHA		
Selkirk	Selkirk	Selkirk
South	Stonewall/Teulon	S Stonewall/Teulon
	Wpg Beach/St. Andrews	S Wpg Beach/St. Andrews
	St. Clements	S St. Clements
	Springfield	S Springfield
East	Beausejour	E Beausejour
	Pinawa/LDB	E Pinawa/LDB
	Whiteshell	E Whiteshell
West	Gimli	W Gimli
	Arborg/Riverton	W Arborg/Riverton
	St. Laurent	W St. Laurent
North	Powerview/PF	N Powerview/PF
	Fisher/Peguis	N Fisher/Peguis
	Eriksdale/Ashern	N Eriksdale/Ashern
Northern Remote	Northern Remote	Northern Remote
Northern Health Region		
Zone 1	Flin,Snow,Cran,Sher	Z1 Flin,Snow,Cran,Sher
	The Pas/OCN,Kels	Z1 The Pas/OCN,Kels
	LL/MCFN,LR,O–P(SIL)CN,PN(GVL)	Z1 LL/MCFN,LR,O–P(SIL)CN,PN(GVL)
	Thompson,Myst Lake	Z1 Thompson,Myst Lake
	Thick,Pik,Wab,Ilf/WL,Corm	Z1 Thick,Pik,Wab,Ilf/WL,Corm
	Gillam, Fox Lake CN	Z1 Gillam, Fox Lake CN
Zone 2	GR/MisCN,ML/MosCN,Eas/CheCN	Z2 GR/MisCN,ML/MosCN,Eas/CheCN
	Puk/Mat Col CN	Z2 Puk/Mat Col CN
	SayD(TL)FN,Bro/BLFN,NoL(Lac)FN	Z2 SayD(TL)FN,Bro/BLFN,NoL(Lac)FN
	Nelson House/NCN	Z2 Nelson House/NCN
	Sham,YorkFN,TatCN(SPL)	Z2 Sham,YorkFN,TatCN(SPL)
	Bu(OH)CN,MS(GR)CN,GLN/GLFN	Z2 Bu(OH)CN,MS(GR)CN,GLN/GLFN
	Cross Lake/Cross Lake FN	Z2 Cross Lake/Cross Lake FN
	Norway House/NH CN	Z2 Norway House/NH CN
Zone 3	IsL/GHFN,RSL/RSLFN,STPFN,WFN	Z3 IsL/GHFN,RSL/RSLFN,STPFN,WFN

Figure 1.7: Distribution of Rural and Urban Income Quintiles in Manitoba 2016 Census Dissemination Areas

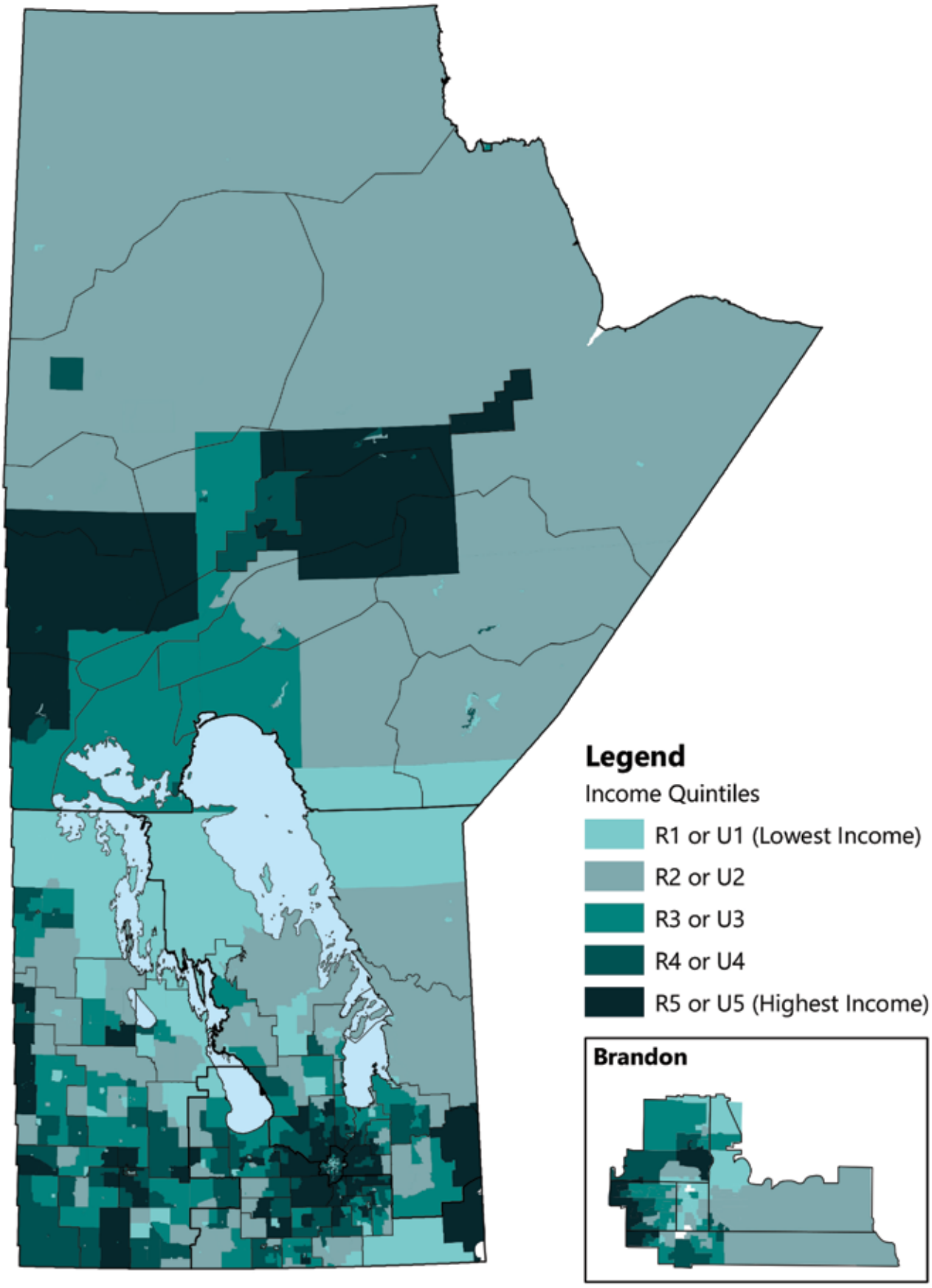
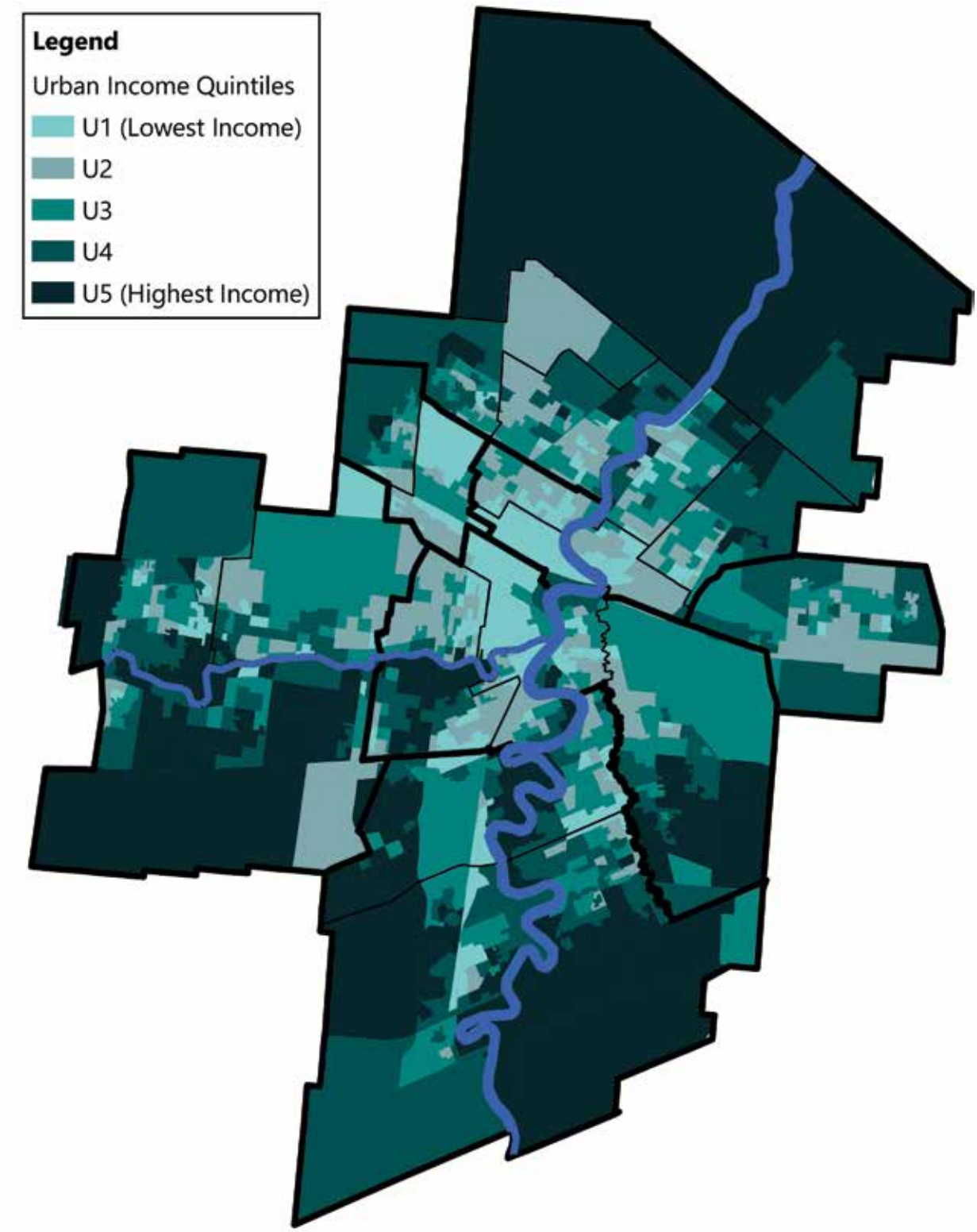


Figure 1.8: Distribution of Urban Income Quintiles in Winnipeg 2016 Census Dissemination Areas



* Churchill (not shown on this map) is also part of the Winnipeg RHA.

1.4 What's in This Report?

The purpose of this report is to provide data for regional and provincial planners and decision-makers. The following areas are covered:

- Introduction and methods (Chapter 1)
- Demographics (Chapter 2)
- Population health status and mortality (Chapter 3)
- Physical illness (Chapter 4)
- Use of physician and nurse practitioner services (Chapter 5)
- Quality of primary care (Chapter 6)
- Use of hospital services (Chapter 7)
- Surgical and diagnostic services (Chapter 8)
- Use of personal care homes (nursing homes) (Chapter 9)
- Maternal and child health (Chapter 10)
- Appendices:
    - Appendix 1: Administrative area boundaries
    - Appendix 2: 20-year time trend analysis of mood and anxiety disorders
    - Appendix 3: Disaggregation of Income Quintile 1 in Winnipeg

Notes regarding content:

- Unlike the 2013 Atlas [1], this report does not include a chapter on mental illness, because other recent MCHP reports provide this information ("Mental Illness among Adult Manitobans" and "The Mental Health of Manitoba's Children" [3,4]). See the MCHP website: http://mchp-appserv.cpe.umanitoba.ca/deliverablesList.html
    - That said, Appendix 2 in this report provides a 20-year time trend for the prevalence of mood and anxiety disorders, because that analysis was not part of the above-mentioned reports.
- Similarly, MCHP is currently working on a report which will provide information regarding the use of home care services in Manitoba: "Describing Patterns of Home Care Use in Manitoba". This report will be viewable and downloadable from the MCHP website once publicly released.

1.5 The Indicators – Key Concepts

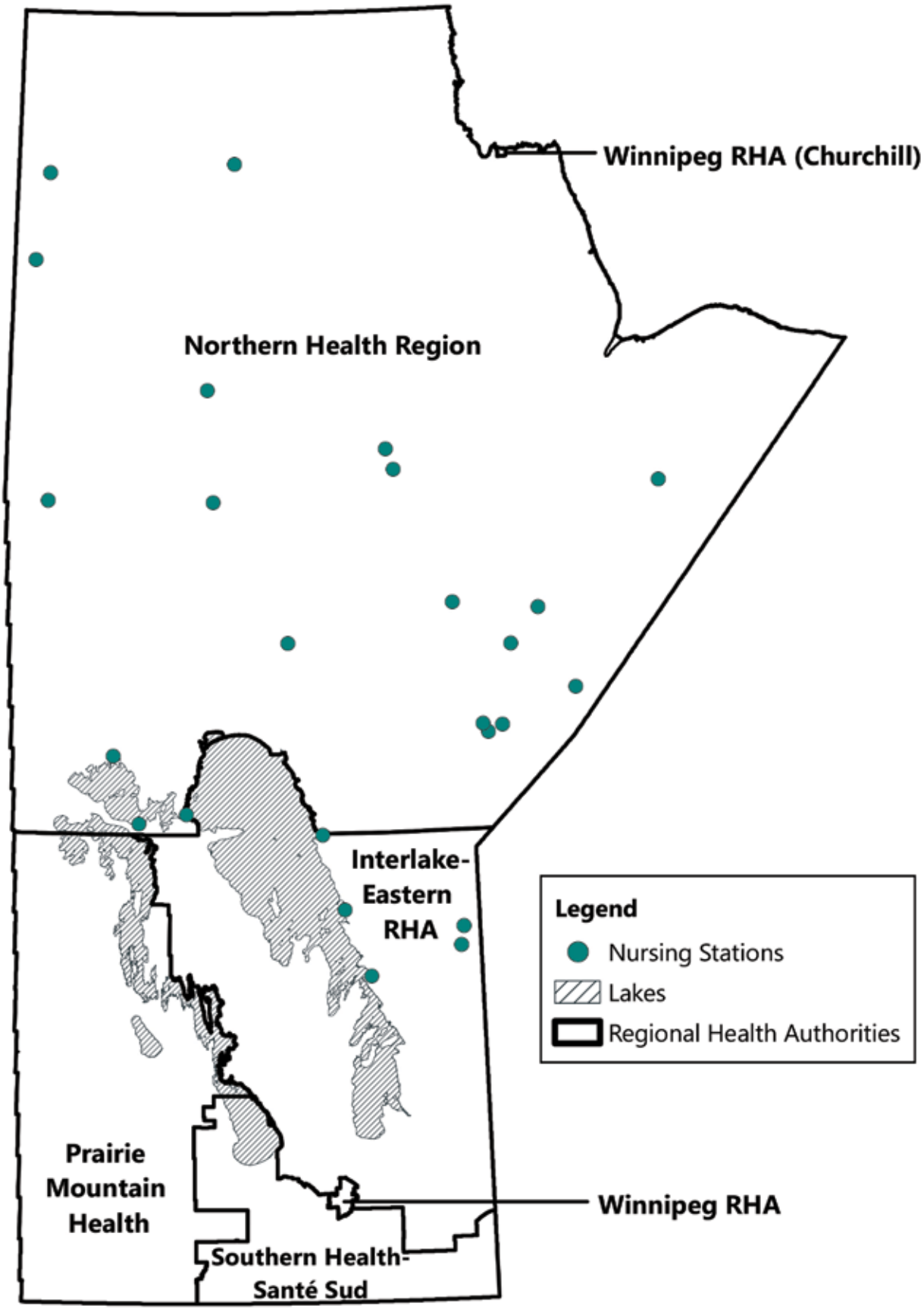
Most indicators in this report were calculated using a population-based approach. This means that the rates or the prevalences shown are based upon virtually every person living in Manitoba.[2] Furthermore, almost all indicators in this report reflect where people live, not where they received services. For example, a person living in a remote area may be hospitalized in Winnipeg, but the hospitalization is attributed back to the rate for the remote area. Thus, the results offer insight into the complete health and healthcare use patterns of the population living in the area, no matter where they receive their care. Selected indicators also show the distribution of locations of service provision to allow insight regarding patient travel patterns.

Residents of some areas receive health services in nursing stations operated by the federal or provincial government (or through local agreements). The locations of these facilities are shown in Figure 1.9. Most of the services provided in these settings are not recorded in the provincial data files used in our analyses. Services provided by physicians and nurse practitioners visiting the nursing stations are supposed to be recorded, though the completeness of such reporting is uncertain. Therefore, service use rates shown in this report underestimate the total level of service provision to some residents. This issue is most prominent in Northern RHA, but also affects Interlake-Eastern RHA.

Definitions of most terms used in this report are available in MCHP's online Concept Dictionary (http://umanitoba.ca/faculties/health_sciences/medicine/units/chs/departmental_units/mchp/resources/concept_dictionary.html).

2 Excludes persons in federal penitentiaries, and personnel of the Canadian Armed Forces and Royal Canadian Mounted Police. Together, these comprise less than 2% of the population of Manitoba.

Figure 1.9: Location of Nursing Stations in Manitoba, 2016



1.6 The Graphs: Order of the Regions and Sub-Areas

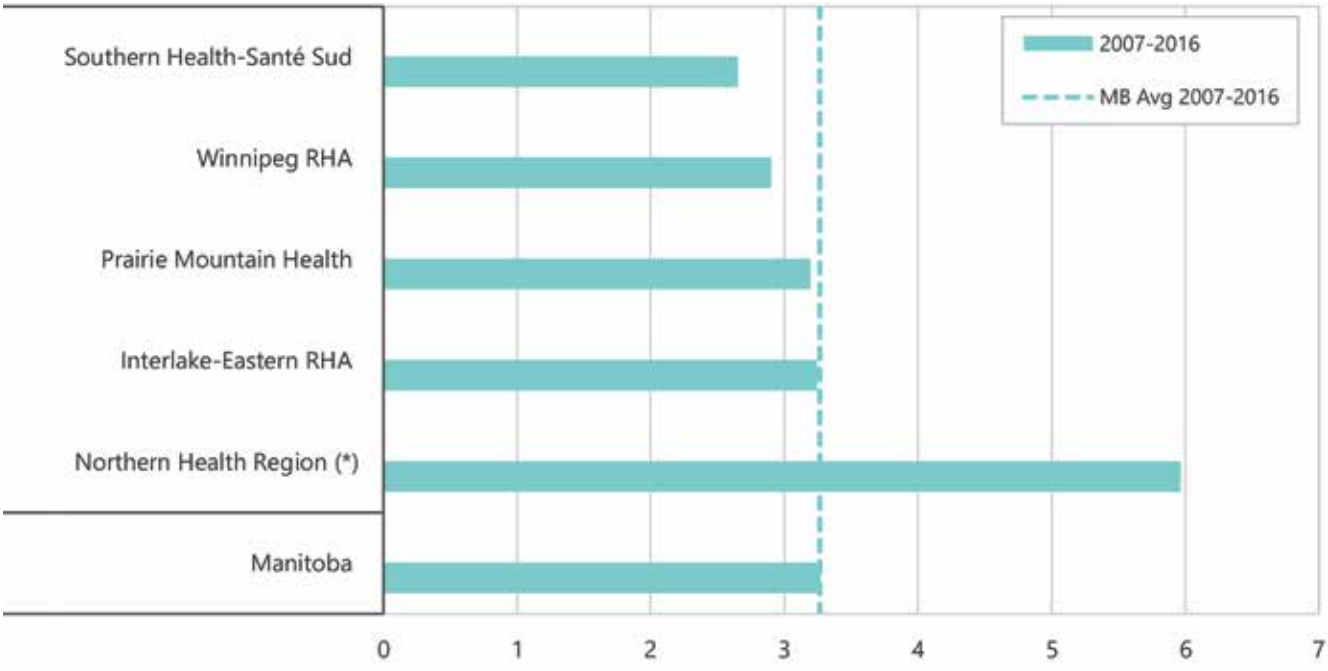
In this report, the health regions and their sub-areas are shown in a particular order, which is consistent throughout the report and similar to other MCHP reports. This order is based on the overall health status of the population of each area as measured by the Premature Mortality Rate (PMR). A death before the age of 75 years is considered premature, so the PMR reflects how many residents of that area died before reaching the age of 75 (per 1,000 area residents under 75). Because some districts have small populations, ten years of data (2006-2015) were used to ensure reliable estimates. Like most other indicators in this report, the PMR data were adjusted to account for the age and sex composition of each area's population.

PMR is considered the best single indicator of the overall health status of a region's population and need for healthcare [5–7]. PMR is correlated with morbidity and with self-rated health, as well as with socioeconomic indicators [8]. Populations having a high PMR are presumed to need more healthcare services than healthier populations.

PMR values for the regions are shown in Figure 1.10. The region with the lowest PMR (that is, the best overall health status) is shown at the top of the graph (Southern Health–Santé Sud), and the other regions follow in order of increasing PMR: Winnipeg RHA, Prairie Mountain Health, Interlake-Eastern RHA, and finally Northern RHA, which has the highest PMR (poorest overall health status). Below that is the overall average for Manitoba; a dashed line is drawn vertically to allow easy comparison of the provincial average to each region's rate. Only Northern RHA's rate is statistically different from the provincial average.

Figure 1.10: Premature Mortality Rate by RHA, 2007-2016

Age- and sex-adjusted average annual rate of death before the age of 75 per 1,000 residents age 0-74



* indicates area's rate was statistically different from Manitoba average
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

1.7 Data Sources and Years of Data Used

The data used for this report are housed at the Manitoba Centre for Health Policy (MCHP), which maintains the Manitoba Population Research Data Repository ('the Repository'). Most of the data in the Repository are derived from administrative records: data which were collected in order to administer health and social services. Data are sent to MCHP from MHSAL only after identifying information (names, addresses) have been removed and personal health identification numbers (PHIN) are scrambled. The Repository includes information of key interest to health planners, such as mortality and birth information, physician and hospital use, pharmaceutical use, and use of personal care homes (nursing homes). The encrypted identifiers allow these files to be linked for individual-level analyses while still protecting privacy. As well, area-level information from public-use 2016 Census data, like average household income for a geographical area, is used to provide insight into the influence of socioeconomic factors on health and healthcare use. These results are calculated separately for urban (Winnipeg and Brandon) and rural (all other) areas, and are shown in the tables in the online supplement.

The following data were used in various analyses for this report:

- Canadian Census
- Diabetes Education Resource for Children and Adolescents (DER-CA)
- Diagnostic Services Manitoba (DSM)
- Drug Program Information Network (DPIN)
- Hospital Discharge Abstracts
- Long Term Care Utilization History
- Manitoba Health Insurance Registry
- Medical (Physician) Services
- Provider Registry
- The Laboratory Information Management System (LIMS) from Cadham Laboratory
- Vital Statistics Mortality Registry

Most indicators in this report using Repository data are provided for two time periods (2011/12 and 2016/17) in order to allow for some assessment of change over time, as was done in previous Atlas reports [1,2,9]. This series of reports thus provides a moving window of observation, each of which incorporates two time periods. For each reporting period, the priority was to provide the most recent data available with additional (prior) years being added as needed to provide statistically reliable results. Therefore, indicators of the most frequent events/outcomes show results for single years, while less common events require between two and five years of data to be aggregated to avoid data suppression and provide statistically reliable results.

Two exceptions to this are the (new) indicators for the prevalence of Human Immunodeficiency Virus (HIV) and Hepatitis C Virus (HCV). For these, more than five years of data were required to produce reliable estimates, so only one time period is shown.

This report also includes a 20-year trend analysis for a small number of key indicators.

In the hospital abstract data system, the ICD–10–CA (International Classification of Diseases) system was used for coding diseases, and the Canadian Classification of Interventions (CCI) system was used for surgical procedures and interventions. Records in the medical claims data (for physician visits) remain in the ICD–9–CM system.

1.8 Differences from the 2013 RHA Indicators Atlas Report

Many of the indicators in this report use multiple years of data in each time period. The first time period in this report, covering 2007/08–2011/12, is the same as the second time period in the 2013 Atlas [1]. However, as frequently occurs in research, the definitions of some indicators have been refined and improved over time, so results for the same time period may be different in the two reports. This 2019 report consistently uses the most up-to-date definitions, so direct comparisons between reports should be made with caution.

In addition, the source data used are continually being revised and corrected, so even some indicators using consistent definitions over time may not have exactly the same results in the two reports (though the differences are typically unnoticeably small). As a result, the values shown in this report are more accurate than those in previous reports.

1.9 Rates and Prevalence, Adjusted Rates, and Statistical Analyses

Rates and Prevalence

Prevalence refers to the *percent of the population that has a certain condition over a specified period of time* (period prevalence). It is an indication of how common the condition is and, therefore, has implications for the provision of services. Most indicators in this report use the concept of period prevalence over 1-year, 3-year, or five-year periods.

In contrast, a *rate* refers to a change in state over time and is used to express the *frequency of events during a given period*. Many health-related events can happen to a given person more than once. For example, the physician visit rate shows how often Manitoba residents visit physicians each year. Where an indicator covers a period longer than one year, the rate is annualized – that is, presented as an annual average.

The administrative data used for this report do not directly indicate who 'gets' or 'has' diseases, but do record who gets diagnosed with which diseases (i.e., visits a physician, gets prescribed certain drugs, or is hospitalized and gets the appropriate codes). When we report the prevalence of a disease, we are reporting the percent of the population who were diagnosed with that disease in the period (though different diseases/indicators have different case definitions – see each indicator for its definition). In other reports, including previous MCHP reports, indicators like this are sometimes referred to as "diagnostic prevalence" or "treatment prevalence" values because they are derived from records of healthcare diagnosis and treatment.

Many of the indicators in this report use data from physician claims. The majority of these claims are generated by fee-for-service physicians, though a growing percent are 'shadow billing' claims generated by physicians covered under alternate payment methods (e.g., salary). Shadow billing claims may not be 100% complete, so some indicators may underreport actual values. Furthermore, in some northern and remote areas, residents are served by nurses (e.g., in nursing stations), and these encounters are not included in physician claims data. Also, rates for Churchill can vary substantially over time, some of which is due to irregularity in reporting of physician services, in combination with the small population.

Adjusted Rates

Most of the indicators are labeled as 'age- and sex-adjusted' rates because the results have been statistically adjusted to account for the different age and sex compositions of the populations living in different areas. This adjustment allows for fair comparisons among areas with different population characteristics (described in Chapter 2). This is important, because many health-related indicators (e.g., diseases, use of healthcare services) are higher for older Manitobans. Adjusted rates show what that area's rate would have been if the area's population had the same age and sex composition as the Manitoba population. For example, adjusted rates are almost always higher than the crude rates for residents of Northern RHA because this region has a relatively young population (and high burden of illness despite this younger age profile). For most of the analyses, these rates were produced using generalized linear models (GLMs) (see Statistical Analyses).

The online supplement on the MCHP website contains tables listing the crude rates/prevalence values and the actual numbers of events observed for each indicator by all levels of geography and by income quintile areas. This type of information is helpful in giving a more pragmatic measure of the burden on the local healthcare system (e.g., actual number of residents diagnosed with a given condition.)

Age Calculations

For most indicators in this report, age is calculated as of December 31 of each study year for both the numerator and the denominator. Exceptions include indicators of period prevalence, when there are more years of data in the numerator than in the denominator, such as diabetes prevalence, in which case age is calculated as of December 31 of the denominator year. Other exceptions include cohort analyses, where age is calculated as of the start of follow-up or at the time of an event.

Statistical Analyses

Most of the analyses for this report were done using a GLM approach, incorporating interaction terms and a quadratic age term, when necessary. Parameters in the model included age, sex, and area of residence (or income quintile). Because we were modeling rates and not events, we used the logarithm of the population as an offset in the model.

One model provided rates for the five RHAs; a second model provided rates for the 16 RHA zones outside Winnipeg, the 12 Winnipeg CAs, and the City of Winnipeg; a third model provided rates for the 70 RHA districts, the 25 Winnipeg NCs, Churchill, and public trustees; and a fourth model provided rates by rural and urban income quintiles. As a result, there are instances in which inconsistencies arise between models. For example, the average rate for Winnipeg RHA (which combines Winnipeg and Churchill) may be slightly higher or slightly lower than those for both Winnipeg and Churchill (typically by less than 0.05%).

Even though most of the analyses in this report include the entire Manitoba population, we use statistical significance tests to indicate how much confidence to put in the differences between rates. If a difference is 'statistically significant' (e.g., p-value below 0.05), then this difference is large enough that we are confident it is not just due to chance. So we would expect to see the rate remain different from the provincial average from year to year, unless some change is implemented.

It is best to not over-interpret the importance of small differences, especially those that are not statistically significant. When you see a difference that is not statistically significant (whether the difference is small or large), the rate should be considered similar to the provincial average, since it could fluctuate from year to year. This is usually due to the rate being based on small numbers: either a small

number of events, a small underlying population, or both. For RHA, zone and CA-level comparisons, we used 99% confidence intervals; for district and NC-level comparisons, we used 99.5% confidence intervals. For comparisons over time within any given area, and for income quintile trend tests, we used 95% confidence intervals. These values were chosen to balance the need for control of type I errors (which increase when performing multiple comparisons) without adhering to a strict Bonferroni correction, which would have required differences to be much larger before being labeled as statistically significant.

- With all that being said, it is also true that for a number of indicators in this report, successive Atlas reports have shown consistent but non-significant changes over time in each report. The accumulation of multiple non-significant changes likely 'add up' to a significant change for some of these indicators. To address this issue, we have included 20-year analyses of selected indicators in this report. For others, commentary is made which refers to several previous Atlas reports. This reflects the fact that while statistical analyses are numerical and clear-cut, their interpretation – especially when combined with results from other reports – are not as simple.

In most figures, the results from both time periods are shown: the most recent period in dark-shaded bars, and the previous period in light-shaded bars. Each area's name can be followed by a set of parentheses that can include any combination of the indicators '1', '2', 't', or 's':

- a '1' indicates that in the first time period, the area's rate was statistically different from the Manitoba average at that time (light dashed line)
- a '2' indicates that in the second time period, the area's rate was statistically different from the Manitoba average at that time (dark dashed line)
- a 't' indicates, for that area, the change in rates from the first time period to the second time period was significant
- an 's' indicates that the results were suppressed to ensure confidentiality

MCHP's confidentiality policy requires that whenever the number of events or persons involved is five or fewer, the results are not shown. However, this excludes a true '0', as the non-occurrence of events can be shown without compromising confidentiality. Therefore, some graphs might seem to be missing a bar, but if there is no 's' beside the area's name, this reflects the fact that zero events occurred.

Results by Income Quintile

The online supplement on the MCHP website also shows results by rural and urban income quintiles. These results are discussed in the Key Findings section for each indicator in the report. Urban areas are Winnipeg and Brandon, while rural areas are all other parts of Manitoba. Within each, the population was divided into five groups of approximately equal population, according to the average household income of the small area (Dissemination Area) they lived in. Income values were taken from the 2006, 2011, and 2016 Canadian Census (whichever was closest in time to the data being analyzed). These rates were age- and sex-adjusted to account for the different demographic profile of these groups (e.g., residents of the lowest income areas are younger than residents of the highest income areas). For each set of areas, in each time period, the relationship between income and the indicator shown were statistically tested using a linear trend test. The results of these tests are cited directly below the results table by income quintiles, along with a test to determine whether the linear trend changed significantly over time. The results shown are 'p' values; those below 0.05 indicate statistically significant relationships and are shown in bold font.

All data management, programming and analyses were performed on MCHP's secure server using SAS® version 9.4 software.

1.10 Putting Evidence into Action

There is a wealth of information in this report. The NTK Team hopes that it will be useful to regional and provincial planners and decision-makers in Manitoba, as well as other planners and researchers across Canada and elsewhere. The information can be used in many ways. A region can obtain an overview of the population it is serving, the percent of the region's population having various diseases or events, the use of healthcare services, and the quality of care being provided.

Regions can 'cross-compare' their information with other regions and their own districts, best done using the adjusted rates. Crude rates and counts can be helpful to inform actual numbers of residents or events to be planned for, in terms of volume. Furthermore, regional planners will ask many questions about the context of their profiles: How do the data add to the knowledge that planners have about their region and its services? What factors caused these results to come about? What can or should be done?

We hope that this information will be a useful tool in the effort to improve the health of the entire population of Manitoba. An electronic version of this report, all Excel files for the graphs in this report, additional data, indicator definitions, and drug codes are available on the MCHP website (listed below) as an 'online supplement', under this Atlas Report.

The MCHP website address for research reports is:

http://mchp-appserv.cpe.umanitoba.ca/deliverablesList.html

Chapter 2: Demographics

Key Findings in Chapter 2

Manitoba's population grew from 1,261,261 in 2011 to 1,351,359 in 2016, a 7.14% increase. All regions had increases over time. The population also aged: the growth rate among children (age 0 to 19 years) was 4.1%; among adults (age 20 to 64) it was 6.6%; and among older adults (age 65 and older), it was 15.2%. Each region's population structure was also different from the provincial average:

- Southern had a higher percent of children and lower percent of adults and older adults.
- Winnipeg had a lower percent of children, a higher percent of adults, and an average percent of older adults.
- Prairie Mountain had a slightly lower percent of children and adults and a higher percent of older adults.
- Interlake-Eastern had a lower percent of children, a slightly lower percent of adults and a higher percent of older adults.
- Northern had a much higher percent of children, a lower percent of adults, and a much lower percent of older adults.
- Overall, the 20-year trend analysis showed a clear shift with children making up a steadily decreasing portion of the population.

Introduction

This chapter describes the age and sex composition of the population of each of Manitoba's health regions, along with several indicators of socioeconomic status/deprivation.

For the demographic information in Section 2.1, two population pyramids are shown for each region: the first shows a percent distribution, comparing each region to the Manitoba population as of December 31, 2016; and the second shows the change in actual numbers over time in each region (December 31, 2011 versus December 31, 2016). Areas with young populations have a triangular shape, reflecting the presence of many young residents and few elderly, whereas areas with older populations have more rectangular shapes.

Manitoba's population grew from 1,261,261 in 2011 to 1,351,359 in 2016. This increase of 90,098 residents represents a growth of 7.14%, marginally higher than the 6.85% increase seen in the previous five years [1]. The population of every region increased, though the growth varied

considerably by region: Southern by 9.81%, Winnipeg by 8.17%, Interlake-Eastern by 4.89%, Northern by 3.72%, and Prairie Mountain by 3.53%.

Manitoba's population is also aging. There was more growth among adult age groups than among children from 2011 to 2016: the age 0-19 group grew by 4.06%, the age 20-64 group by 6.61%, and the age 65 or older group by 15.2%.

Manitoba's health regions vary widely in terms of demographic profiles (Table 2.1 and Figure 2.1). Northern has the youngest population, whereas Prairie Mountain has the oldest population. These differences have important implications for health and health service use, which is why most indicators in this report show age- and sex-adjusted rates (see Chapter 1). This adjustment allows results to be validly compared across areas, ensuring that any differences between them were not determined by differences in age/sex distributions of local populations.

20-Year Time Trend Analysis

- Figure 2.2 shows the provincial demographic summary for each year from 1997 to 2016. Overall, there is a clear shift, with children making up a steadily decreasing portion of the population (from 28.5% to 25.2%), while the percent of older adults increased (from 13.6% to 15.0%).
- A very similar trend was evident in all RHAs (see online supplement), though the actual distribution was different.

Table 2.1: Demographic Summary by RHA, 2016
Crude percent of residents per age group (years), all ages

Regional Health Authority	0-19	20-64	65+
Southern Health-Santé Sud	30.3%	56.5%	13.2%
Winnipeg RHA	22.7%	62.2%	15.1%
Prairie Mountain Health	25.0%	56.7%	18.3%
Interlake-Eastern RHA	23.6%	58.6%	17.8%
Northern Health Region	37.8%	55.1%	7.0%
Manitoba	**25.2%**	**59.7%**	**15.0%**

Figure 2.1: Demographic Summary by RHA, 2016
Crude percent of residents per age group (years), all ages

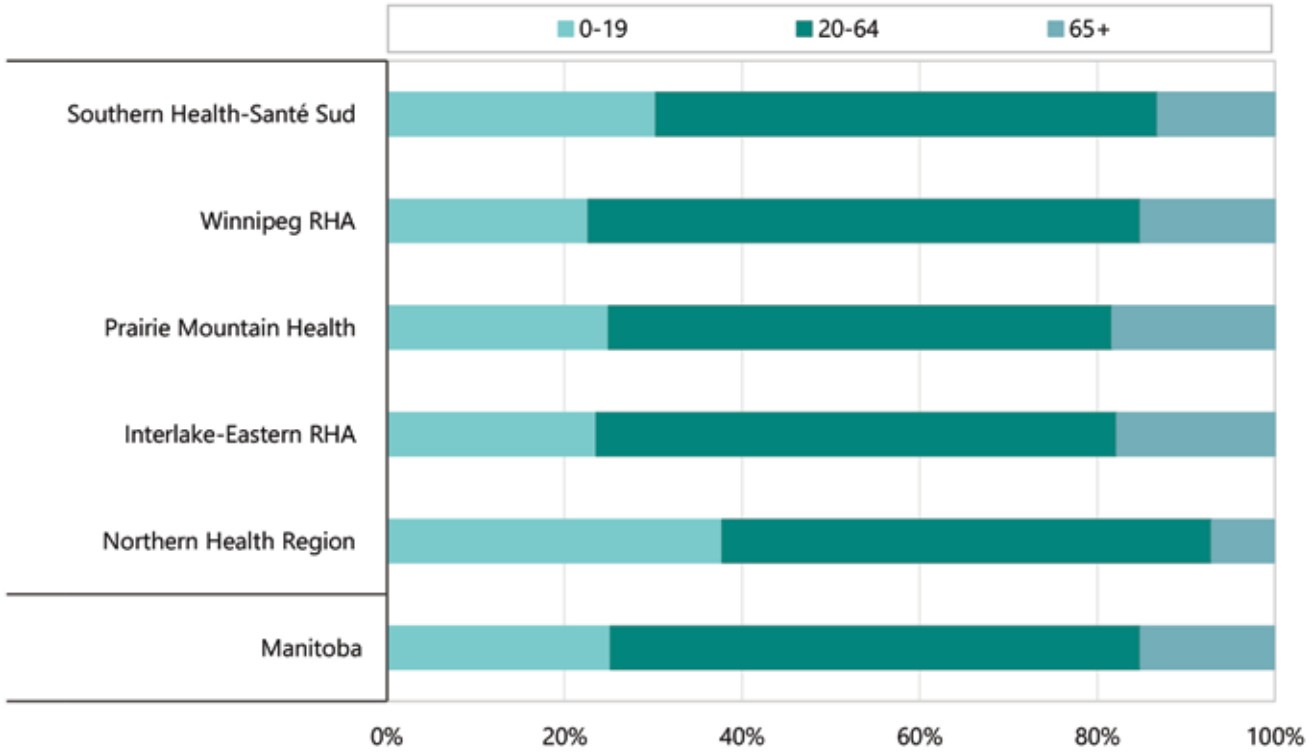
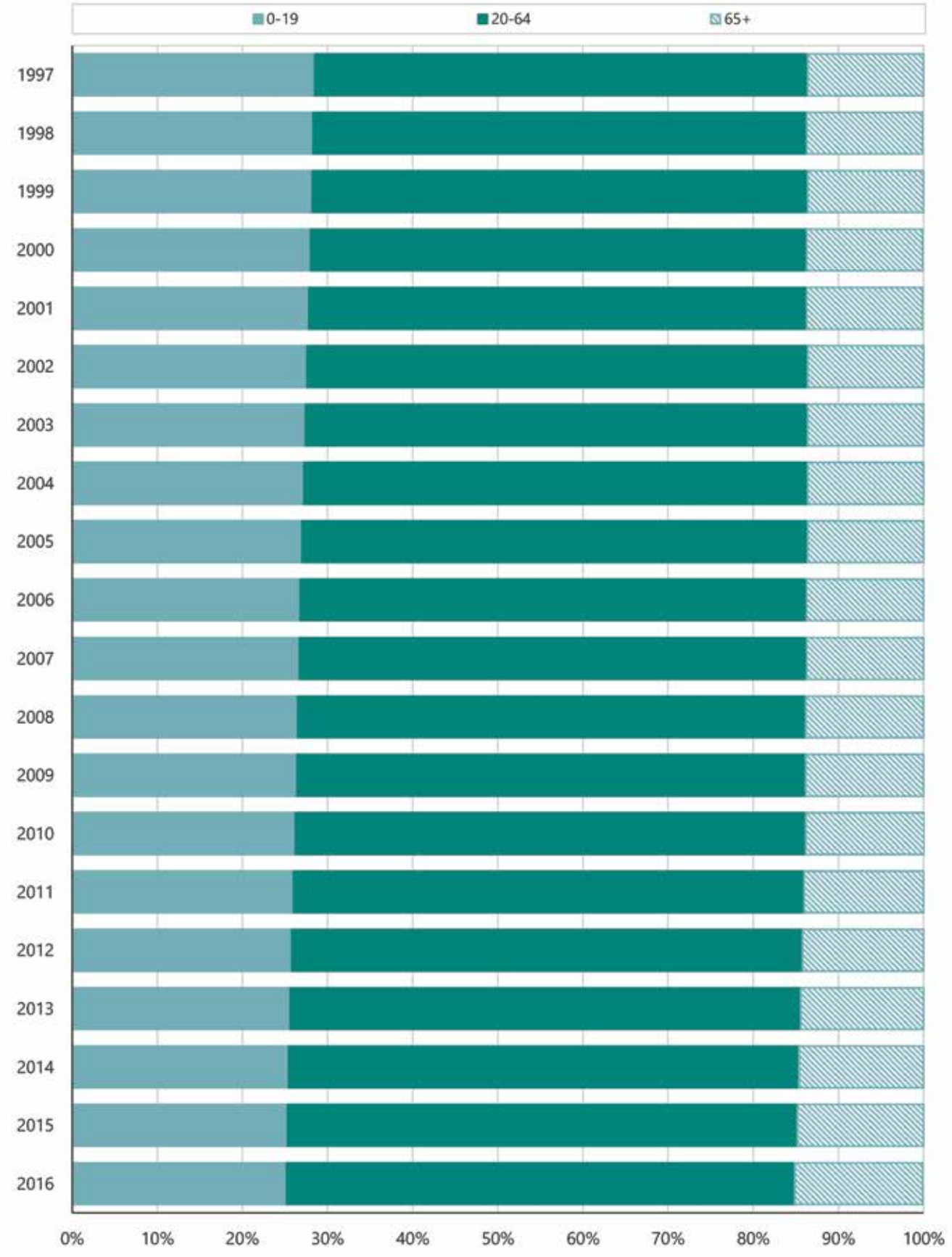


Figure 2.2: Demographic Summary for Manitoba, 1997-2016
Crude percent of residents per age group (years), all ages



2.1 Population Pyramids

Definition: A population pyramid is a graphic representation of the age and sex composition of a population. The percent or number of residents within each five-year age group (from 0-4 to 90 and older) are shown for both males and females. Values for each RHA are shown for 2011 and 2016 in two different ways:

- A pyramid that compares a health region to the Manitoba population on December 31, 2016; showing the percent of males and females in each five-year age category. This allows comparison of the region's demographic profile to that of Manitoba overall.
- A pyramid that shows how each region has changed over time. The population on December 31, 2011 is compared with that on December 31, 2016; showing the actual number of males and females in each five-year age category. This allows an assessment of how that region's population has changed over time.

Figure 2.3: Age and Sex Profile for Manitoba, 2011 and 2016
Crude percent of residents (all ages)

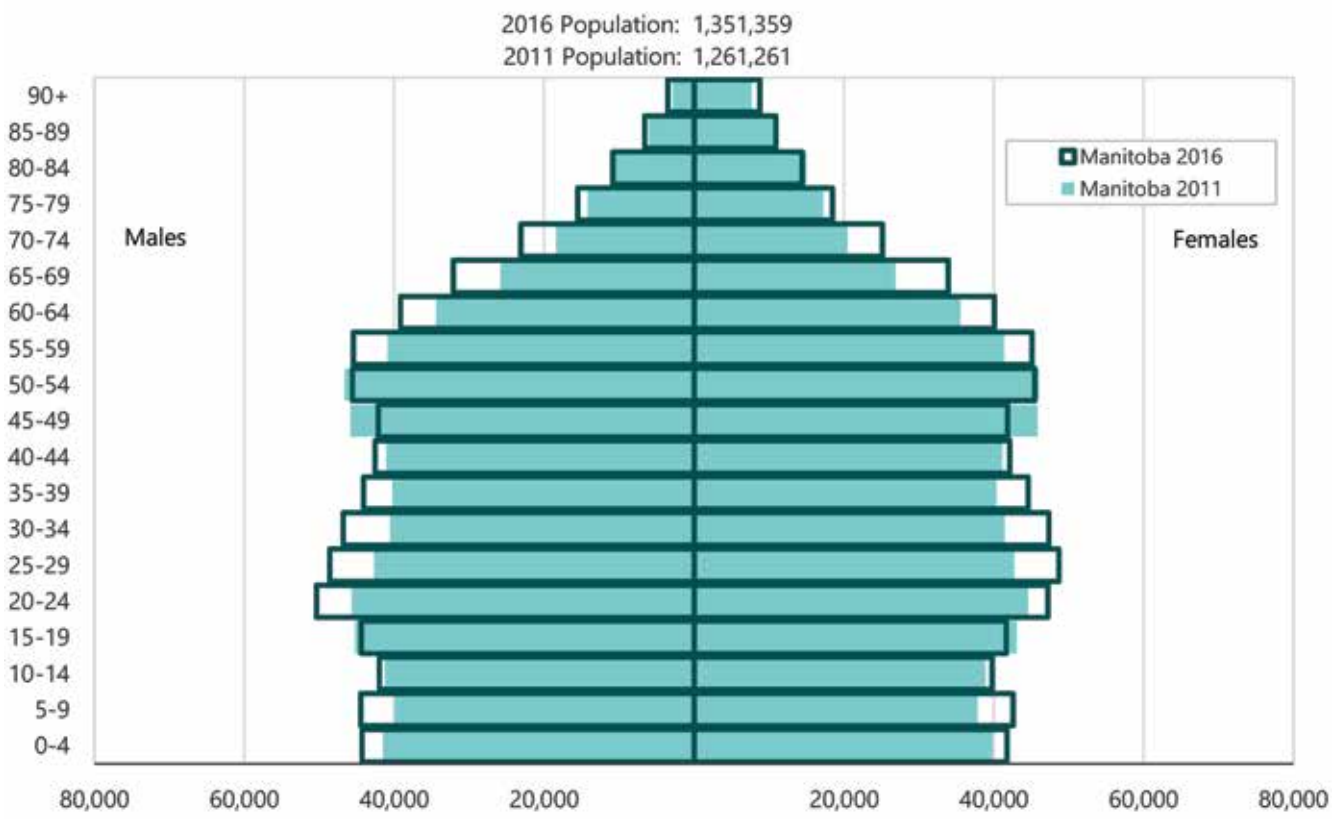


Figure 2.4: Age and Sex Profile for Southern Health-Santé Sud vs. Manitoba, 2016
Crude percent of residents (all ages)

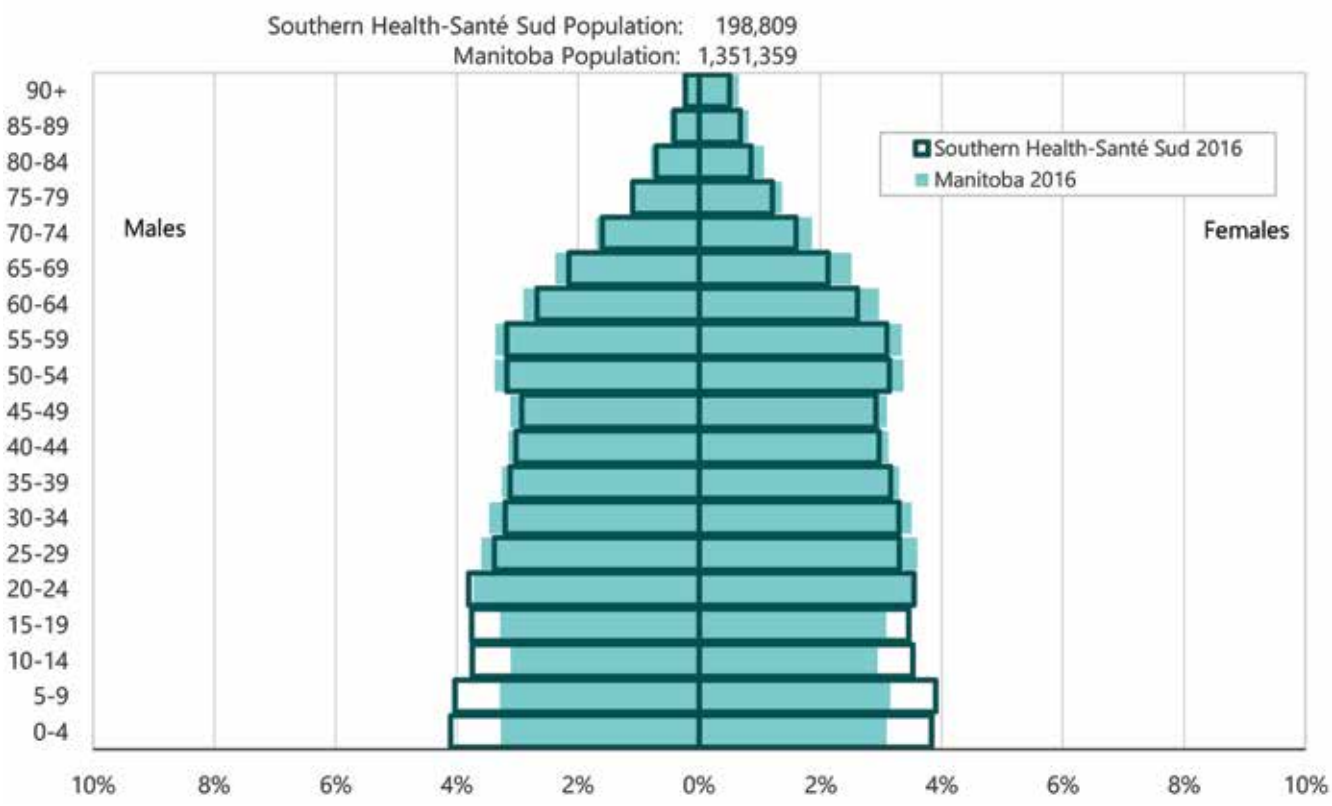


Figure 2.5: Age and Sex Profile for Southern Health-Santé Sud, 2011 and 2016
Crude percent of residents (all ages)

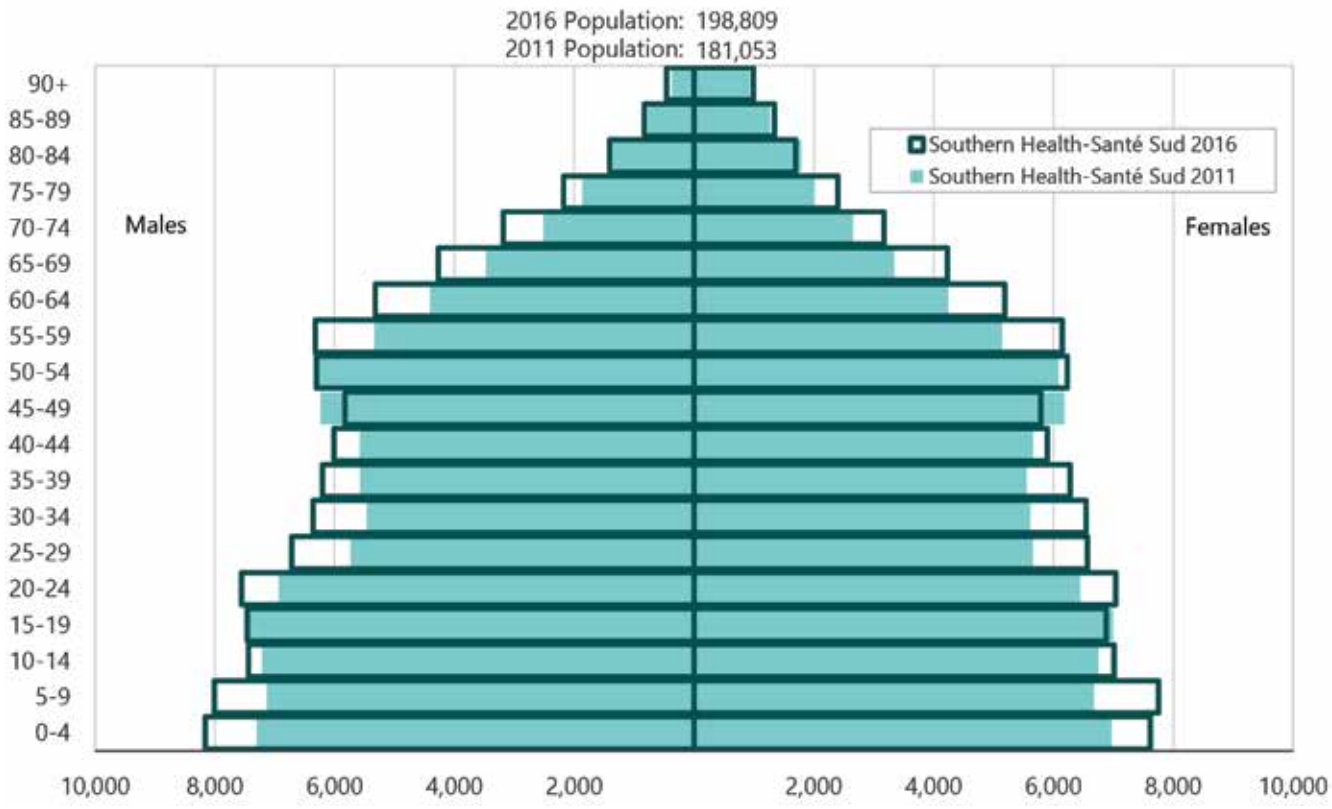


Figure 2.6: Age and Sex Profile for Winnipeg RHA vs. Manitoba, 2016
Crude percent of residents (all ages)

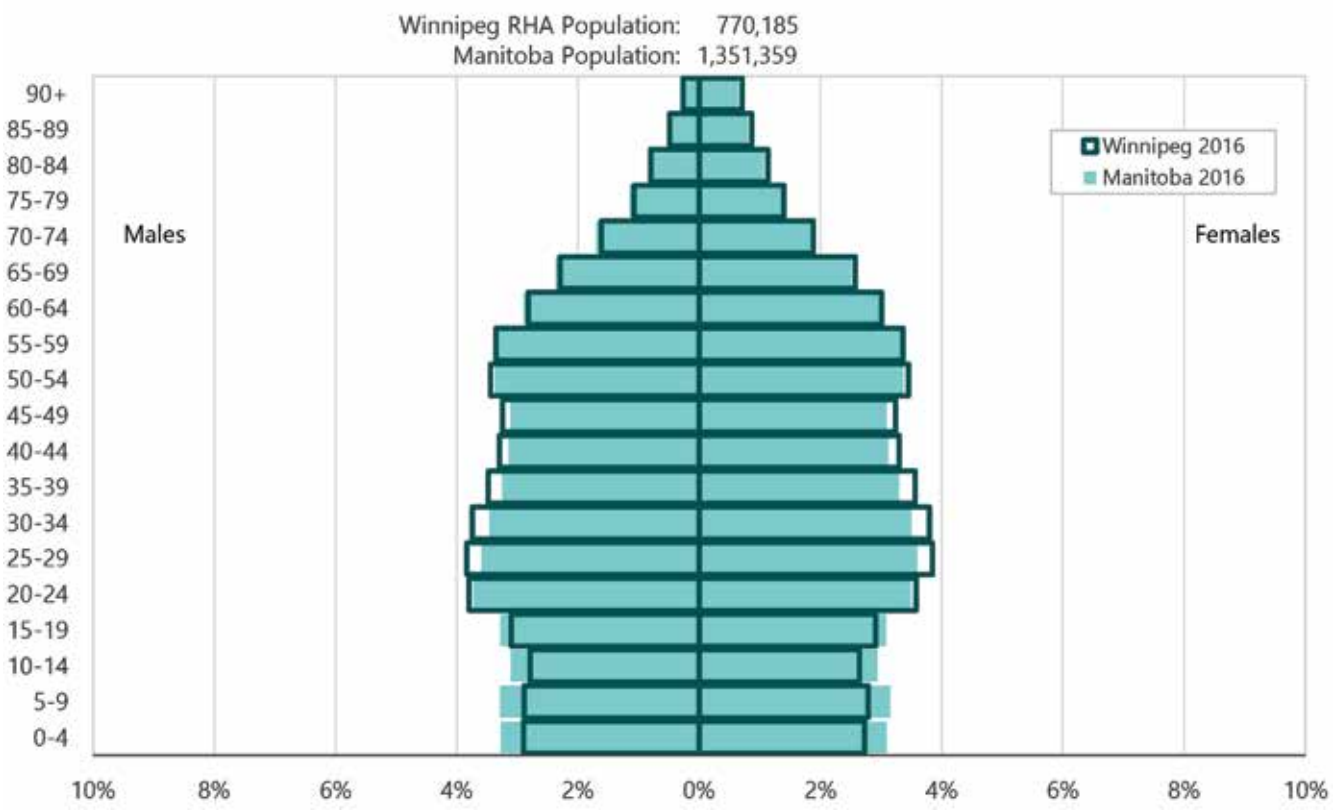


Figure 2.7: Age and Sex Profile for Winnipeg RHA, 2011 and 2016
Crude percent of residents (all ages)

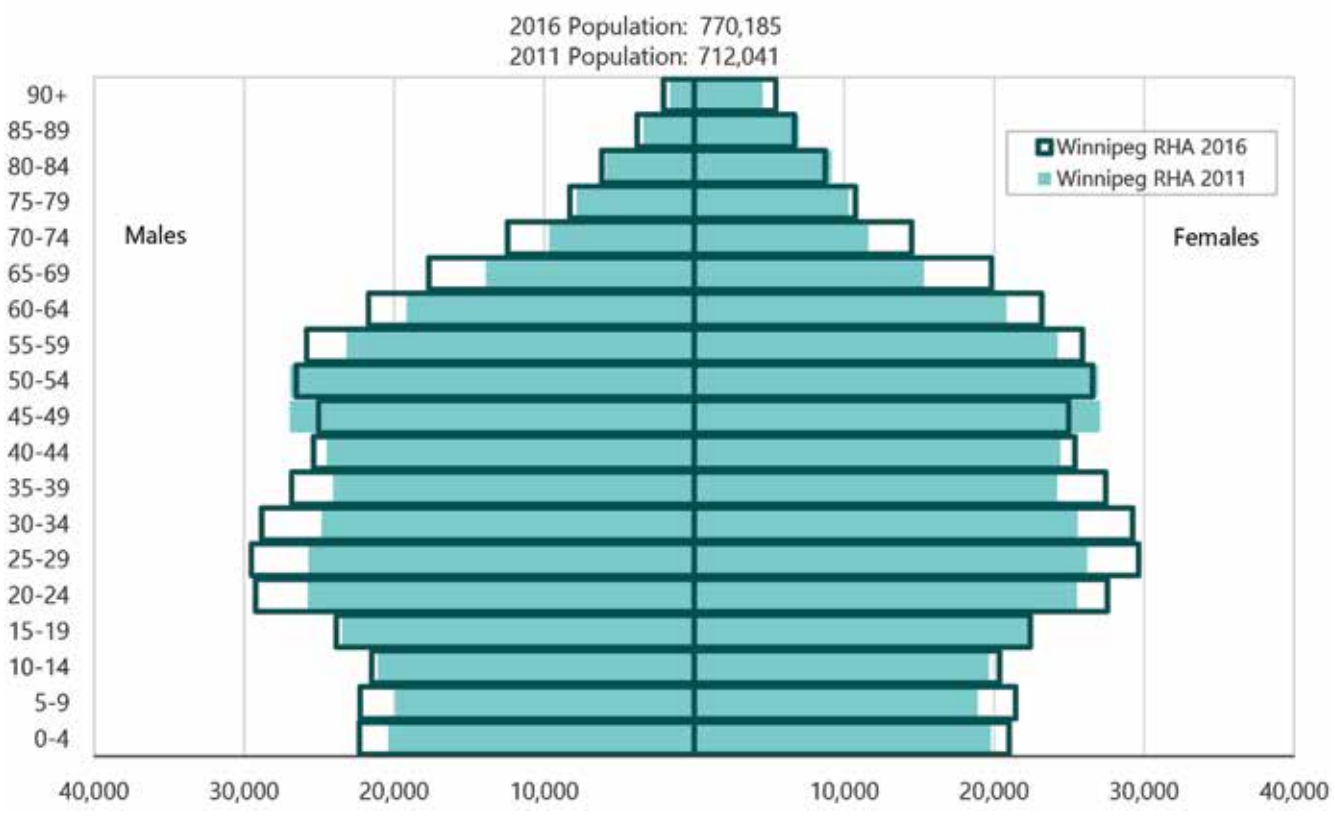


Figure 2.8: Age and Sex Profile for Prairie Mountain Health vs. Manitoba, 2016
Crude percent of residents (all ages)

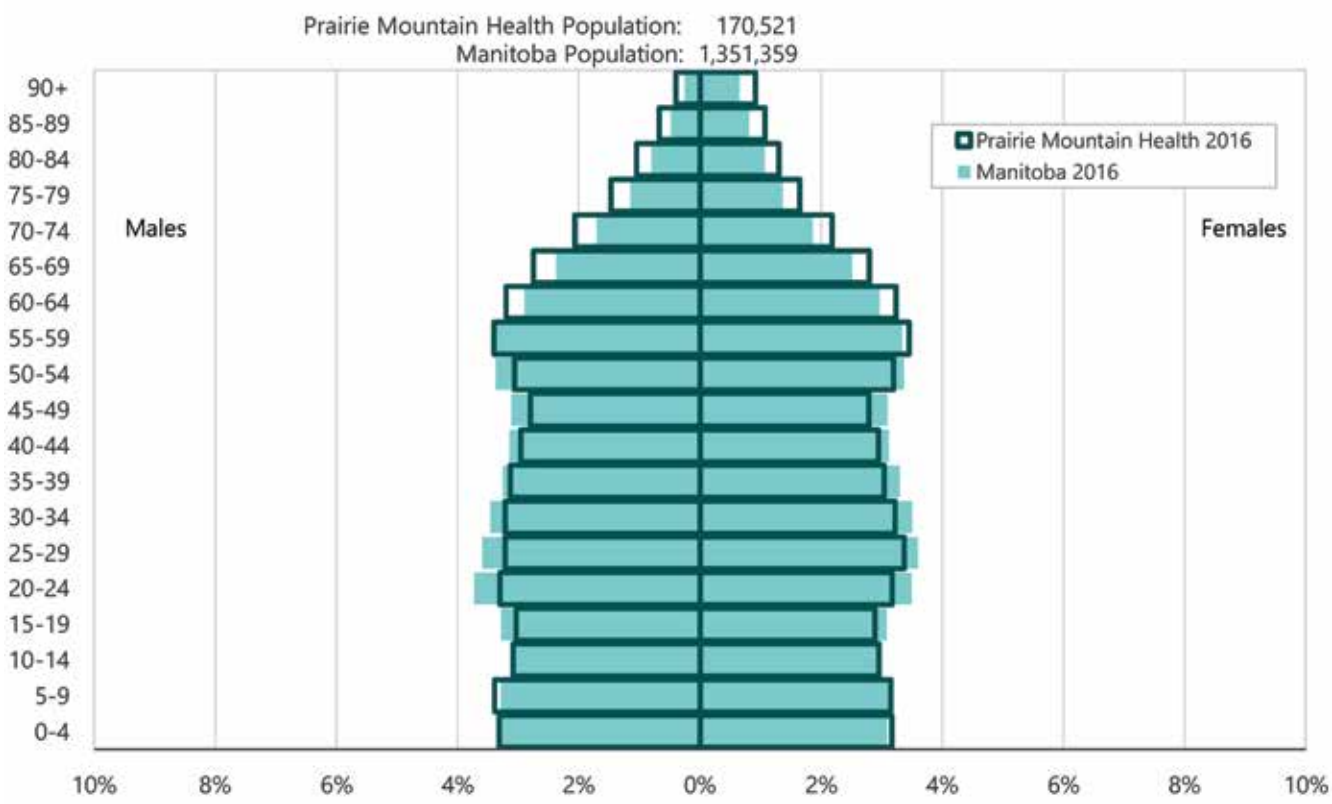


Figure 2.9: Age and Sex Profile for Prairie Mountain Health, 2011 and 2016
Crude percent of residents (all ages)

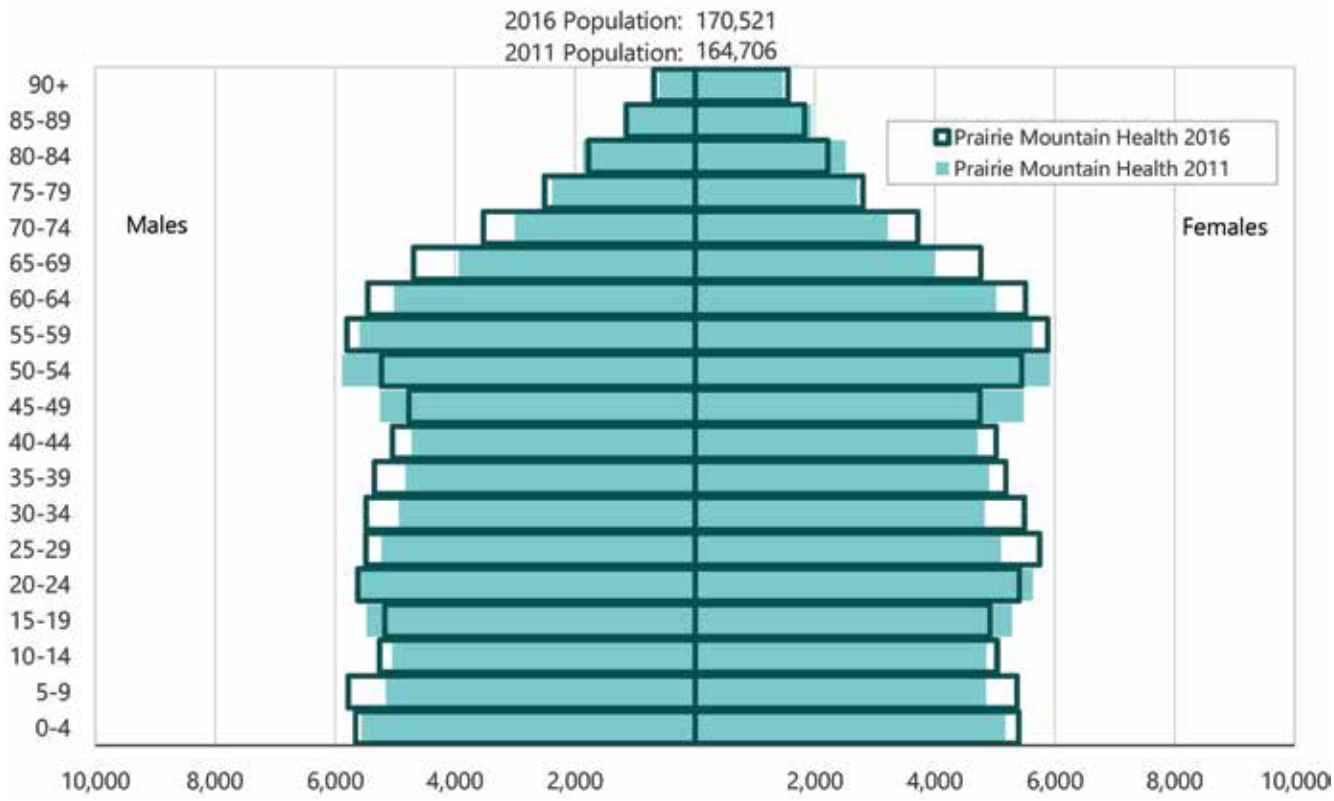


Figure 2.10: Age and Sex Profile for Interlake-Eastern RHA vs. Manitoba, 2016
Crude percent of residents (all ages)

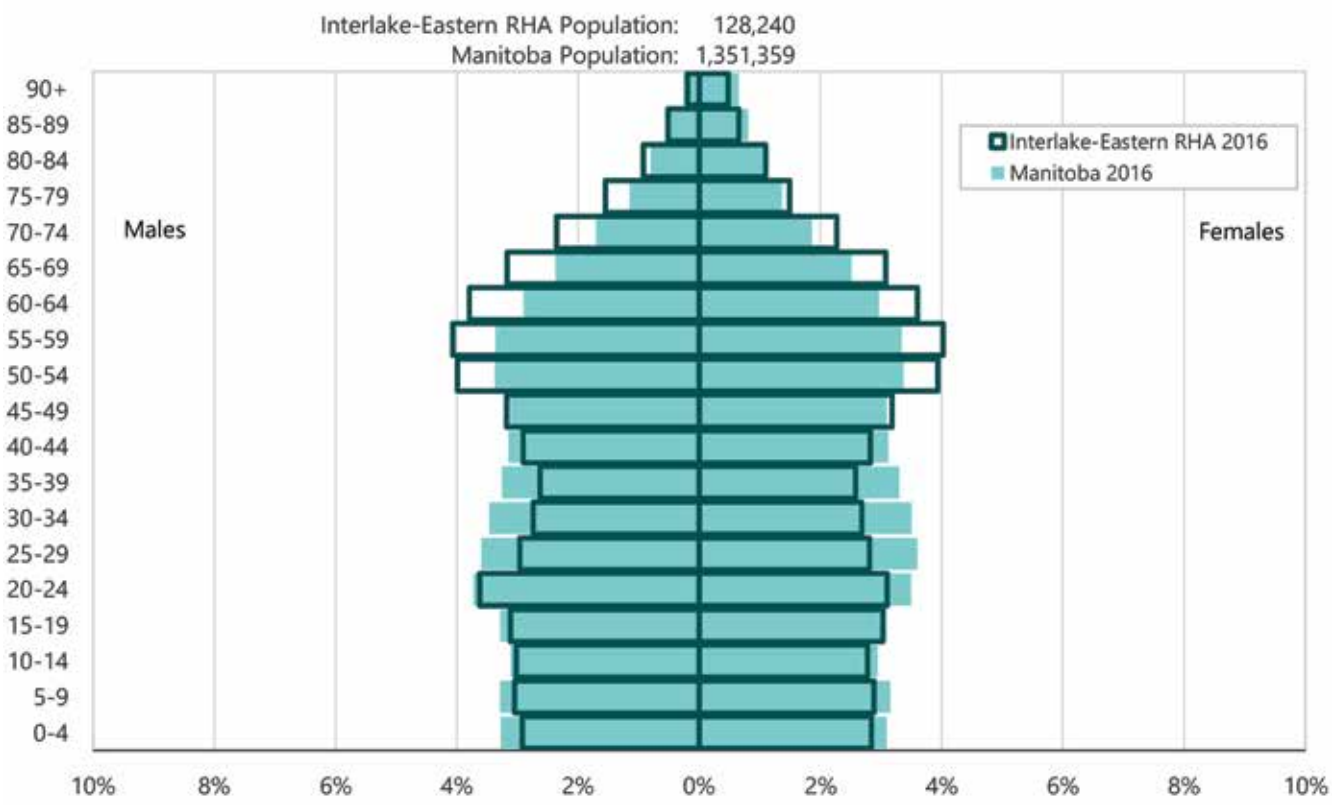


Figure 2.11: Age and Sex Profile for Interlake-Eastern RHA, 2011 and 2016
Crude percent of residents (all ages)

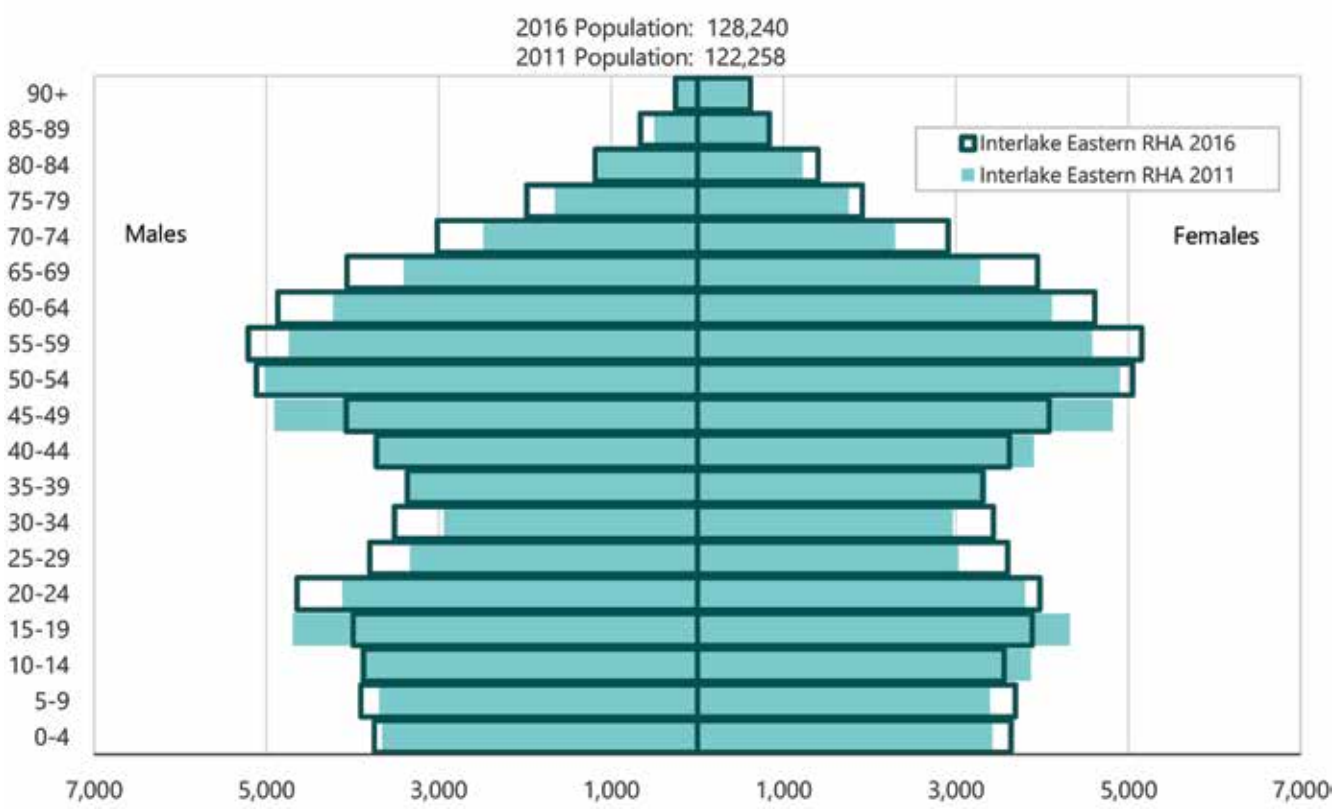


Figure 2.12: Age and Sex Profile for Northern Health Region vs. Manitoba, 2016
Crude percent of residents (all ages)

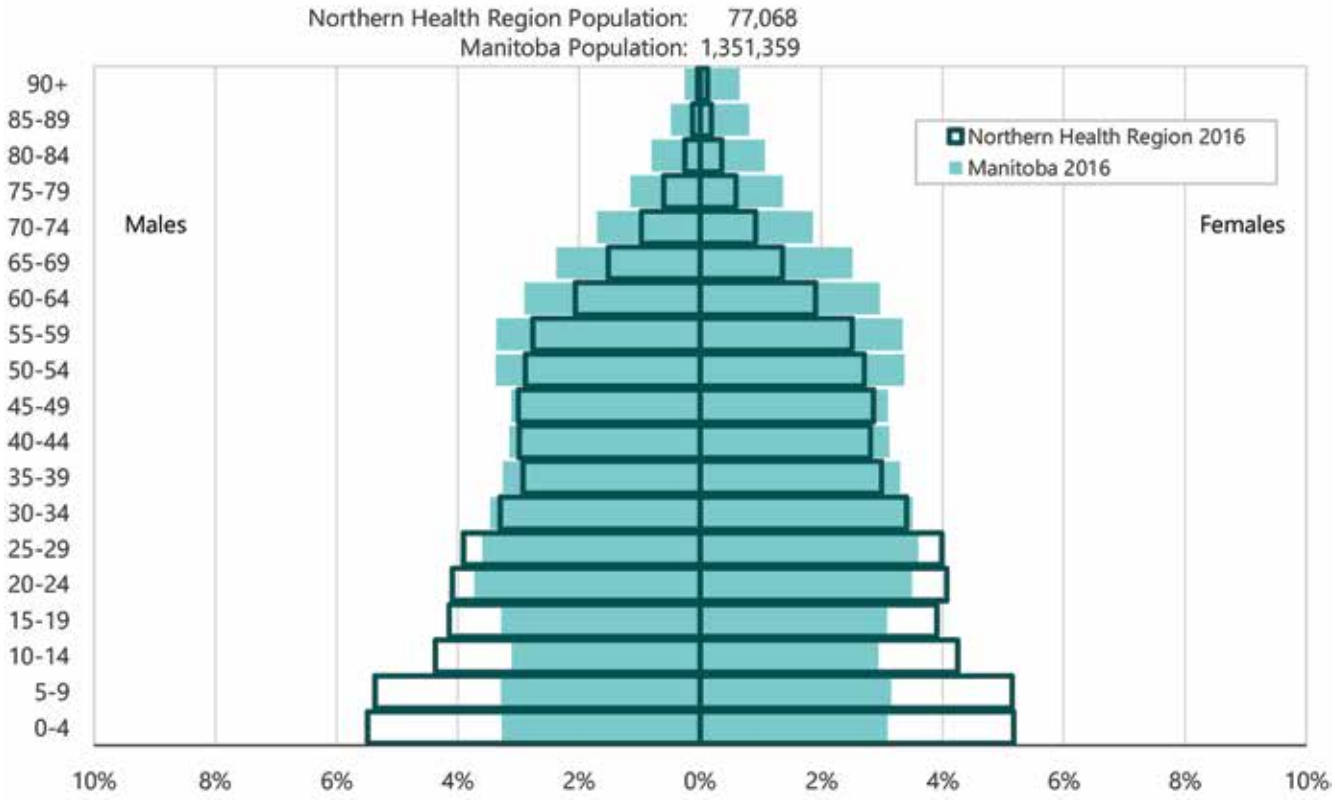
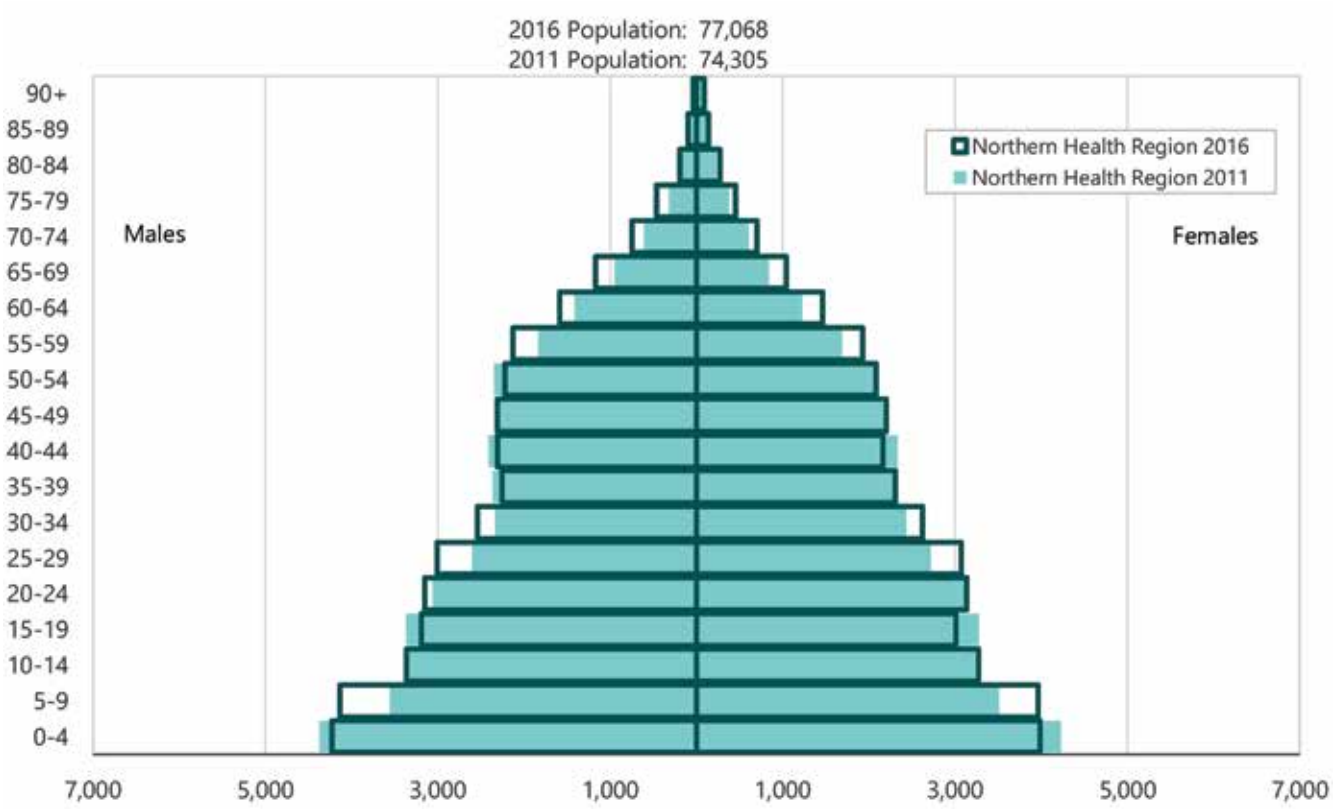


Figure 2.13: Age and Sex Profile for Northern Health Region, 2011 and 2016
Crude percent of residents (all ages)



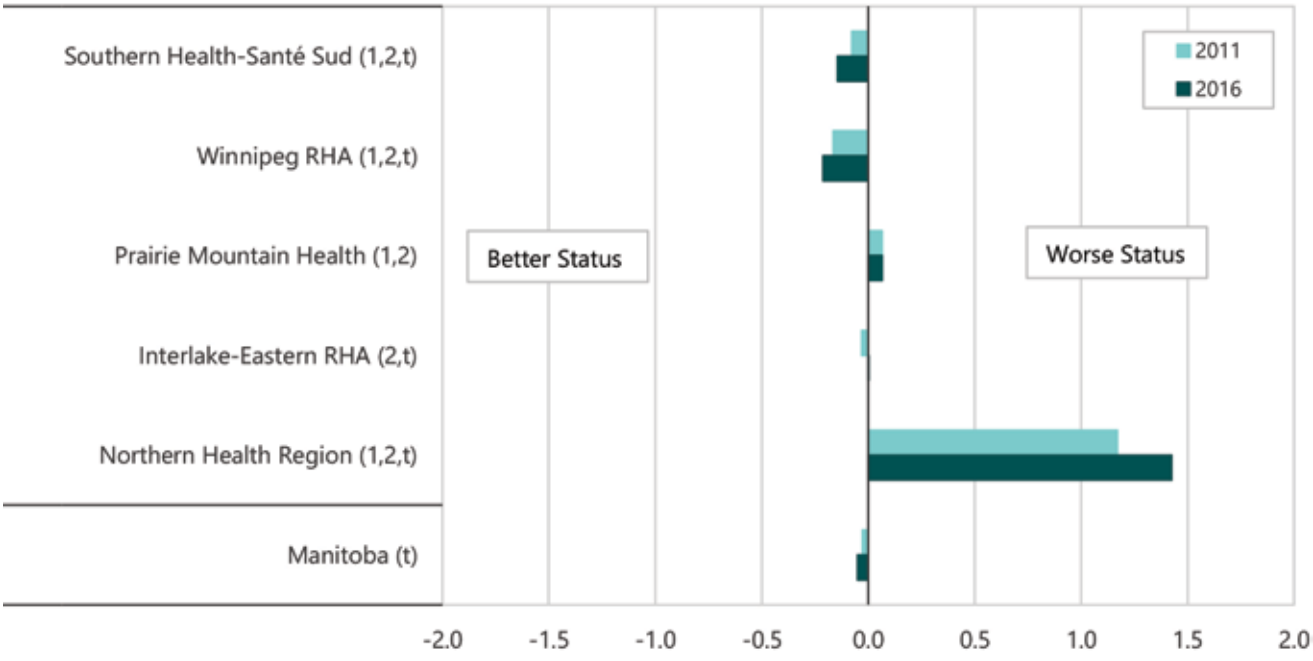
2.2 Socioeconomic Factor Index (SEFI)

Definition: The SEFI is a factor score based on Canadian Census data that reflects the social determinants of health (e.g., income, education, marital status, and residential mobility). It combines indicators of material deprivation and social deprivation, which are defined and shown in the subsequent sections of this report. SEFI scores range from approximately –5 to +5, and a value of zero represents the Manitoba average. Scores less than zero indicate more favourable socioeconomic conditions, while scores greater than zero indicate less favourable socioeconomic conditions [10].

Key Findings

- Every RHA was significantly different from the provincial average in both time periods, except Interlake-Eastern in 2011.
- Northern RHA was the most different, and 'worse off' than the Manitoba average.
- Winnipeg and Southern were significantly 'better off' than the provincial average in both time periods.
- Overall, SEFI scores got slightly better over time, though strictly speaking, changes in the values for this indicator over time should be interpreted with caution, because they are created by a process of 'standardization' within each time period (i.e., the change was driven by population distribution: in 2016, more Manitobans lived in dissemination areas that had lower average scores.
- The values for Southern and Winnipeg improved over time, whereas Interlake-Eastern and Northern got worse. Prairie Mountain did not change over time.

Figure 2.14: Socioeconomic Status by RHA, Canadian Census 2011 and 2016
Average score on MCHP's Socioeconomic Factor Index (SEFI). Lower values indicate better status



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

2.3 Material Deprivation Index

Definition: The material deprivation index includes average household income, the unemployment rate of the population age 15 and older, and the percent of the population age 15 and older without a high school diploma. Lower scores (e.g., below zero) indicate better status (less deprivation), while scores higher than zero indicate worse status [10]. Population-weighted scores were calculated for 2011 and 2016.

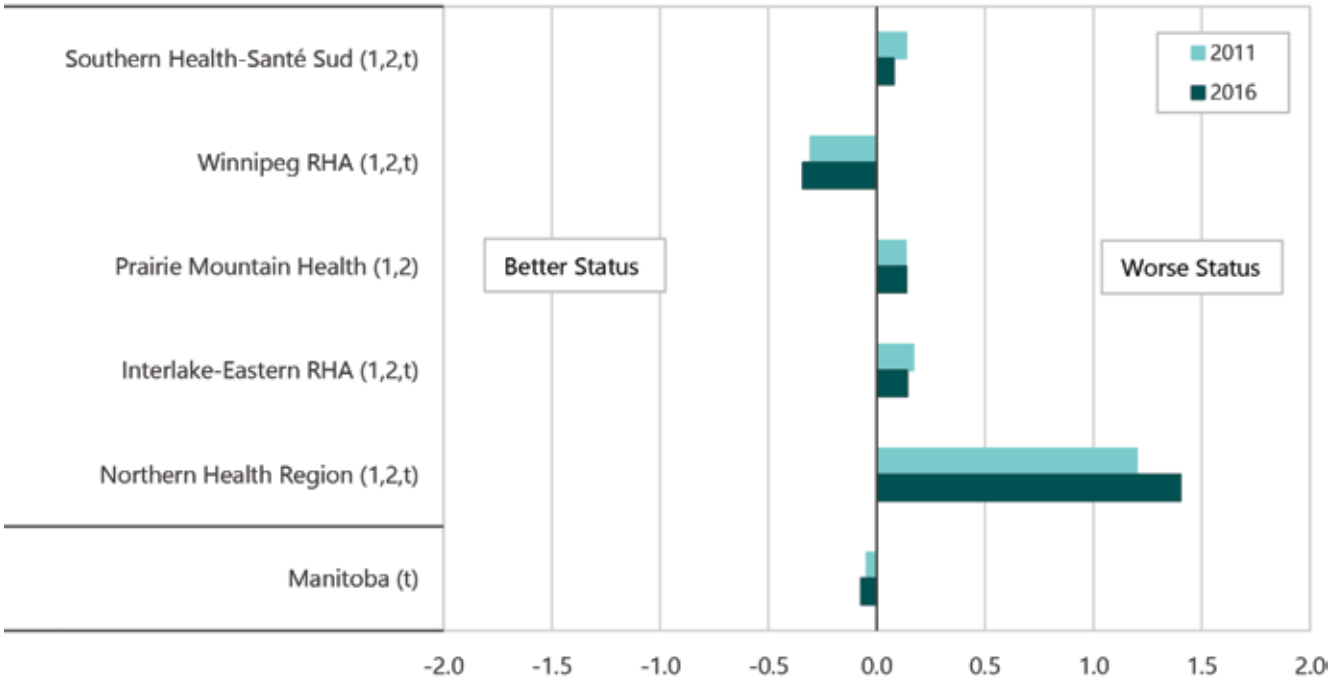
Key Findings

- Every RHA was significantly different from the provincial average in both time periods.
- Northern RHA was the most different, and 'worse off' than the Manitoba average.
- Winnipeg was significantly 'better off' than the provincial average in both time periods.
- Overall, material deprivation got better over time. The values for Southern, Winnipeg, and Interlake-Eastern RHAs improved, whereas Northern got worse. Prairie Mountain did not change over time.

20-Year Time Trend Analysis

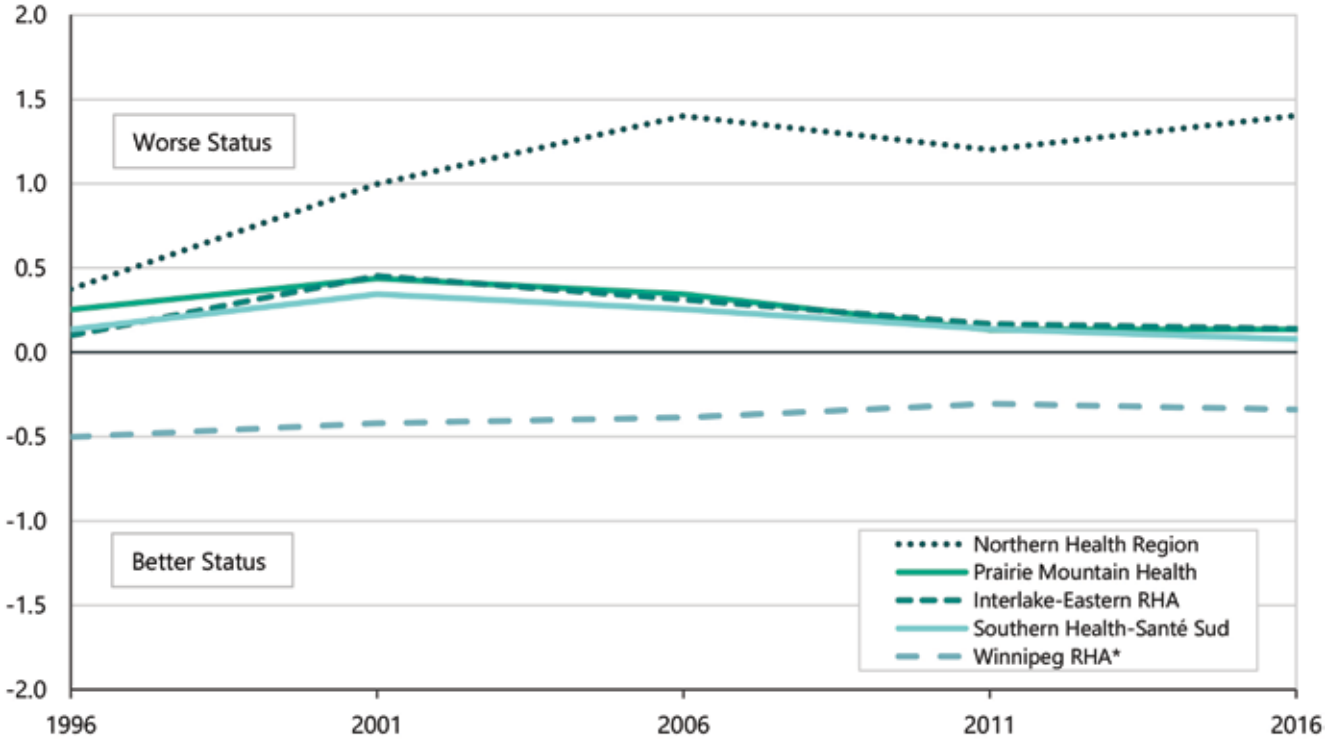
- Material deprivation was relatively stable over time, with a slight but statistically significant decrease for Manitoba overall (see online supplement). Values got worse in Winnipeg and Northern, though only the change in Winnipeg was significant. Southern, Prairie Mountain and Interlake-Eastern showed no clear pattern over time.

Figure 2.15: Material Deprivation by RHA, Canadian Census 2011 and 2016
Average score on MCHP's Material Deprivation Index. Lower values indicate better status



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

Figure 2.16: Material Deprivation by RHA, Census Years 1996-2016
Average score on MCHP's Material Deprivation Index. Lower values indicate better status



* this area's rate has a statistically significant change over time

2.4 Social Deprivation Index

Definition: The social deprivation index includes the percent of the population age 15 and older who are separated, divorced, or widowed, the percent of the population that lives alone, and the percent of the population that has moved at least once in the past five years. Scores on these indices range from –5 to +5. Lower scores (e.g., below zero) indicate better status (less deprivation), while scores higher than zero indicate worse status [10]. Population-weighted scores were calculated for 2011 and 2016.

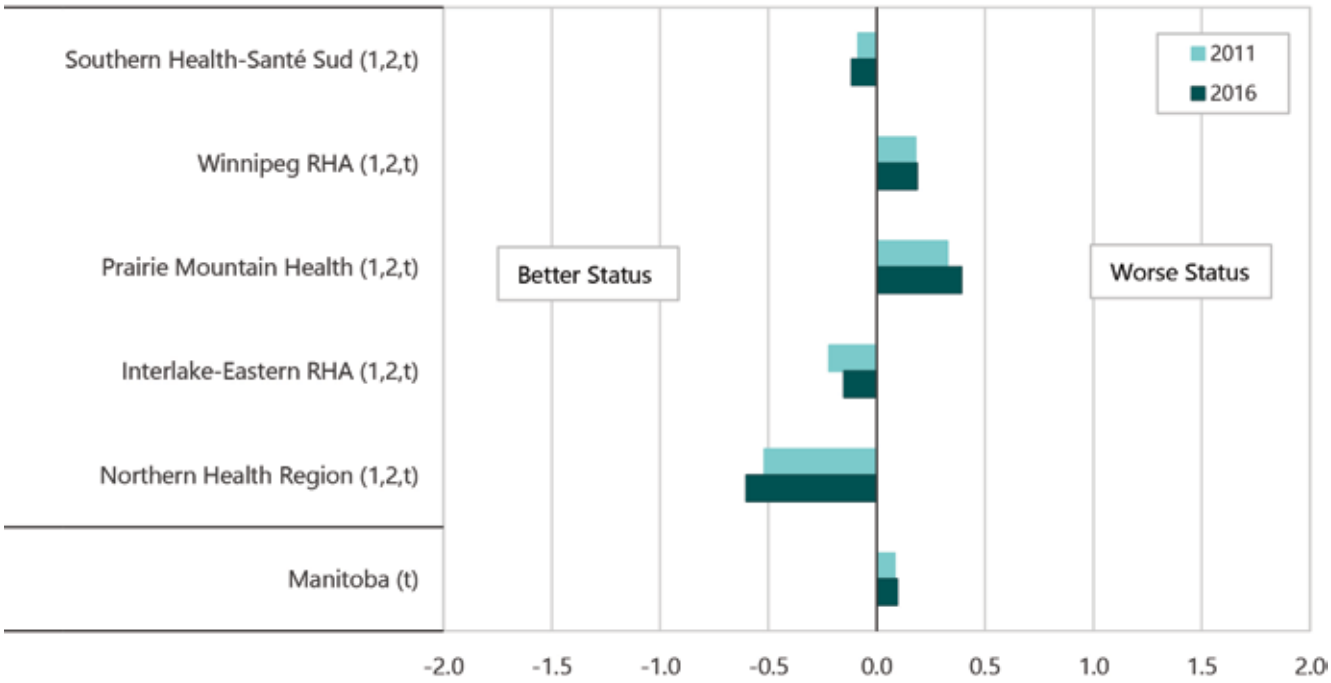
Key Findings

- Every RHA was significantly different from the provincial average in both time periods.
- Northern had the largest difference, followed by Prairie Mountain and Winnipeg, which were both significantly 'worse off' than the provincial average.
- Overall, social deprivation got slightly worse over time. The values for Southern and Northern improved, whereas Prairie Mountain and Interlake-Eastern got worse. Social deprivation in Winnipeg did not change over time.

20-Year Time Trend Analysis

- Social deprivation was stable over time for Manitoba overall (see online supplement).
- Values got worse in Southern and Prairie Mountain, and slightly but not significantly better in Northern. Winnipeg and Interlake-Eastern showed no clear pattern.

Figure 2.17: Social Deprivation by RHA, Canadian Census 2011 and 2016
Average score on MCHP's Social Deprivation Index. Lower values indicate better status



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
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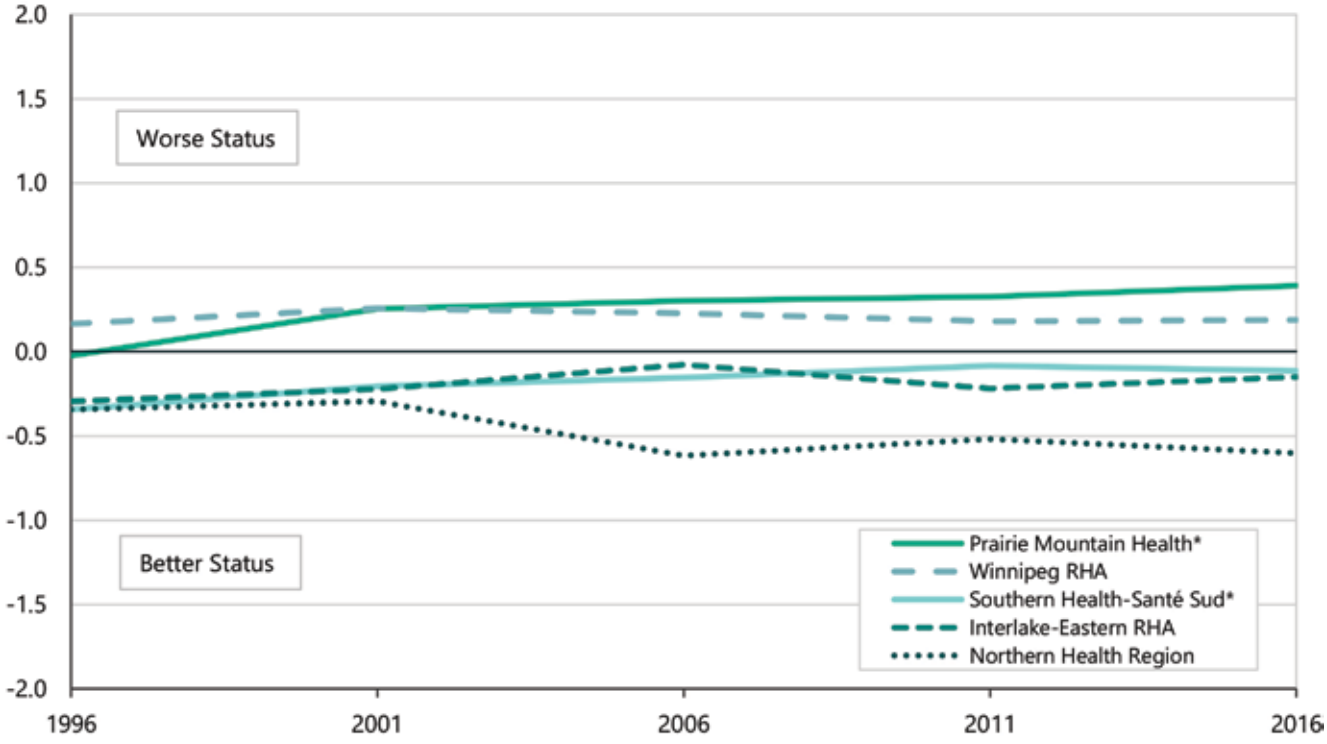
Figure 2.18: Social Deprivation by RHA, Census Years 1996-2016
Average score on MCHP's Social Deprivation Index. Lower values indicate better status



* this area's rate has a statistically significant change over time

Chapter 3:
Population Health Status and Mortality

Key Findings in Chapter 3

- The results in this chapter show that population health status continues to improve in Manitoba, albeit gradually.
- Most indicators show improvement over time, though many of these changes were not statistically significant.
- The health status improvements shown in this report appear to be almost universal, in that they are evident across geographic areas and income groups, with only a few exceptions.
    - This contrasts with the 2013 Atlas, which showed widening gaps: those in areas of better health had improvements, while those in areas of poorer health had no change or slight declines [1].
- The indicators for which 20-year trend analyses were done (premature mortality and life expectancy) clearly show significant improvement over time. These improvements mirror the decreases in total mortality and potential years of life lost.

Introduction

This chapter includes a number of indicators of mortality and population health status. Life expectancy is perhaps the most widely used indicator of a population's health status, especially for international comparisons. The total mortality rate is another common indicator of health status, tracking the annual death rate within a population. Like life expectancy, it is based on the mortality experience of the entire population. The premature mortality rate (PMR), by contrast, focuses on the population under 75 years of age. As explained in Chapter 1, it is based on the concept that deaths occurring before age 75 are considered 'premature.' Potential Years of Life Lost (PYLL) also uses only those under age 75, but further excludes infants (age 0-1) in its calculations. The PYLL is more sensitive to deaths among younger residents because it is a rate determined by the number of years below 75 at which each death occurs. For example, the death of a 50-year-old contributes '25' to the PYLL measure, but only '1' to the premature (and total) mortality rate. So while the PMR is a good indicator of overall health status and need for healthcare, PYLL rates give an indication of whether the premature deaths are occurring among relatively younger and older 'under 75' residents. Mortality indicators are routinely calculated for calendar years (not fiscal years like most other indicators) because Vital Statistics data are collected and organized by calendar year.

For areas with small populations, small changes in the number of deaths and the age of decedents can cause very high or low rates, or what appear to be dramatic changes over time. Therefore, caution is required when interpreting some of the results shown in the online supplement. More discussion of this effect is included with each indicator, as appropriate.

3.1 Total Mortality Rates

Definition: The average annual rate of deaths per 1,000 residents was calculated for two five-year time periods: 2007–2011 and 2012–2016. Values for the second time period were age- and sex-adjusted to the Manitoba population in the first time period.

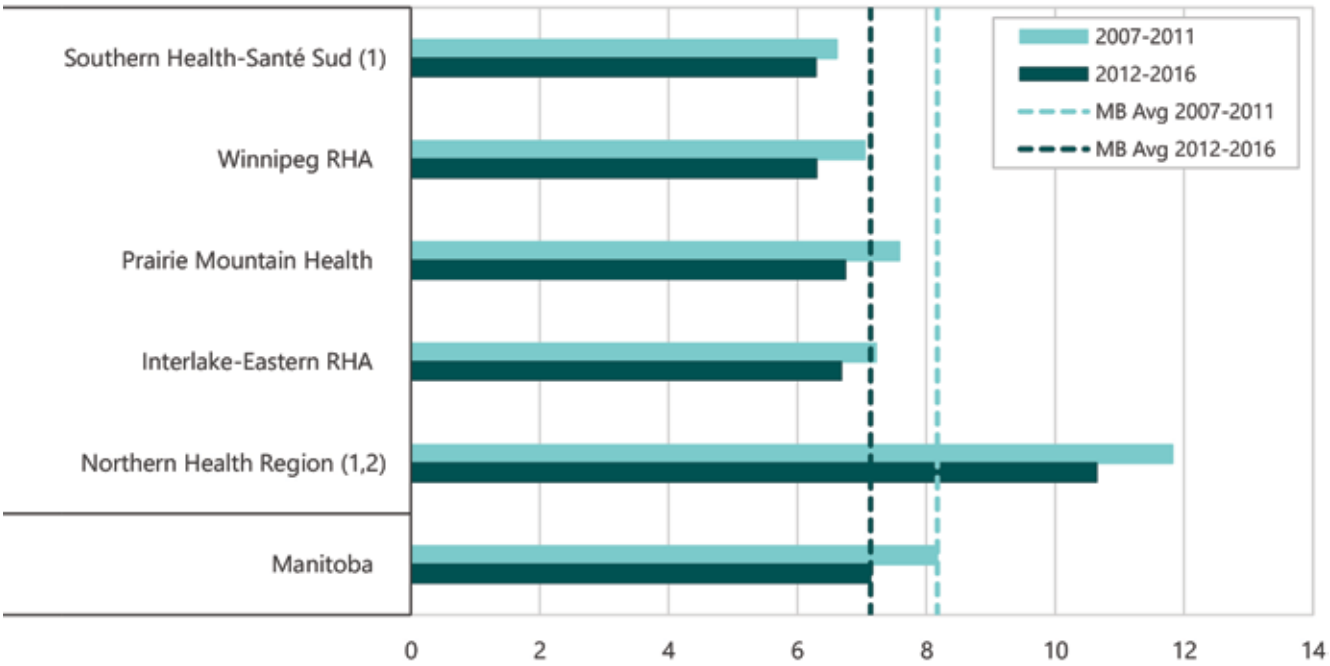
Key Findings

- The total mortality rate for Manitoba decreased over time from 8.17 to 7.14 deaths per 1,000 residents per year, but this difference did not quite reach statistical significance (p=0.055), likely due to the variability of the change in the many districts and NCs across the province.
- Most regions appear to have decreasing total mortality rates, though none of the changes over time were statistically significant. These results suggest that population health status is improving throughout the province.
- There were strong relationships between income and total mortality rates in rural and urban areas in both time periods: mortality rates were higher among residents of lower income areas, particularly the lowest group (see online supplement).

Comparisons to Previous Findings

- The decrease in mortality rates over time, while not statistically significant, was also seen in previous Atlas reports [1,2]. Across the districts and NCs of Manitoba, the change in total mortality rates is quite inconsistent, and this variability prevents the statistical threshold from being reached, even though the decrease appears compelling in the graph.
- The results shown here indicate a consistent improvement in population health status across all RHAs, which is different from the trend shown in previous Atlas reports [1,2]. Even among residents of the lowest income quintile, total mortality rates were lower in the second time period than in the first.
- The pattern of total mortality rates by region is consistent with and extends the results from the 2009 and 2013 Atlases, which showed the same pattern [1,2].

Figure 3.1: Total Mortality Rate by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate of death per 1,000 residents per year (all ages)



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

3.2 Causes of Death

Definition: The most common causes of death for Manitobans in two five-year time periods: 2007–2011 and 2012–2016. Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most common causes are shown for each RHA and the province overall (average annual crude percent). Note: 'Circulatory disease' includes heart attack and stroke.

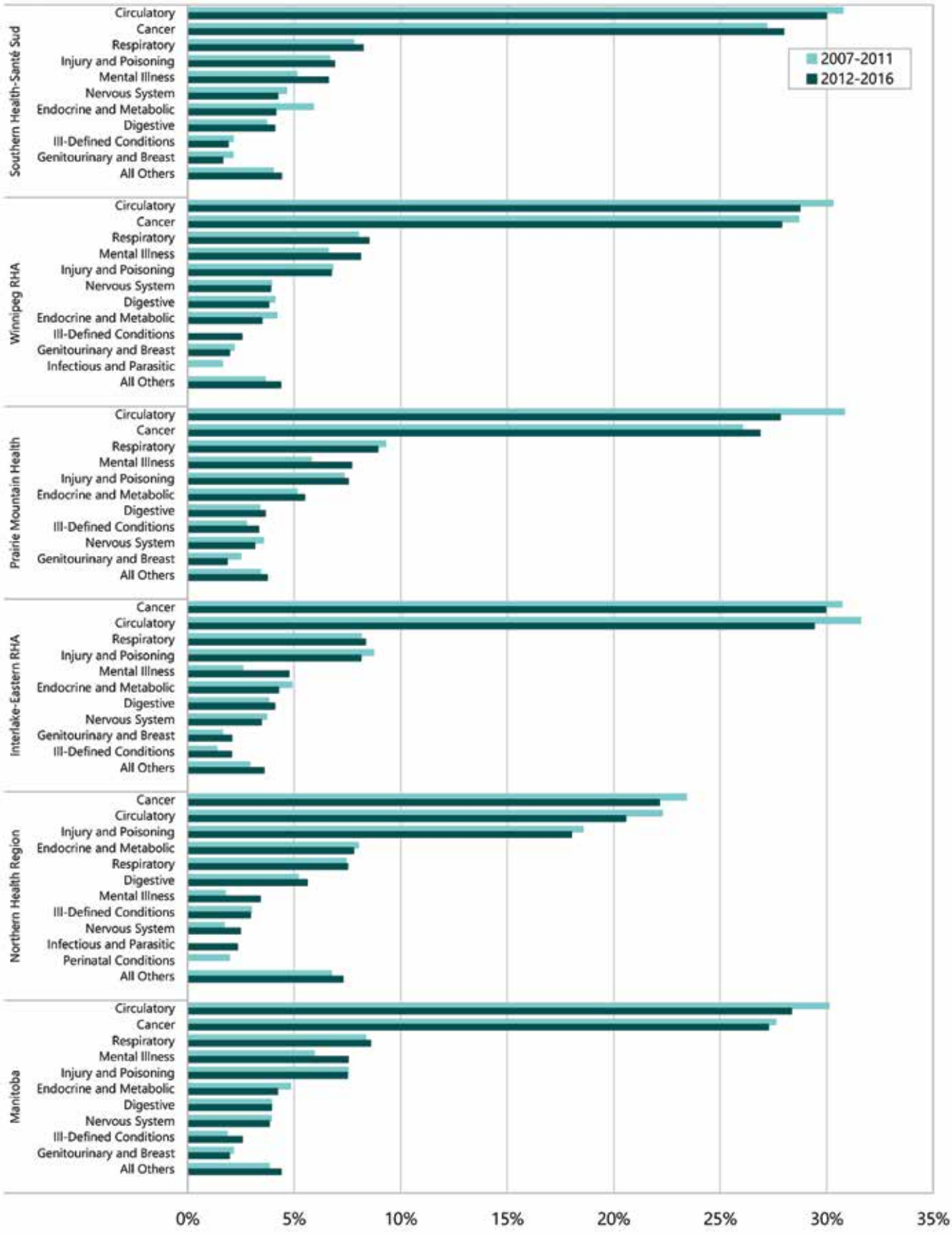
Key Findings

- In 2012–2016, the most common causes of death in Manitoba were circulatory disease (28.3%) and cancer (27.3%), followed by respiratory disease (8.59%), mental illness (7.53%), and injury & poisoning (7.48%).
    - It is important to note that the two most common causes alone (circulatory disease and cancer) comprise more than half of all deaths (56%). This is quite different from the rankings of the causes of health service use shown in subsequent chapters.
- The most common causes of death in Manitoba were relatively stable over time, though the percent attributable to circulatory disease decreased. This is consistent with previous Atlas reports and reflects the ongoing reduction in deaths from heart attack and stroke [1,2].
- The rankings varied somewhat by health region, though circulatory disease and cancer were the top two in all regions.
    - Northern had a unique profile, with injury and poisoning being considerably more common than in other regions, and circulatory disease and cancer being less common. These differences were likely related to the relatively young population of Northern RHA.

Comparisons to Previous Findings

- These results are similar to those reported in previous Atlas reports [1,2,9], with one important change over time: Circulatory disease has always been the most common cause of death, but the actual percent of deaths attributed to this cause has been consistently decreasing, from 40% in 1990–1994 to 28.3% in 2012–2016.
- The percent of deaths attributable to several other leading causes have been consistent: Cancer 25-27%, respiratory disease 8-10%, injuries 6-7%. The percent of deaths due to various other causes have increased over time.

Figure 3.2: Most Common Causes of Death by RHA, 2007-2011 and 2012-2016
Average annual crude percent of deaths (all ages)



3.3 Premature Mortality Rates (PMR)

Definition: The average annual rate of deaths per 1,000 residents age 0-74 was calculated for two five-year time periods: 2007–2011 and 2012–2016. Rates for the second period were age- and sex-adjusted to the Manitoba population in the first time period. (See Chapter 1 for a more thorough discussion of the meaning and interpretation of PMR)

Key Findings

- PMR in Manitoba decreased over time from 3.29 to 2.98 deaths per 1,000 residents age 0-74. This suggests an improvement in population health, but the decrease did not reach statistical significance (p=0.24), likely due to the variability in changes across the many districts and NCs in the province.
- Southern Health–Santé Sud was lower than the Manitoba average in the first time period; Northern RHA was higher than average in both time periods.
- Rates in all RHAs decreased over time, but none of the changes reached statistical significance.
- There were strong relationships between income and PMR in urban and rural areas in both time periods: rates were higher among residents of lower income areas (see online supplement).

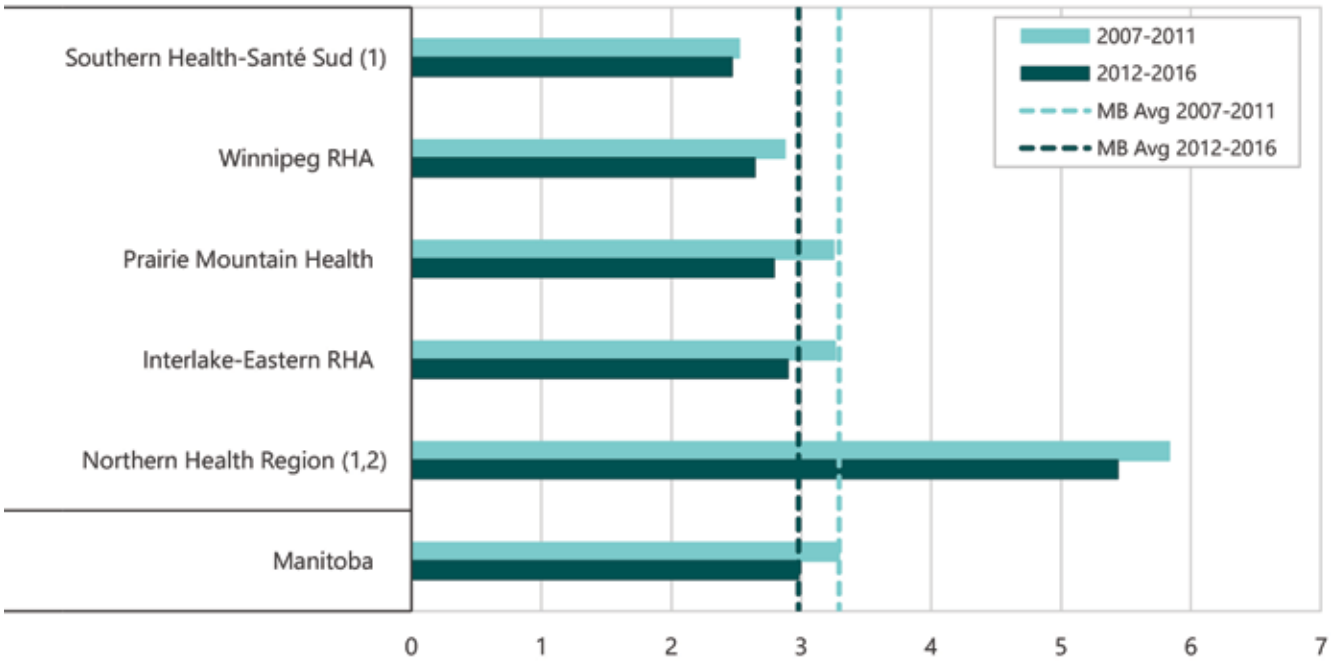
Comparison to Previous Findings

- These results are consistent with and extend the trend of decreasing PMR shown in previous Atlas reports [1,2,9], suggesting that the health status of Manitobans continues to improve over time.

20-Year Time Trend Analysis

- Figure 3.4 shows a steady and significant decline over 20 years in all RHAs except Northern, which had a highly variable rate and no clear time trend.
- At the provincial level (see online supplement), the trend within the last 6-7 years suggests that we may be reaching a plateau in PMR, with only small changes since 2010.

Figure 3.3: Premature Mortality Rate by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate of death before age 75 per 1,000 residents age 0-74



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
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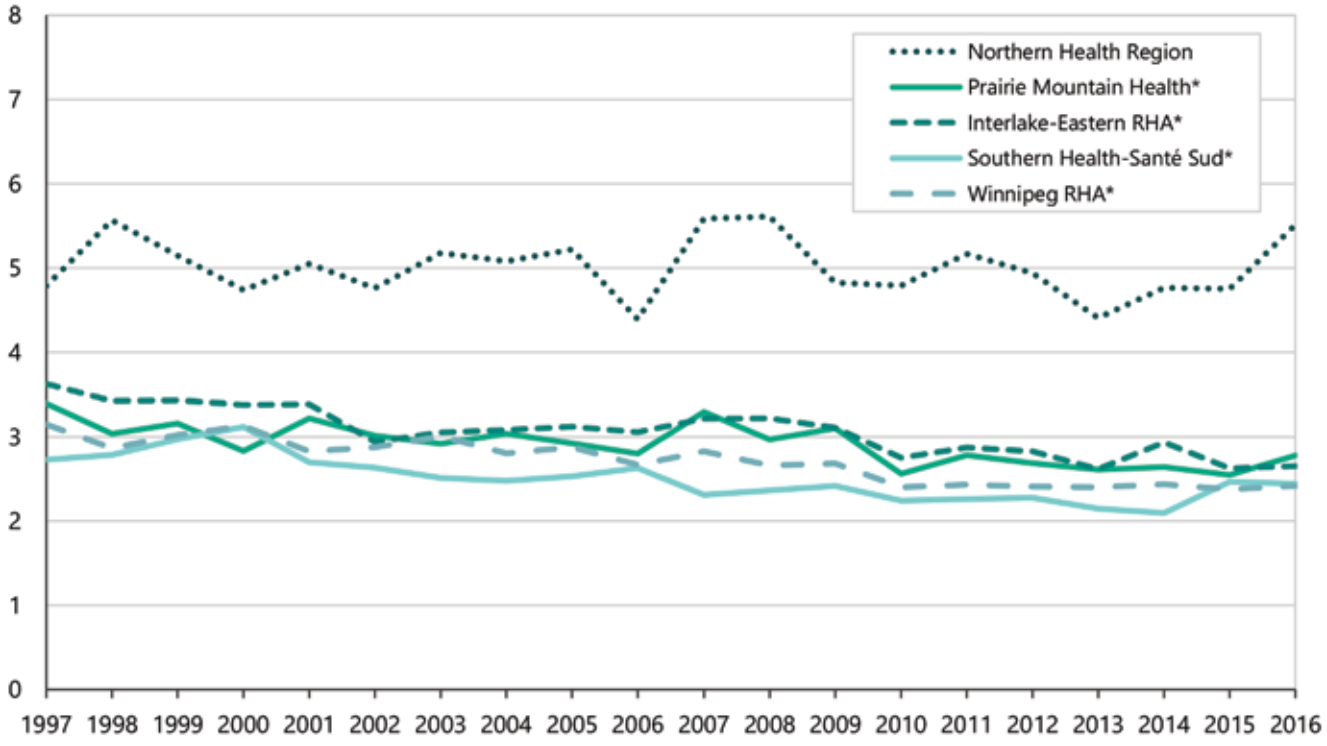
Figure 3.4: Premature Mortality Rate by RHA, 1997-2016
Age- and sex-adjusted, per 1,000 residents age 0-74



* this area's rate has a statistically significant change over time

3.4 Causes of Premature Death

Definition: The most common causes of premature death for Manitobans age 0-74 in two five-year time periods: 2007–2011 and 2012–2016. Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most common causes are shown for each RHA and the province overall (average annual crude/unadjusted percent). Note: 'Circulatory disease' includes heart attack and stroke.

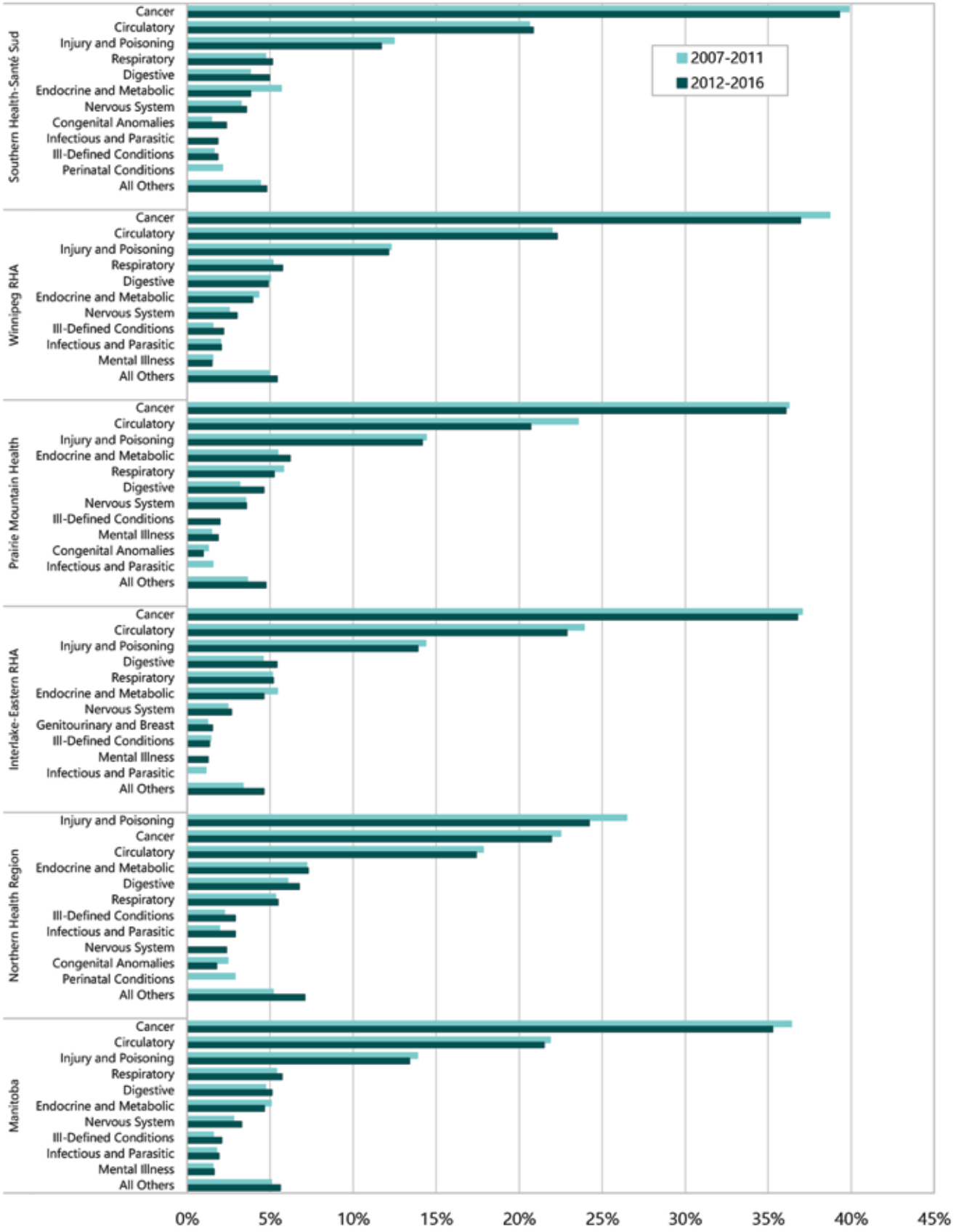
Key Findings

- From 2012-2016, the most common causes of premature death (i.e., before age 75) in Manitoba were cancer (35.2%) and circulatory disease (21.5%), followed by injury & poisoning (13.4%), respiratory disease (5.69%), and endocrine & metabolic disorders (4.64%; this category includes diabetes).
- As was seen with causes of total mortality (Section 3.2), cancer and circulatory disease were responsible for almost 60% of all premature deaths. However, they have swapped rankings in this indicator (causes of premature mortality). This means that cancer was responsible for considerably more deaths of people under the age of 75 than was circulatory disease.
- The top causes of premature death in Manitoba were stable over time, though the percent attributable to circulatory disease decreased slightly.
- The rankings varied somewhat by health region though cancer was the top cause in all regions except Northern, which had a unique profile.
- In Northern RHA, injury and poisoning was the most common cause of premature death (24.2%), followed by cancer (21.9%).

Comparison to Previous Findings

- Results from previous Atlas reports show that cancer (at about 35-36%) has consistently been the most common cause of premature deaths [1,2]. Circulatory disease has been the second most common, but the percent attributable to circulatory disease has decreased from 28% in 1996-2000 to 21.5% in 2012-2016. Premature deaths due injury have increased slightly from 11% to 13.5%, whereas premature deaths due to respiratory disease and to endocrine & metabolic disorders have been steady at about 5.5% and 5%, respectively. Percents attributed to other causes have increased slightly.

Figure 3.5: Most Common Causes of Premature Death by RHA, 2007-2011 and 2012-2016
Average annual crude percent of deaths among residents age 0-75



3.5 Male Life Expectancy

Definition: The expected length of life from birth was calculated based on the average annual mortality in the population during two five-year time periods: 2007–2011 and 2012–2016. Life expectancy values are not age-adjusted, but calculated directly from the mortality experience of local residents using a 'life table' approach. As a result, not all differences could be statistically tested as with other indicators. Small differences in life expectancy values imply important differences in population health status.

Key Findings

- Estimated life expectancy for males in Manitoba increased from 77.5 years in 2007–2011, to 78.5years in 2012–2016. Significant increases were seen in all RHAs, except Southern, which had the highest value in the first time period.
- In both time periods, values for Northern were lower than the Manitoba average, while values for Southern and Winnipeg were above the Manitoba average.
- There were strong relationships between income and male life expectancy in urban and rural areas in both time periods: life expectancy was shorter for residents of lower income areas, though the trend for males in rural areas in the first time period did not reach statistical significance ($p=0.086$, rather than $p<0.05$).
- Life expectancy values increased over time for males in all income quintile groups in both urban and rural areas.

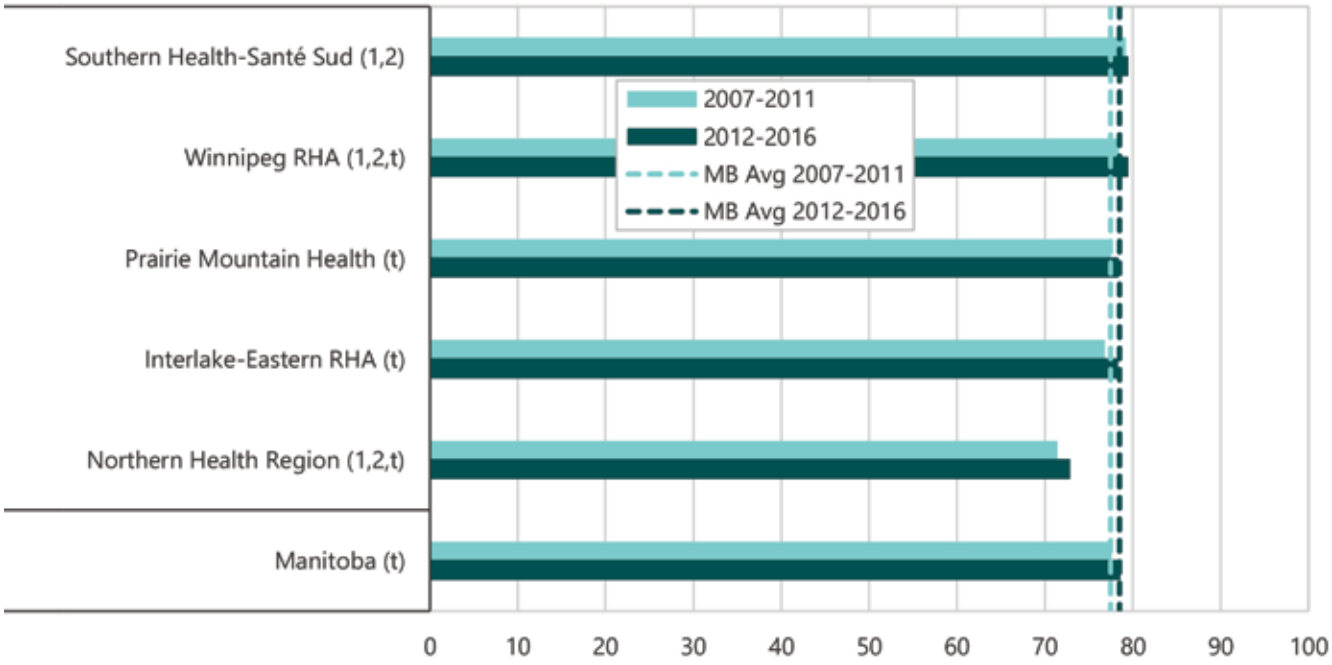
Comparison to Previous Findings

- These values are consistent with and extend the findings of previous Atlas reports, which also showed increases in male life expectancy [1,2].

20-Year Time Trend Analysis

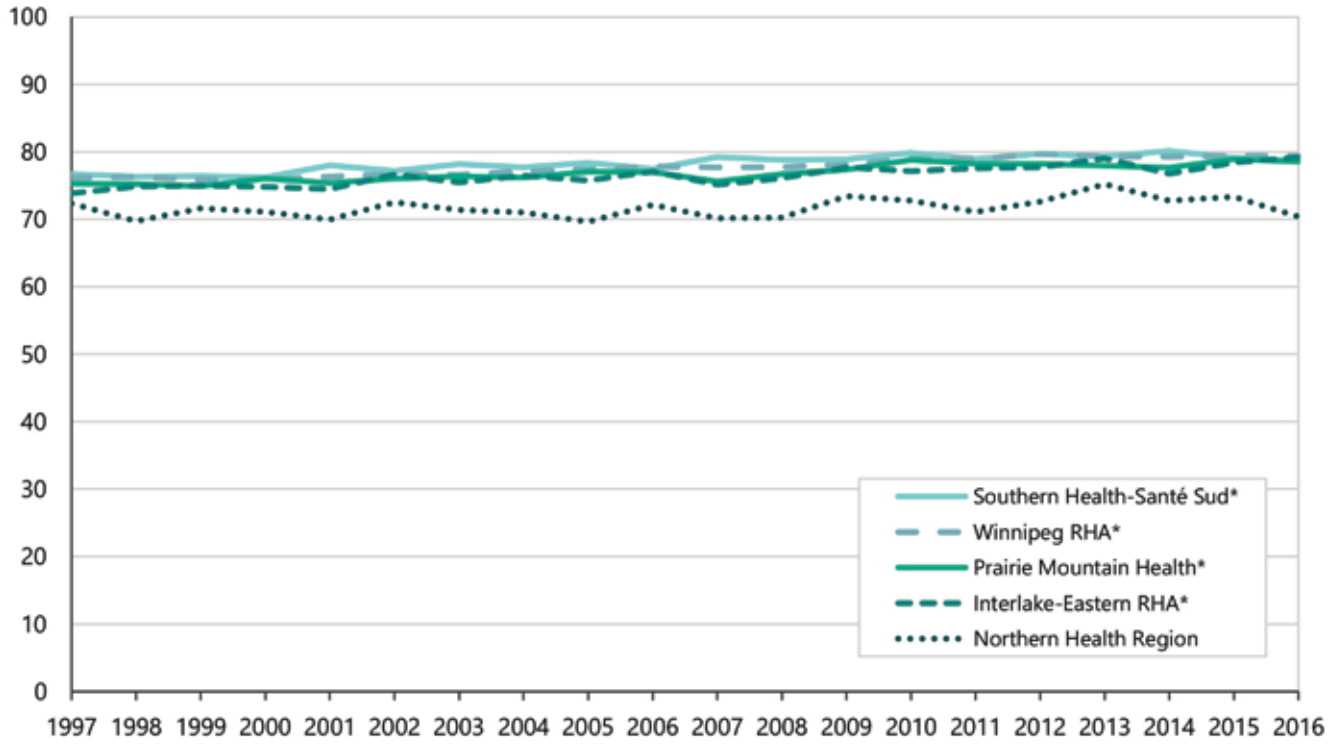
- Figure 3.7 shows a steady and significant increase in the life expectancy for males in all RHAs except Northern, which had a more variable rate and no clear time trend.
- The Manitoba average (see online supplement) also showed a significant increase over time, though the trend within the last 6-7 years suggests that we may have reached a plateau in male life expectancy around the year 2010, after which there seems to be no further increase.

Figure 3.6: Male Life Expectancy at Birth by RHA, 2007-2011 and 2012-2016
Life expectancy at birth in years



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

Figure 3.7: Male Life Expectancy at Birth by RHA, 1997-2016
Life expectancy at birth in years



* this area's rate has a statistically significant change over time

3.6 Female Life Expectancy

Definition: The expected length of life from birth was calculated based on the average annual mortality in the population for two five-year time periods, 2007–2011 and 2012–2016. Life expectancy values are not age-adjusted, but calculated directly from the mortality experience of local residents using a 'life table' approach. As a result, no tall differences could be statistically tested as with other indicators. Small differences in life expectancy values imply important differences in health status.

Key Findings

- Life expectancy for females in Manitoba increased from 82.2 to 82.8 years. Values increased for all RHAs,though only the changes in Winnipeg and Prairie Mountain reached statistical significance.• In both time periods, values for Northern were lower than the Manitoba average, while values for Southern and Winnipeg were above the Manitoba average.
- In both time periods, values for Northern were lower than the Manitoba average, while values for Southern and Winnipeg were above the Manitoba average.
- There were strong relationships between income and female life expectancy in urban and rural areas in both time periods: life expectancy was shorter for residents of lower income areas, though the trend for females in urban areas in the first time period did not reach the level of statistical significance (p=0.053).
- Life expectancy values increased over time for females in most income quintile groups in urban and rural areas, though there were a few exceptions(slight decreases over time in R3, R1, and U2).

Comparison to Previous Findings

- These values are consistent with and extend the findings of previous Atlas reports, which also showed increases in female life expectancy [1,2].

20-Year Time Trend Analysis

- Figure 3.9 shows a slight but statistically significant increase in the life expectancy for females in all RHAs except Northern, which had no clear time trend.
- The Manitoba average (see online supplement) also showed a significant increase over time, though it seems to have peaked at 83.3 years in 2013, then decreased slightly before increasing again to 82.8 years in 2016. As with males, this trend suggests that we may have reached a plateau for female life expectancy.

Figure 3.8: Female Life Expectancy at Birth by RHA, 2007-2011 and 2012-2016
Life expectancy at birth in years

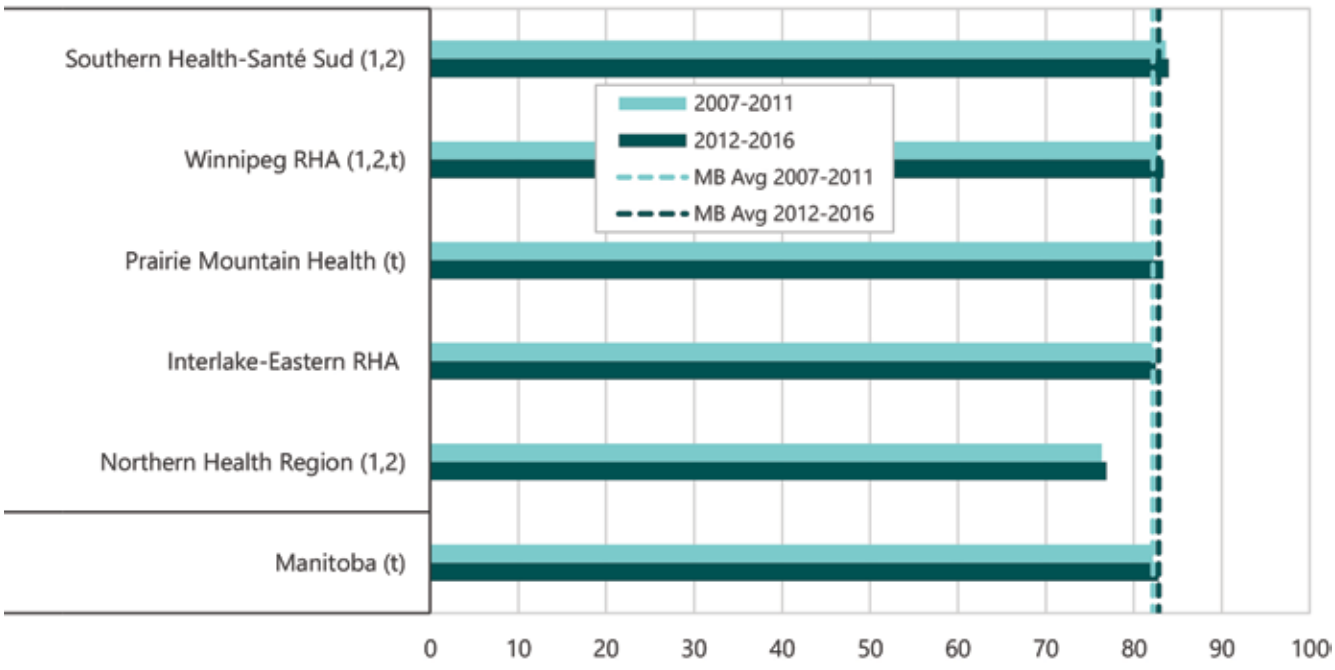


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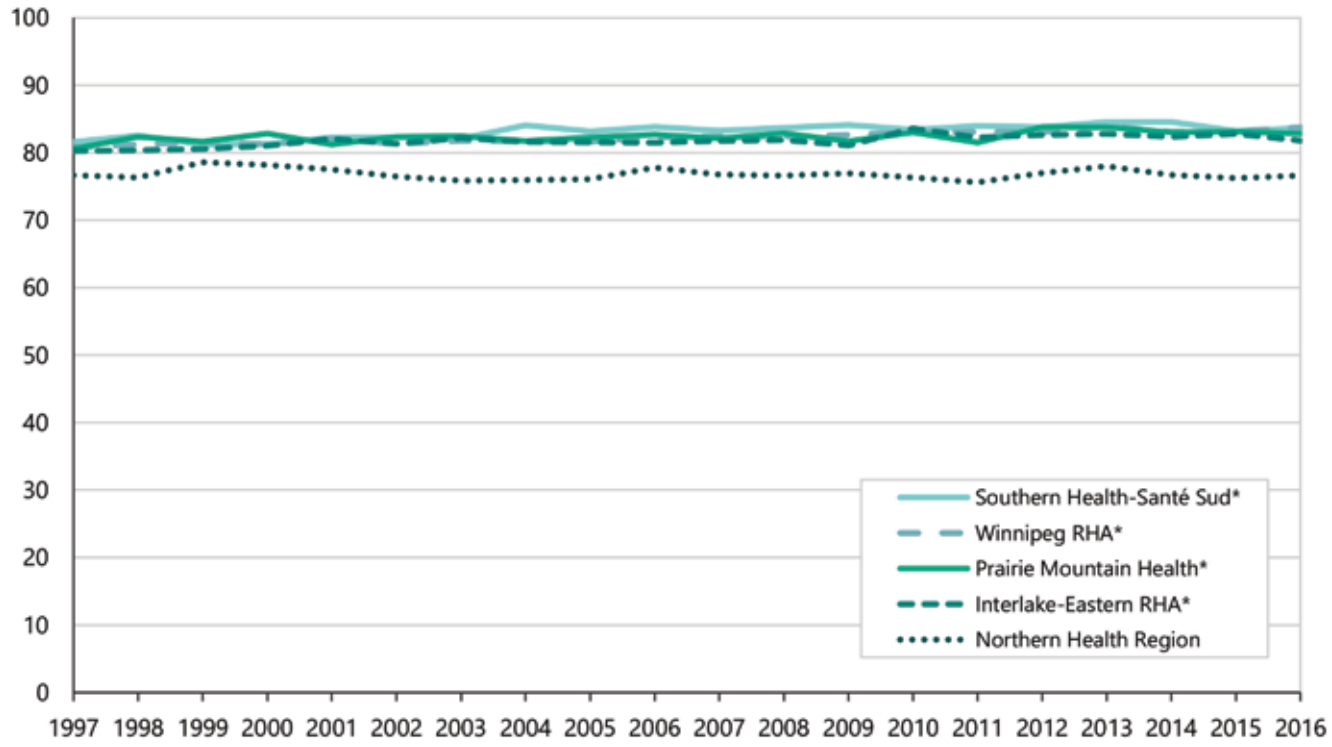
Figure 3.9: Female Life Expectancy at Birth by RHA, 1997-2016
Life expectancy at birth in years



* this area's rate has a statistically significant change over time

3.7 Potential Years of Life Lost (PYLL)

Definition: The number of potential years of life lost per 1,000 residents age 1-74. For each death, the PYLL value is calculated as the difference (in years) between age at death and 75 years of age. PYLL is more sensitive to deaths at young ages than other mortality indicators. Average annual rates were calculated for two five-year periods, 2007–2011 and 2012–2016, and were age- and sex-adjusted to the Manitoba population age 1-74 in the first time period.

Key Findings

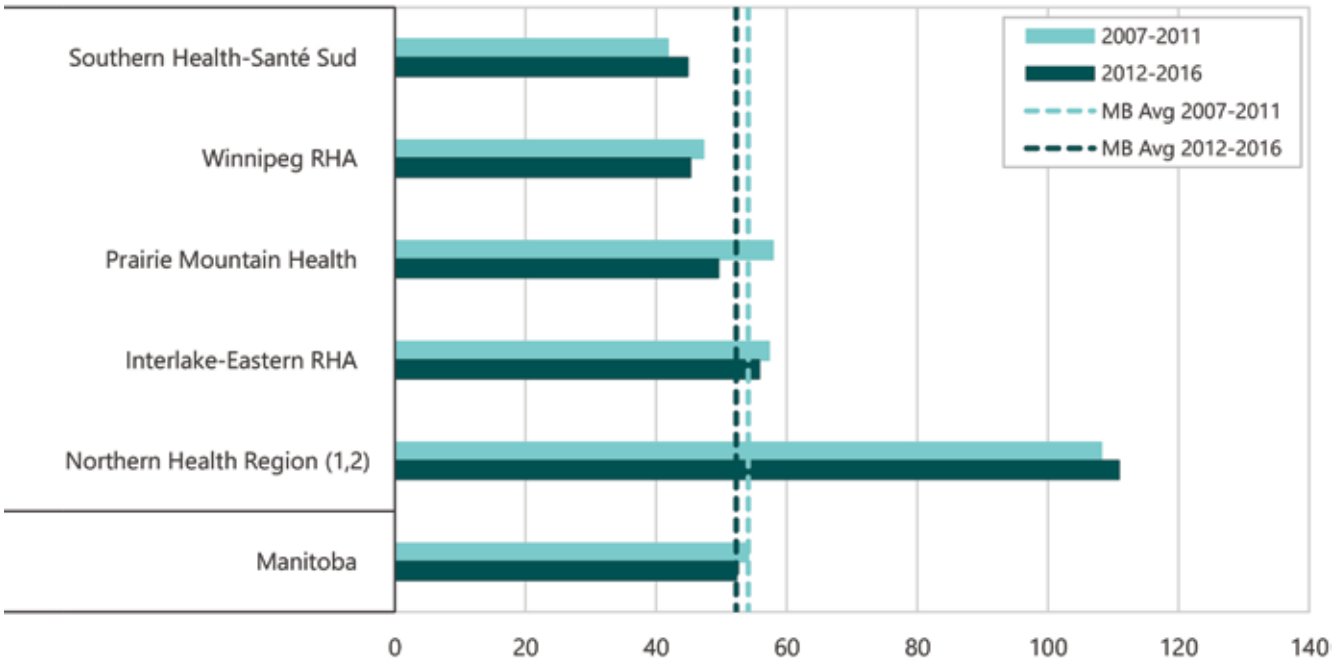
- The rate of PYLL in Manitoba decreased over time from 54.1 to 52.3, but this decrease was not statistically significant, likely due to the variability in the changes across the many districts and NCs in the province.
- Northern had the highest rates of PYLL in both time periods, and they were significantly higher than the provincial average in both periods.
- There were strong relationships between income and PYLL rates in urban and rural areas in both time periods: PYLL rates were higher for residents of lower income areas (see online supplement).
    - Rates for the lowest income quintile areas, both rural and urban, were particularly high, indicating more deaths among residents well below 75 years of age.

Comparison to Previous Findings

- The small decrease in rates of potential years of life lost in this report is consistent with and extends the findings from previous Atlas reports [1,2].

Figure 3.10: Potential Years of Life Lost by RHA, 2007-2011 and 2012-2016

Age- and sex-adjusted average annual potential years of life lost before the age of 75 per 1,000 residents age 1-74



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3.8 Suicide Rates

Definition: The annual average rate of deaths due to suicide among residents age 10 and older per 100,000 residents age 10 and older. Suicide was defined as a death recorded in Vital Statistics data with any of the following causes:

- Intentional self-harm: ICD–10–CA codes X60-X84
- Late effects of intentional self-harm: ICD–10–CA code Y87.0
- Poisoning of undetermined intent: ICD–10–CA codes Y10-Y19
- Other events of undetermined intent: ICD–10–CA codes Y20-Y34
- Late effects of other events of undetermined intent: ICD–10–CA code Y87.2

A relatively 'inclusive' definition was used in an attempt to overcome suspected undercounting of suicides in administrative data; however, deaths due to accidental poisoning were excluded. Results are available by RHA, zone, and Winnipeg CA, but not by district, due to the relatively small number of suicides in smaller areas. Average annual rates were calculated for two five-year periods, 2007–2011 and 2012–2016, and were age- and sex-adjusted to the Manitoba population age 10 and older in the first time period.

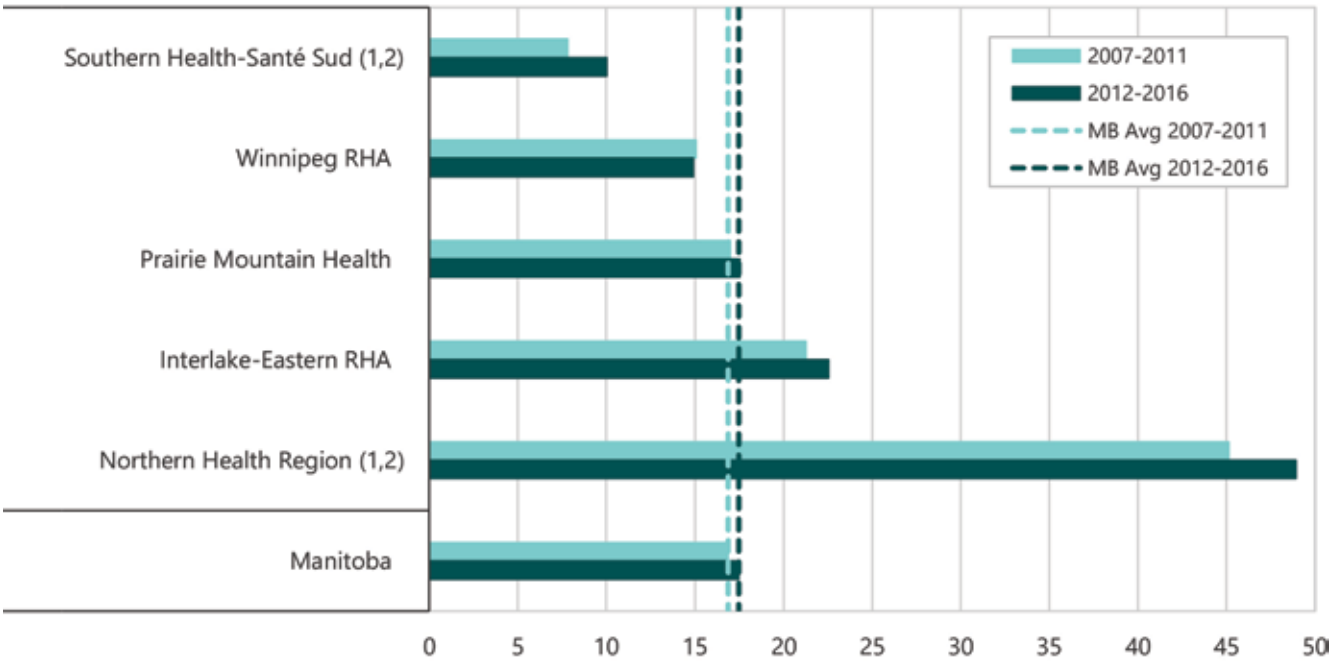
Key Findings

- The suicide rate in Manitoba increased slightly but not significantly over time from 169 to 175 per 100,000. Similar changes were seen in all RHAs except Winnipeg.
- Suicide rates were clearly related to PMR, with higher suicide rates among residents of areas with higher PMR.
- There were strong relationships between income and suicide rates in urban and rural areas in both time periods: suicide rates were dramatically higher for residents of lower income areas (see online supplement).

Comparison to Previous Findings

- The slight change in suicide rates shown here is consistent with the findings from previous Atlas reports, which also showed slight increases over time [1,2].

Figure 3.11: Suicide Rate by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate of suicide per 100,000 residents age 10+



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2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

3.9 Unintentional Injury Causing Death

Definition: The average annual rate of death caused by unintentional injuries, per 1,000 residents. Rates were calculated for two five-year time periods: 2007–2011 and 2012–2016, and those for the second time period were age- and sex-adjusted to the Manitoba population in the first time period. Unintentional injuries were defined as any death recorded in the Vital Statistics Registry with any ICD–10–CA code in the chapter 'External Causes of Morbidity and Mortality' (codes V01–Y98), but excluding the ICD–10–CA codes related to suicide (listed in previous section).

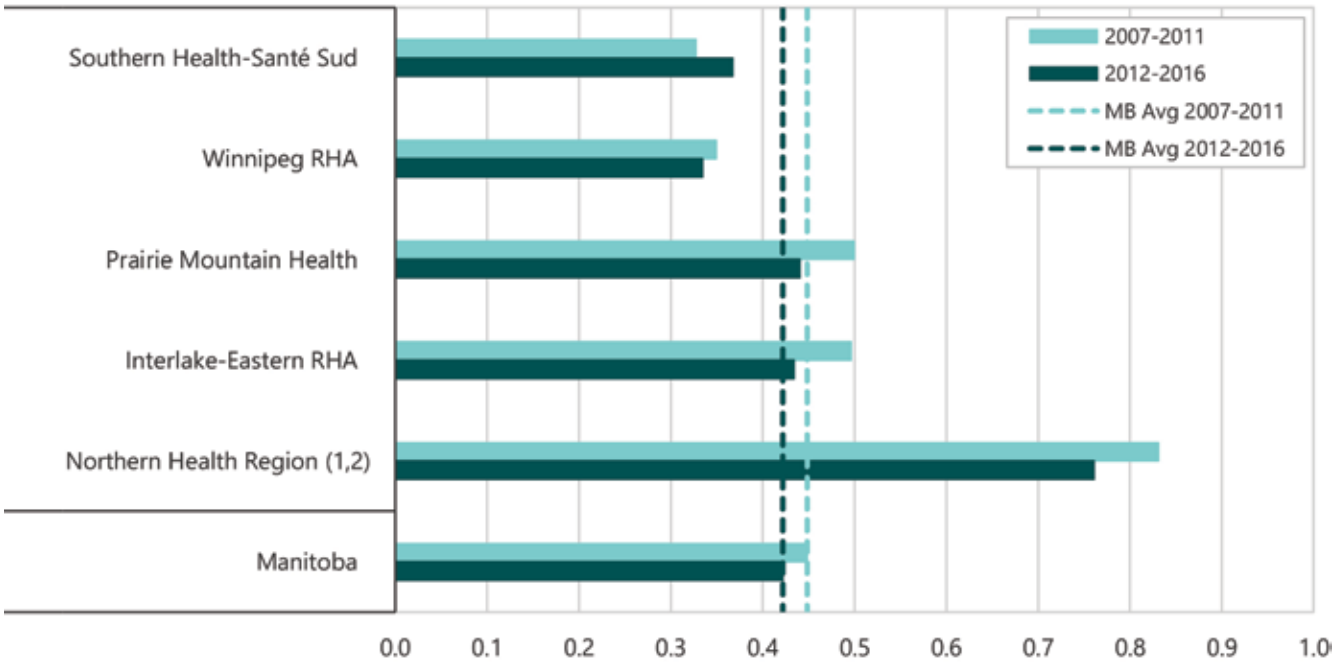
Key Findings

- The rate of deaths due to unintentional injuries in Manitoba decreased slightly over time, but the drop was not statistically significant.
- Northern RHA had rates above the provincial average in both time periods.
- Unintentional injury death rates were clearly related to PMR, with higher rates among residents of areas with higher PMR.
- There were strong relationships between income and unintentional injury death rates in urban and rural areas in both time periods: rates were dramatically higher for residents of lower income areas (see online supplement).

Comparison to Previous Findings

- This indicator is new to the Atlas report, so comparisons to previous regional findings cannot be made.

Figure 3.12: Rate of Unintentional Injury Causing Death by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate per 1,000 residents (all ages)



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

3.10 Potentially Avoidable Death Rates

Definition: The average annual rate of potentially avoidable deaths per 1,000 residents age 0-74 was calculated for two five-year time periods: 2007–2011 and 2012–2016. Rates for the second time period were age- and sex-adjusted to the Manitoba population in the first time period. Potentially avoidable deaths were defined by the Canadian Institute for Health Information (CIHI) in 2016 (though we added ICD–10–CA code Y87.2 – Late effects of injury of undetermined intent – to keep this definition consistent with the suicide indicator shown earlier).

Key Findings

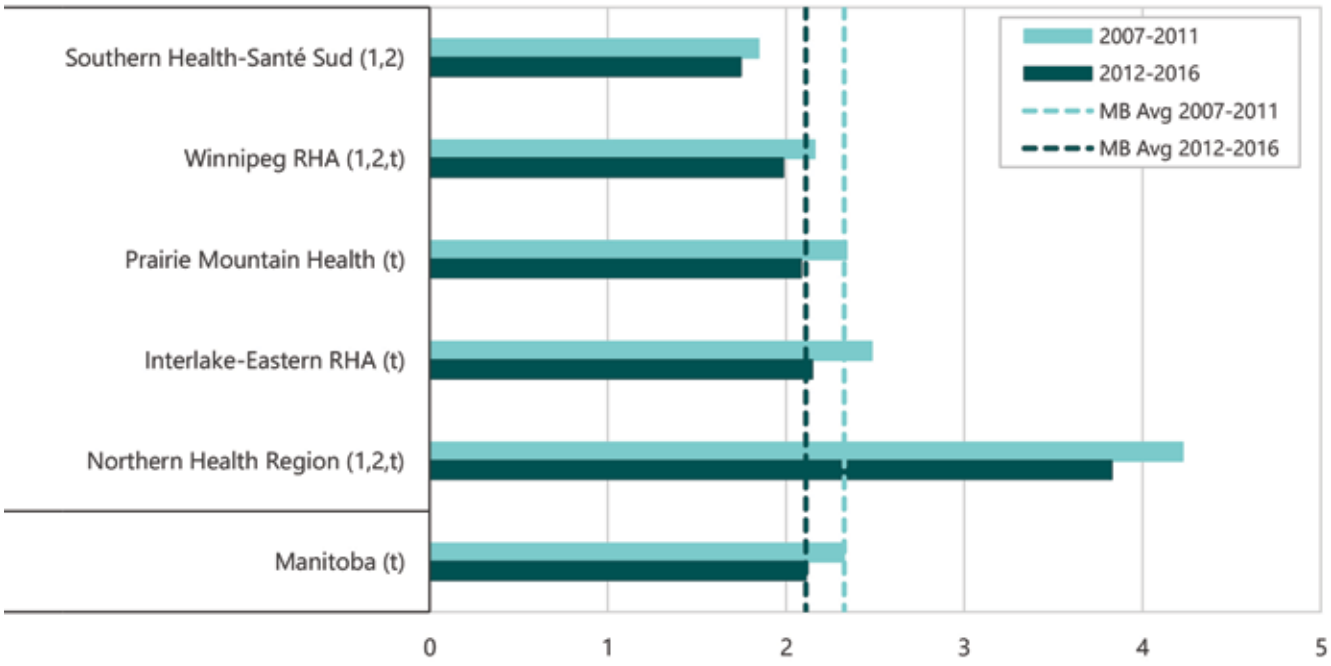
- The rate of potentially avoidable deaths in Manitoba decreased over time. A statistically significant decrease was seen in all RHAs, except Southern.
- Southern and Winnipeg had lower than average rates, while Northern had rates above the provincial average in both time periods.
- Potentially avoidable death rates were very strongly related to PMR, with higher rates among residents of areas with higher PMR.
- There were strong relationships between income and potentially avoidable death rates in urban and rural areas in both time periods: rates were dramatically higher for residents of lower income areas (see online supplement).

Comparison to Previous Findings

- This indicator is new to the Atlas report, so comparisons to previous regional findings cannot be made.

Figure 3.13: Rate of Potentially Avoidable Death by RHA, 2007-2011 and 2012-2016

Age- and sex-adjusted average annual rate of avoidable deaths before age 75 per 1,000 residents age 0-74



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

3.11 Types of Potentially Avoidable Deaths

Definition: This indicator sub-divides potentially avoidable deaths (Section 3.10) into three categories:

- Deaths due to diseases that are preventable (e.g., vaccine-preventable diseases and skin cancer)
- Deaths due to diseases that are treatable (e.g., hypertension and asthma)
- Deaths due to diseases considered 50% preventable and 50% treatable (e.g., ischemic heart disease)

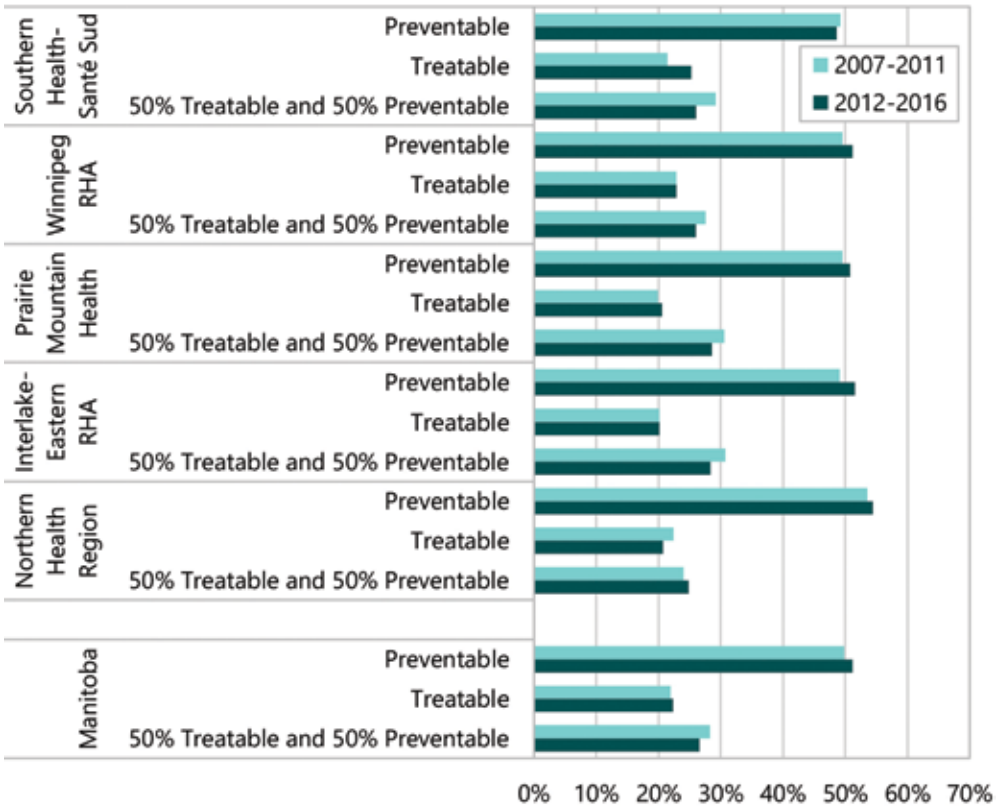
Key Findings

- For Manitoba and within each RHA, about 50% of all potentially avoidable deaths were in the preventable category. In most regions, this percent increased slightly over time, though in Southern it decreased slightly.
- The percent of deaths in the treatable and 50–50 categories varied a bit by RHA, with only small changes over time.

Comparison to Previous Findings

- This indicator is new to the Atlas report, so comparisons to previous regional findings cannot be made.

Figure 3.14: Potentially Avoidable Deaths by Type and RHA, 2007-2011 and 2012-2016
Crude percent of avoidable deaths before age 75 per 1,000 residents age 0-74



Chapter 4:
Physical Illness

Key Findings in Chapter 4

- Overall, the results in this chapter suggest a slightly increasing burden of physical illness among Manitobans.
    - Increases in disease prevalence can result from a number of factors, primarily from prior increases in disease incidence rates, and/or from decreases in mortality – often due to improvements in treatments available (medical, surgical, or pharmaceutical).
    - However, population demographics are also related to disease prevalence in that most physical diseases affect older residents more than younger ones, and Manitoba's population is aging.
- Of the seven chronic physical illnesses studied in this report, the prevalence of the two most common diseases (hypertension and arthritis) and one other (congestive heart failure) were unchanged, while three others (respiratory morbidity, diabetes, and ischemic heart disease) increased, and one (osteoporosis, the least common disease) decreased.
- The rates of the three key health events studied (heart attacks, strokes, and lower limb amputations) all decreased over time.

Introduction

Administrative data do not directly indicate who 'has' a given disease, but rather who uses health services for that disease (e.g., physician visits, hospital care, prescription drugs, or laboratory tests). The indicators used in this report have been validated against other data sources (e.g., survey data or electronic medical records). The diseases with the highest prevalence are presented first. For selected conditions, estimates of disease incidence (i.e., new cases) are also provided.

This chapter is divided into three sections:

- **Section A** contains prevalence estimates for a number of key chronic diseases, expressed as the percent of the population with the disease during each of two time periods.
- **Section B** contains prevalence estimates for two infectious diseases newly added to this Atlas report (Hepatitis C Virus (HCV) and Human Immunodeficiency Virus (HIV)). These indicators were developed in partnership with staff from Cadham Laboratory and MHSAL.
- **Section C** contains indicators of key adverse health events (e.g., heart attacks and strokes) expressed as annual rates, because these events could happen to the same person more than once in a given period.

Each indicator starts with the case definition used to identify Manitoba residents as having the disease or event. Most definitions use a combination of data from physician visits, hospitalizations, and prescription drug use, though some also use laboratory data. In Manitoba, these data systems cover the entire population. Hospital claims are coded using the ICD–10–CA system, whereas physician claims use the ICD–9–CM system. The codes used in each system are listed in the definition for each indicator, with further details provided in the online supplement.

The disease prevalence indicators are based in part on data from physician claims (fee-for-service and shadow billing claims for salaried physicians), which include claims from nurse practitioners. These values likely underestimate the true prevalence of disease in Northern and remote areas where a significant amount of care is delivered in nursing stations, because this care is not coded into provincial data systems.

For hypertension, diabetes, and ischemic heart disease, in addition to the indicator of disease prevalence (what percent of the population already have this condition), we have provided indicators of disease incidence; that is, how many people develop the condition in a given year. The incidence is expressed as a rate of new cases per 100 person-years at risk and can be thought of as follows: Of 100 people without this disease, how many will develop it over the next year if we assume all 100 people live for the entire year?

Finally, there always remains the possibility that a Manitoban with a given chronic disease may not have that diagnosis attributed to them in the time period under study. For example, a Manitoba resident with diabetes may visit physicians several times for reasons other than their diabetes, so none of those visits would get the diagnosis code for diabetes. In this case, the person could be erroneously classified as not having diabetes in that period. But even in this case, data from prescription drug use and medical laboratory tests often ensure the case is still identified.

Section A: Chronic Physical Illness

4.1 Hypertension Prevalence

Definition: The percent of residents age 19 and older with hypertension (high blood pressure) in a one-year period, as defined by any of the following:

- One or more hospitalizations with a diagnosis of hypertension: ICD-10-CA codes I10-I13, I15
- Two or more physician visits with a diagnosis of hypertension (ICD-9-CM codes 401-405)
- Two or more dispensations of medications to treat hypertension (see online supplement)

Prevalence was calculated for 2011/12 and 2016/17, and was age- and sex-adjusted to the Manitoba population age 19 and older in 2011/12. See the online supplement for further details.

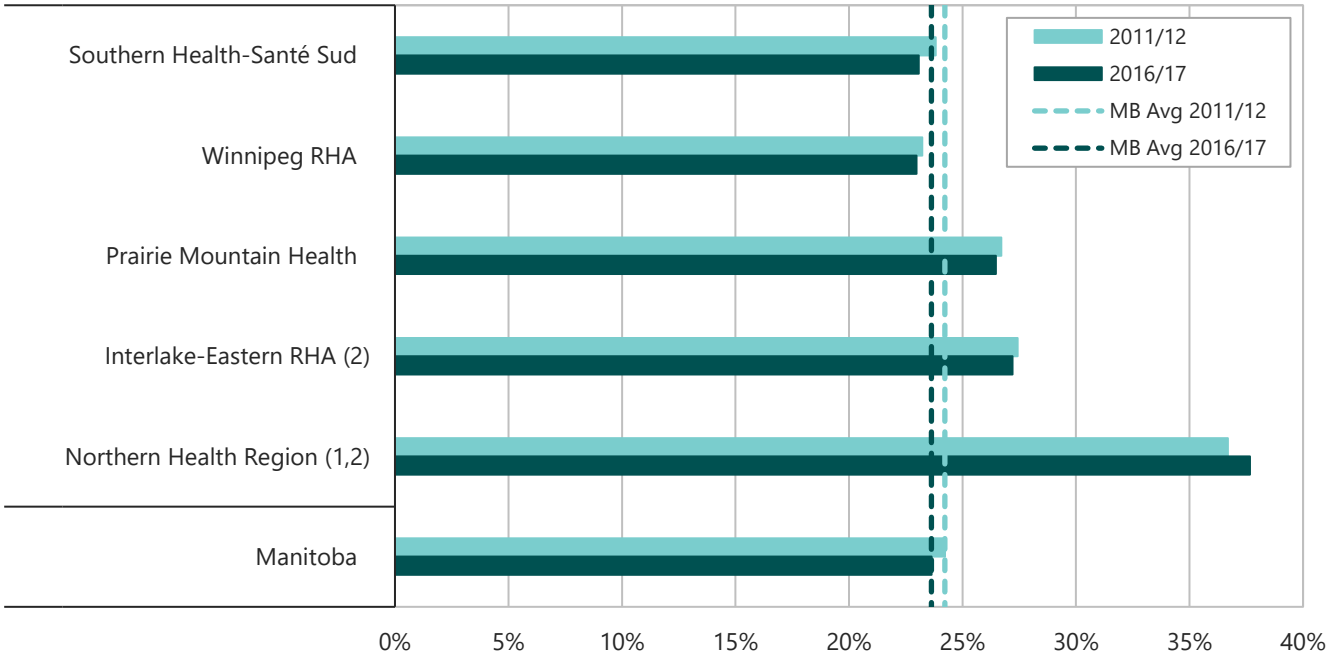
Key Findings

- Hypertension prevalence in Manitoba decreased slightly from 24.2% to 23.6%. There were small changes in some RHAs, but none of these changes were significant.
- Hypertension prevalence was related to PMR at the regional level, with the lowest values in Southern and Winnipeg and the highest in Northern. This relationship did not hold as strongly across districts of most rural regions; at these smaller levels, results were more variable (see online supplement).
  - The crude rates of hypertension in Northern are actually lower than the provincial average, but the high adjusted rates indicate the prevalence is higher than expected for the young population living there.
- There were significant relationships between income and hypertension prevalence in urban and rural areas in both time periods: prevalence was higher among residents of lower income areas (see online supplement).

Comparisons to Previous Findings

- For this report, MCHP adopted a revised case definition for hypertension, based on ongoing validation work by other researchers in Canada. Therefore, the prevalence rates reported here for most regions and Manitoba overall are lower than in previous Atlas reports [1,2].
- Earlier Atlas reports suggested a slow but steady increase in hypertension prevalence over time [2,9], but current results suggest rates may be stabilizing, which is consistent with decreasing incidence rates reported in the 2013 Atlas [1].

Figure 4.1: Prevalence of Hypertension by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of residents age 19+ diagnosed with disorder



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
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s indicates data suppressed due to small numbers

4.2 Hypertension Incidence

Definition: The number of new cases of hypertension (high blood pressure) among residents age 19 and older per 100 person-years at risk, defined using the case definition in Section 4.1 of this report (hypertension prevalence).

Incidence rates were calculated for 2011/12 and 2016/17, and age- and sex-adjusted to the Manitoba population age 19 and older in 2011/12. See the online supplement for further details.

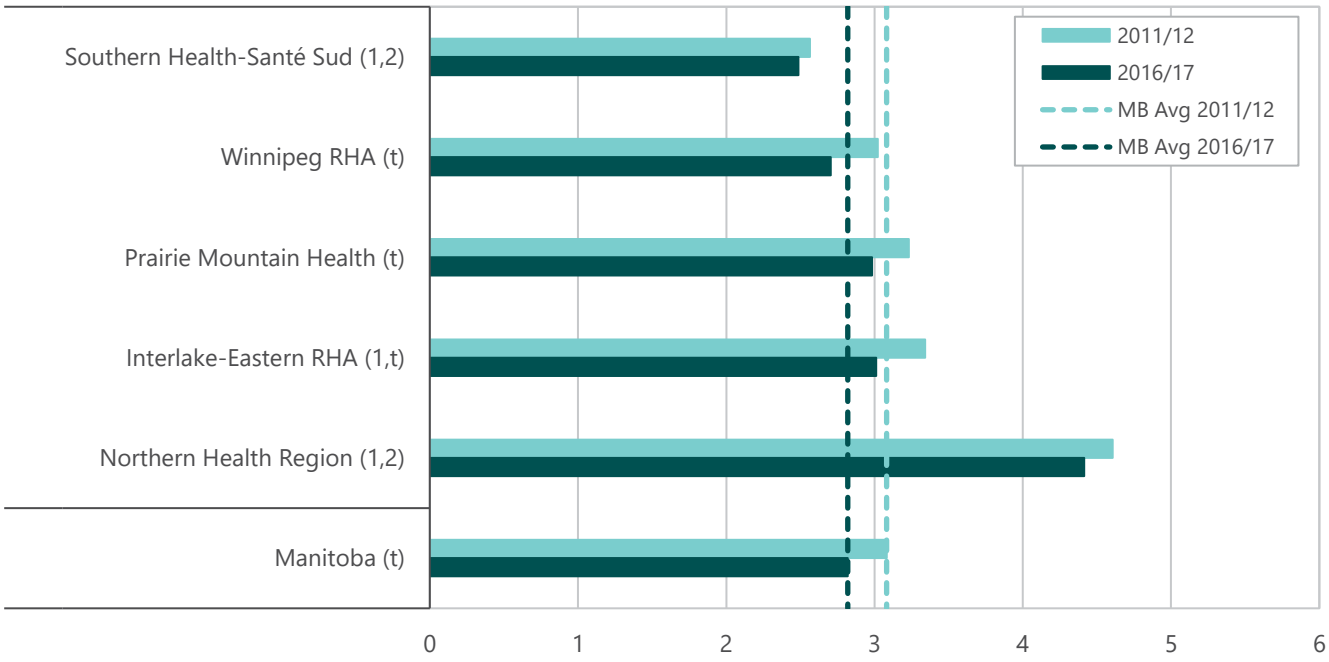
Key Findings

- Hypertension incidence decreased significantly from 3.1 to 2.8 cases per 100 person-years. (As explained in the introduction, these values can be interpreted as a percent, presuming all residents lived for at least one year). Incidence decreased in all regions, though the drop decline in Southern and Northern was not statistically significant.
- Hypertension incidence rates were related to PMR at the regional level, with the lowest rates in Southern and the highest in Northern. Interestingly, this relationship did not hold as strongly across districts of most rural regions or Winnipeg NCs; at these smaller levels, results were more variable (see online supplement).
- There were significant relationships between income and hypertension incidence in urban and rural areas in both time periods: incidence rates were higher among residents of lower income areas (see online supplement).

Comparison to Previous Findings

- Hypertension incidence was first reported in the 2013 Atlas, which also showed a slight decrease over time [1]. If this trend continues, we would expect decreases in hypertension prevalence in the future.

Figure 4.2: Incidence of Hypertension by RHA, 2011/12 and 2016/17
Age- and sex-adjusted incidence rate per 100 person-years at risk for residents age 19+



1 indicates area's rate was statistically different from Manitoba average in first time period
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4.3 Arthritis Prevalence

Definition: The percent of residents age 19 and older with arthritis (rheumatoid or osteoarthritis) in a two-year period, as defined by any of the following:

- at least one hospitalization with an ICD-9-CM code of 274, 446, 710-721, 725-729, 739 or an ICD-10-CA code of M00-M03, M05-M07, M10-M25, M30-M36, M65-M79
- at least two physician visits with an ICD-9-CM code listed above
- one physician visit with an ICD code listed above and at least two dispensation of medications used to treat rheumatoid arthritis (see the online supplement).
- Prevalence was calculated for 2010/11-2011/12 and 2015/16-2016/17, and was age- and sex-adjusted to the Manitoba population age 19 and older in the first time period.

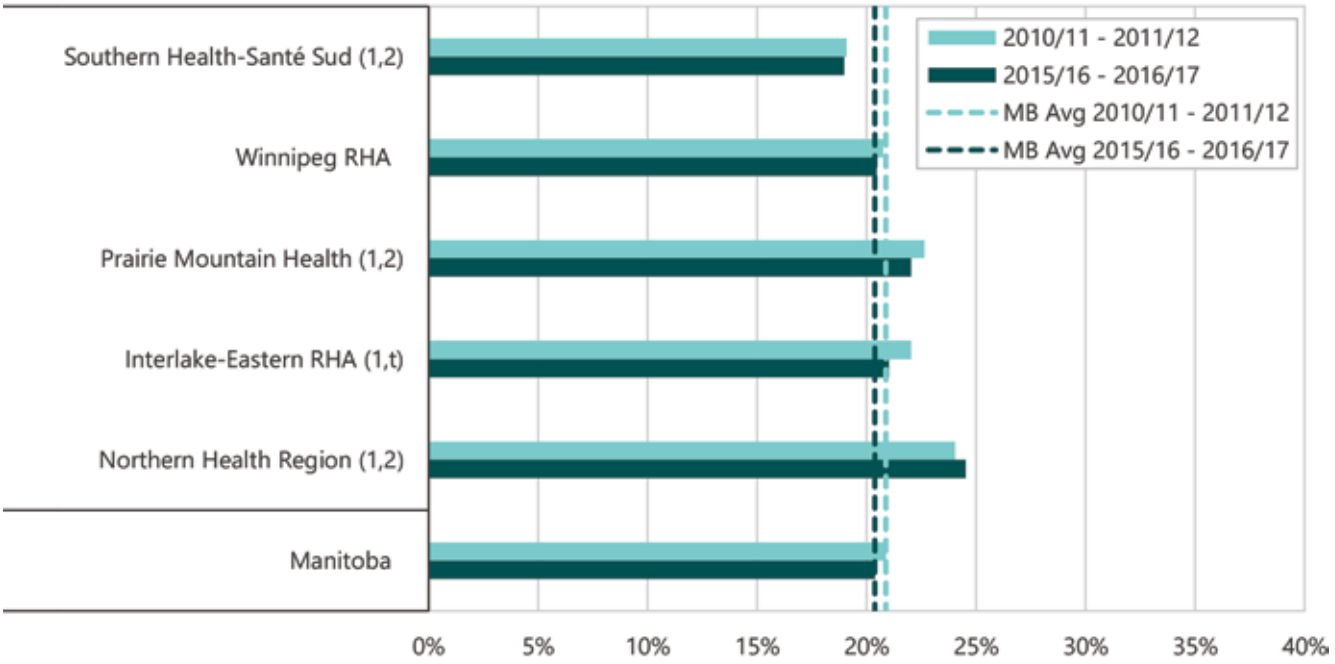
Key Findings

- For Manitoba overall, the prevalence of arthritis decreased slightly over time from 20.9% to 20.4%. The changes varied by RHA, though only the decrease in Interlake-Eastern was statistically significant.
- Arthritis prevalence was related to PMR at the regional level, though not as strongly as other indicators.
- There were statistically significant relationships between income and arthritis prevalence in urban and rural areas in both time periods: arthritis prevalence was higher among residents of lower income areas (see online supplement).

Comparison to Previous Findings

- The results shown here are consistent with previous Atlas reports, which have consistently shown arthritis prevalence to be near 21% [1,2].

Figure 4.3: Prevalence of Arthritis by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted percent of residents age 19+ diagnosed with disorder



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
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4.4 Total Respiratory Morbidity (TRM) Prevalence

Definition: The percent of residents (all ages) with a respiratory disease (asthma, chronic or acute bronchitis, emphysema, or chronic airway obstruction) in a one-year period, as defined by either:

- at least one hospitalization with an ICD-9-CM code of 466, 490, 491, 492, 493, 496 or an ICD-10-CA code of J20, J21, J40-J45, or
- at least one physician visit with an ICD-9-CM code listed above

Prevalence was calculated for 2011/12 and 2016/17, and was age- and sex-adjusted to the Manitoba population in 2011/12. See the online supplement for further details.

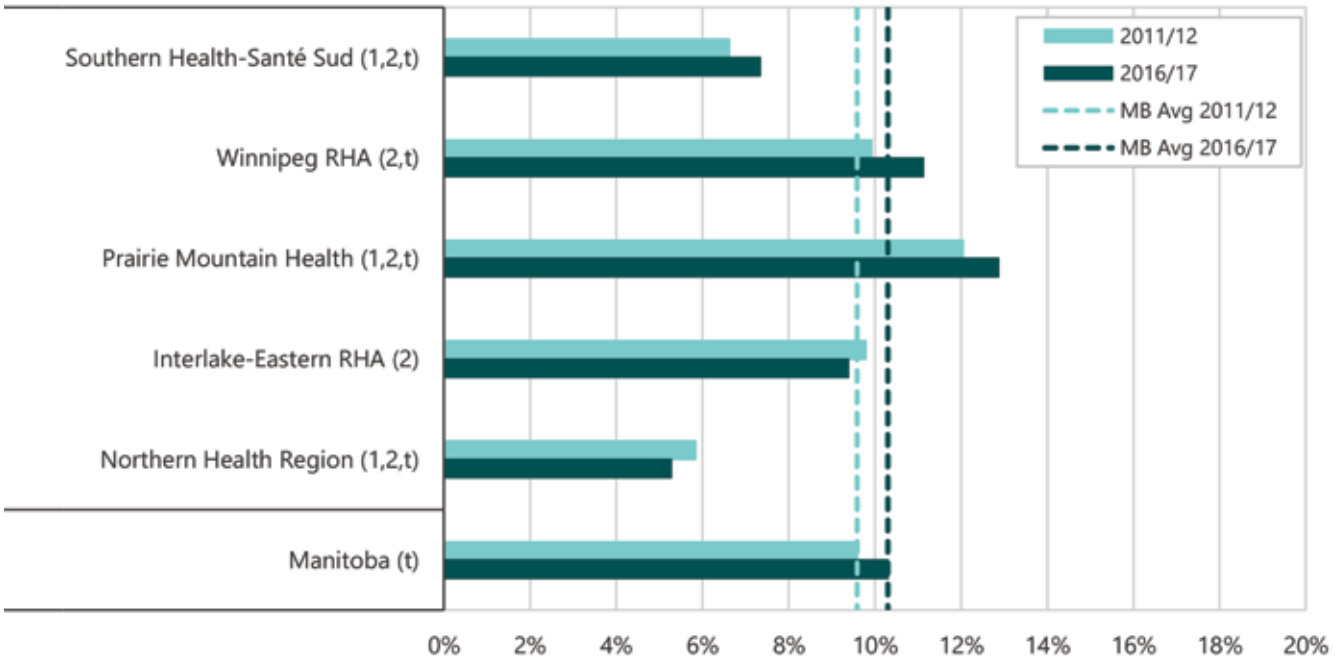
Key Findings

- Overall, TRM prevalence increased in Manitoba from 9.58% to 10.3% of the population. However, the changes varied by RHA, with significant increases in Southern, Winnipeg, and Prairie Mountain, but a significant decrease in Northern. Interlake-Eastern showed a non-significant decrease.
- There was an unusual relationship between TRM prevalence and premature mortality: TRM prevalence was highest in the 'middle' health status regions and lower in both Southern (most healthy) and Northern (least healthy).
- Prevalence values of TRM were lowest in Northern RHA and within most of its districts. This may be related to the limitations of the medical claims data for many Northern districts, because (1) much of the primary care for residents in some communities is provided by nurses and not coded into medical claims; and (2) medical claims allow for only a single diagnosis to be entered, and to the extent that many of these same residents have other diagnoses attributed to them (e.g., heart disease, diabetes, etc.), they are less likely to receive a TRM diagnosis.
- The variation in TRM prevalence across the districts of rural regions was dramatic, with values ranging from below 4% to over 20%. This contrasts with results for the Winnipeg NCs, which had much less variation (see online supplement).
- Relationships with income were different among urban and rural residents (see online supplement).
- In urban areas, there was a strong stepwise relationship with higher prevalence among residents of lower income areas in both time periods.
- Among rural residents, the relationship was significant in the first time period (with higher prevalence in lower income areas), but not significant in the second time period.

Comparison to Previous Findings

- The increase shown in this report is the opposite of the decreases shown in the 2013 and 2009 Atlases, though the unique pattern of values across RHAs is the same [1,2].

Figure 4.4: Prevalence of Total Respiratory Morbidity by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of residents (all ages) diagnosed with disorder



1 indicates area's rate was statistically different from Manitoba average in first time period
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4.5 Diabetes Prevalence

Definition: The percent of residents age 19 and older with diabetes (type 1 or 2) in a three-year period, as defined by any of the following:

- one or more hospitalization with a diagnosis of ICD–9–CM code 250; ICD–10–CA codes E10–E14
- two or more physician visits with a diagnosis of ICD–9–CM code 250
- at least one dispensation of medications to treat diabetes (see the online supplement)
- at least one glycosylated hemoglobin (HbA1c) test with a result ≥ 6.5%
- identified as having type 1 or type 2 diabetes in youth, as identified in the Diabetes Education Resource for Children and Adolescents (DER-CA) database

Prevalence was calculated for 2009/10–2011/12 and 2014/15–2016/17, and was age- and sex-adjusted to the Manitoba population age 19 and older in the first time period. See the online supplement for further details.

Key Findings

- Diabetes prevalence increased over time in Manitoba from 7.57% to 8.65% of the population age 19 and older. This increase was reflected in almost all regions, RHA districts, and Winnipeg sub-areas, though in some areas the increase was not statistically significant.
- Diabetes prevalence values were closely related to PMR, with lower prevalence values in healthier areas and higher prevalence values in less healthy areas.
- The prevalence in Northern RHA was higher than that in all other regions, in both time periods.
- Among the districts of the rural RHAs, there was a ten-fold difference in diabetes prevalence from 4.5% to 45%. There was less variation across NCs within Winnipeg, though some had higher and some had lower than average rates (see online supplement).
- There were strong relationships between income and diabetes prevalence in urban and rural areas in both time periods: diabetes prevalence was higher among residents of lower income areas (see online supplement).

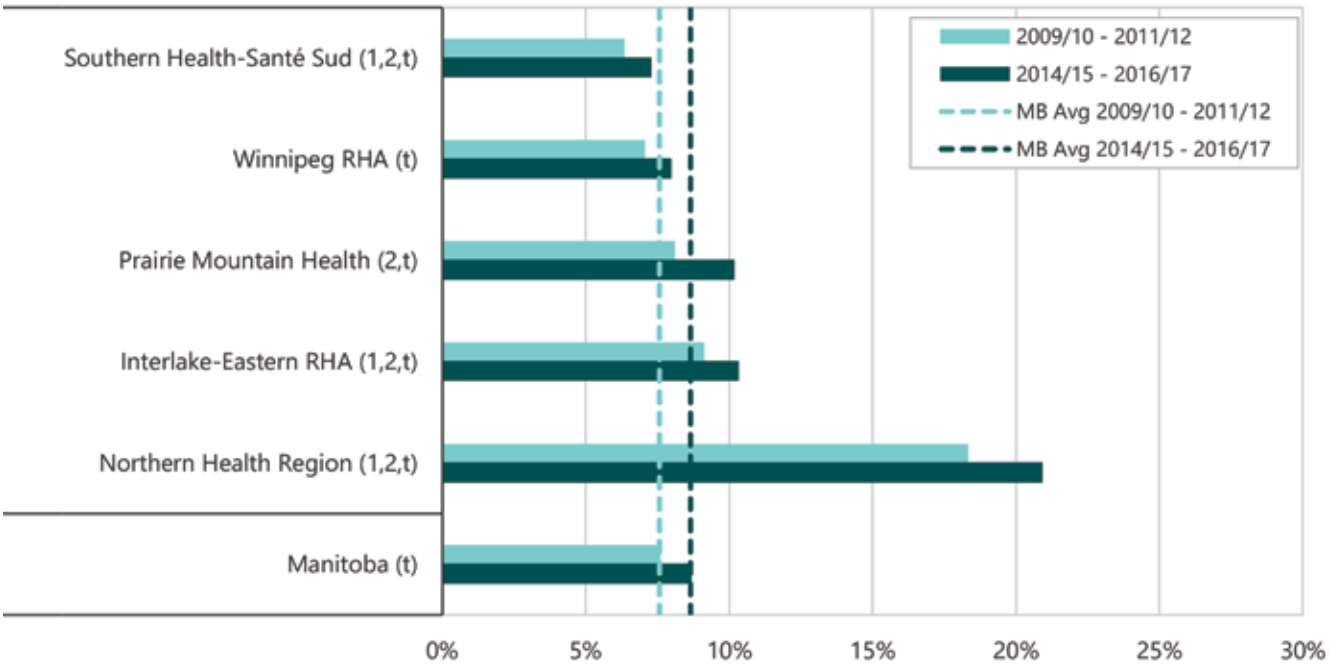
Comparisons to Previous Findings

- The case definition used in this report was significantly improved from that used in previous Atlas reports. The current definition uses more of the detailed clinical data now available at MCHP, which results in lower values.
- The increase in diabetes prevalence shown here is consistent with and extends that shown in previous Atlas reports [1,2].
- The values for diabetes prevalence shown here are different from those shown in reports using the Canadian Chronic Disease Surveillance System (CCDSS) definition [11,12]. CCDSS uses physician visits and hospitalizations to define cases over a two-year period. Our definition used physician visits and hospitalizations, but covered a three-year period, and added drug dispensations for diabetes, laboratory testing of HbA1c, and information from the DER-CA database (to take advantage of these data being available in Manitoba).

20-Year Time Trend Analysis

- Results in Figure 4.6 show a steady and significant increase in diabetes prevalence over time in all RHAs.

Figure 4.5: Prevalence of Diabetes by RHA, 2009/10-2011/12 and 2014/15-2016/17
Age- and sex-adjusted percent of residents (all ages) diagnosed with disorder



1 indicates area's rate was statistically different from Manitoba average in first time period
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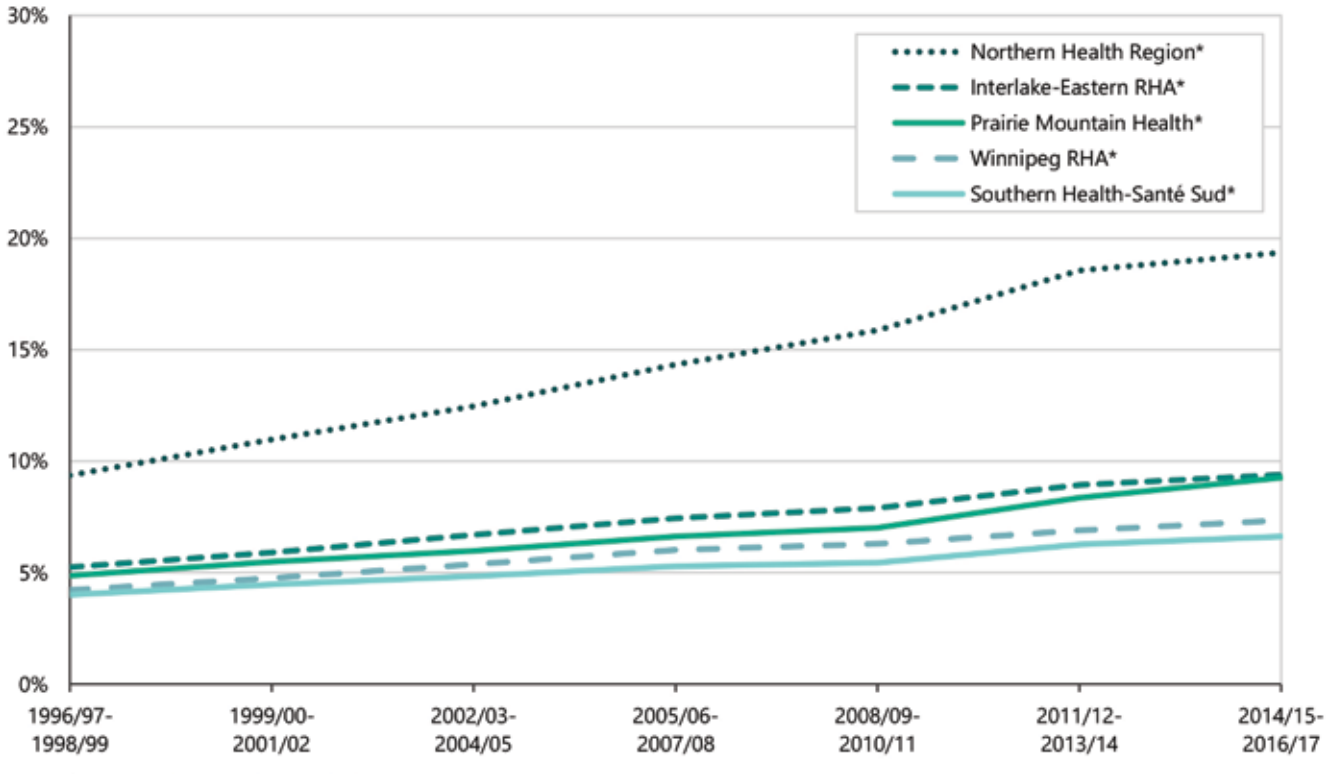
Figure 4.6: Prevalence of Diabetes by RHA, 1996/97-1998/99 to 2014/15-2016/17
Age- and sex-adjusted percent of residents (all ages) diagnosed with disorder



* this area's rate has a statistically significant change over time

4.6 Diabetes Incidence

Definition: The average number of new cases of diabetes among residents age 19 and older per 100 person-years at risk, using the case definition described in Section 4.5 of this report (diabetes prevalence).

Incidence rates were calculated for 2009/10–2011/12 and 2014/15–2016/17, and age- and sex-adjusted to the Manitoba population age 19 and older in the first time period.

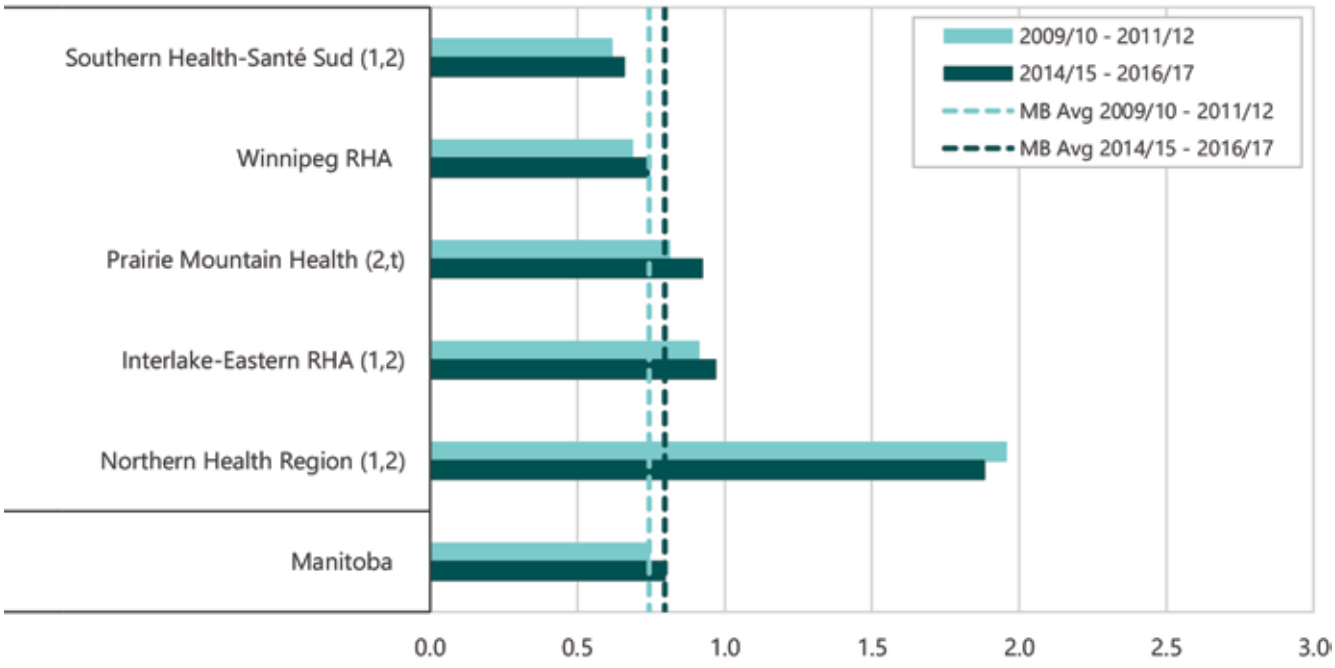
Key Findings

- Diabetes incidence increased slightly but not significantly over time in Manitoba. This increase was reflected in most regions, RHA districts, and Winnipeg sub-areas, though the only region in which the increase reached statistical significance was Prairie Mountain Health.
- Notably, diabetes incidence decreased significantly over time in two districts (Cross Lake and Island Lake) of Northern RHA, where the burden of diabetes is high, in addition to several other RHA districts, including Northern Remote in Interlake-Eastern RHA.
- Diabetes incidence values were closely related to PMR, with lower incidence values in healthier areas and higher incidence values in less healthy areas.
- The incidence in Northern RHA was much higher than that in all other regions in both time periods.
- As with diabetes prevalence, there was great variation in diabetes incidence rates across RHA districts. There was less variation across NCs within Winnipeg, though some had higher and some had lower than average rates (see online supplement).
- There were strong relationships between income and diabetes incidence in urban and rural areas in both time periods: diabetes incidence was higher among residents of lower income areas (see online supplement).

Comparisons to Previous Findings

- The case definition used in this report was significantly improved from that used in previous Atlas reports [1,2]. The current definition uses more of the detailed clinical data now available at MCHP, and results in lower values.
- The slight (non-significant) increase in diabetes incidence shown here is opposite to the results in the 2013 Atlas, which showed a significant decrease over time [1].

Figure 4.7: Incidence of Diabetes by RHA, 2009/10-2011/12 and 2014/15-2016/17
Age- and sex-adjusted incidence rate per 100 person-years at risk for residents (all ages)



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4.7 Ischemic Heart Disease (IHD) Prevalence

Definition: The percent of residents age 19 and older with IHD in a five-year period, as defined by any of the following:

- at least one hospitalization with an ICD–9–CM code of 410–414 or an ICD–10–CA code of I20–I22, I24, or I25
- at least two physician visits with an ICD–9–CM code listed above
- one physician visit with an ICD–9–CM code listed above and at least two dispensations of medications used to treat IHD (see online supplement)

Prevalence was calculated for 2007/08–2011/12 and 2012/13–2016/17, and was age- and sex-adjusted to the Manitoba population age 19 and older in the first time period.

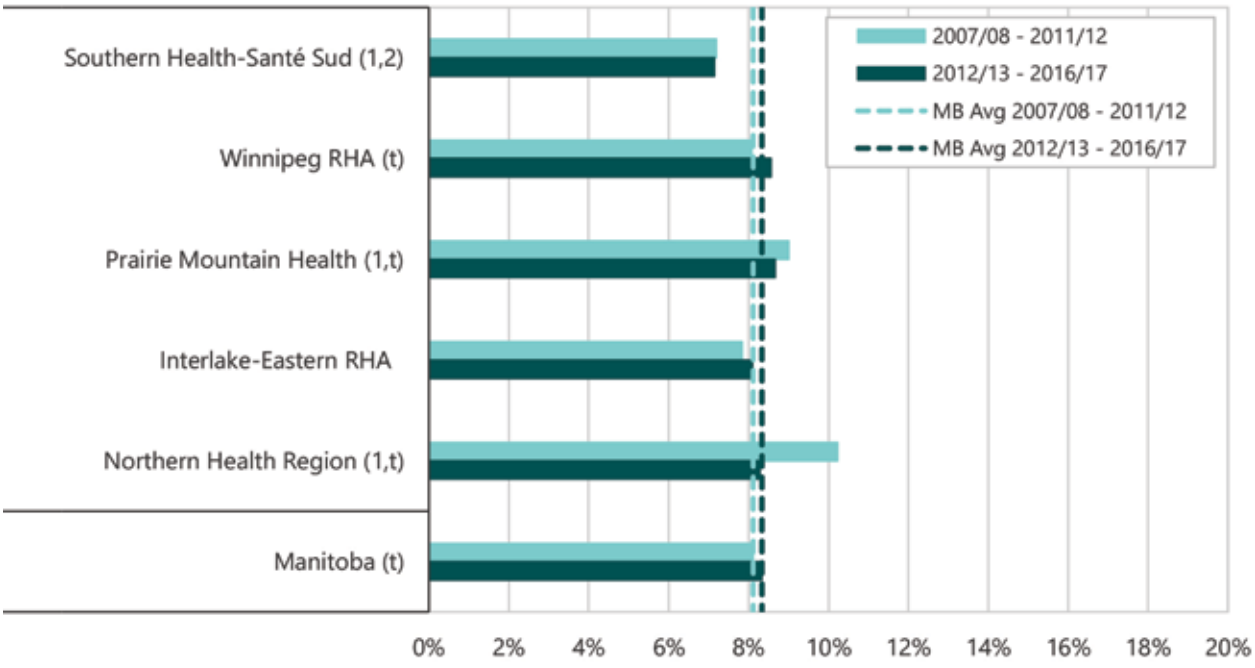
Key Findings

- IHD prevalence increased slightly from 8.11% to 8.33% of the population age 19 and older. The rate in Winnipeg increased over time, while the rates in Northern and Prairie Mountain decreased. There was no statistically significant change in Southern and Interlake-Eastern.
- IHD prevalence appears to be related to premature mortality at the regional level in the first time period, but not in the second.
- There were strong relationships between income and IHD prevalence in urban and rural areas in both time periods: IHD prevalence was higher among residents of lower income areas. In urban areas, this relationship was strong and linear in both time periods (see online supplement).

Comparisons to Previous Findings

- These results are the opposite of the trend seen in all previous Atlas reports, which have shown decreasing IHD prevalence over time. While the increase shown here is modest, it reverses the declining trend seen in the past [1,2].
- Interestingly, the rate of acute myocardial infarctions, which accounts for about half of all IHD cases, declined over this same time period in the current report and in previous Atlas reports [1,2].

Figure 4.8: Prevalence of Ischemic Heart Disease by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted percent of residents age 19+ diagnosed with disorder



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2 indicates area's rate was statistically different from Manitoba average in second time period
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4.8 Ischemic Heart Disease (IHD) Incidence

Definition: The average number of new cases of IHD among residents age 19 and older per 100 person-years at risk, as defined using the case definition in Section 4.7 of this report (IHD prevalence).

Incidence was calculated for 2007/08–2011/12 and 2012/13–2016/17, and was age- and sex-adjusted to the Manitoba population age 19 and older in the first time period. See the online supplement for further details.

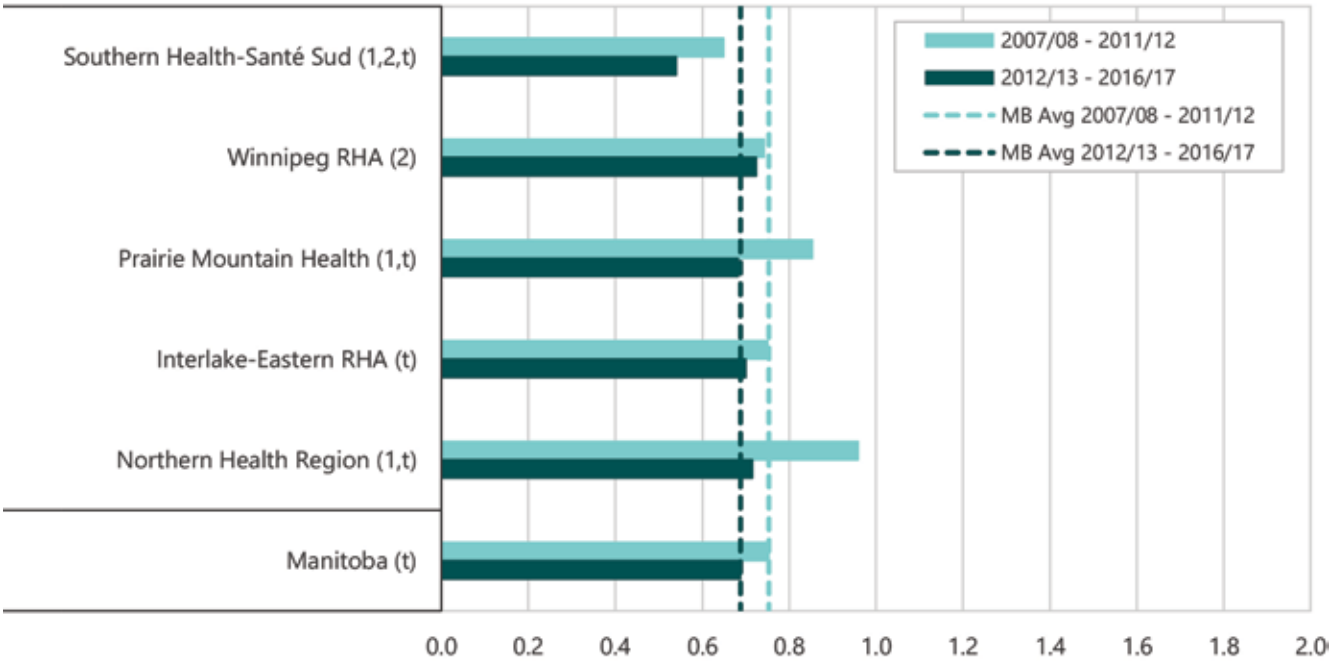
Key Findings

- IHD incidence decreased in Manitoba from 0.753 to 0.688 cases per 100 person-years at risk. (As explained in the introduction, these values can be interpreted as percent of the population, presuming all residents lived for at least one year). Incidence decreased in all regions, though the decrease in Winnipeg was not statistically significant.
- IHD incidence appears to be related to premature mortality at the regional level in the first time period, but not in the second.
- There were statistically significant relationships between income and IHD incidence rates in urban and rural areas in both time periods: incidence rates were higher among residents of lower income areas (see online supplement).

Comparison to Previous Findings

- The results shown here are consistent with and extend the findings shown in the 2013 Atlas, which also showed a decrease in IHD incidence over time [1].

Figure 4.9: Incidence of Ischemic Heart Disease by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted incidence rate per 100 person-years at risk for residents age 19+



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4.9 Osteoporosis Prevalence

Definition: The percent of residents age 50 and older with osteoporosis in a three-year period as defined by either:

- at least one hospitalization or physician visit with a diagnosis of ICD–9–CM code 733 or ICD–10–CA code M81, **or**
- at least one dispensation of medications used to treat osteoporosis (see online supplement)

Prevalence was calculated for 2011/12 and 2016/17, and was age- and sex-adjusted to the Manitoba population age 50 and older in the first time period.

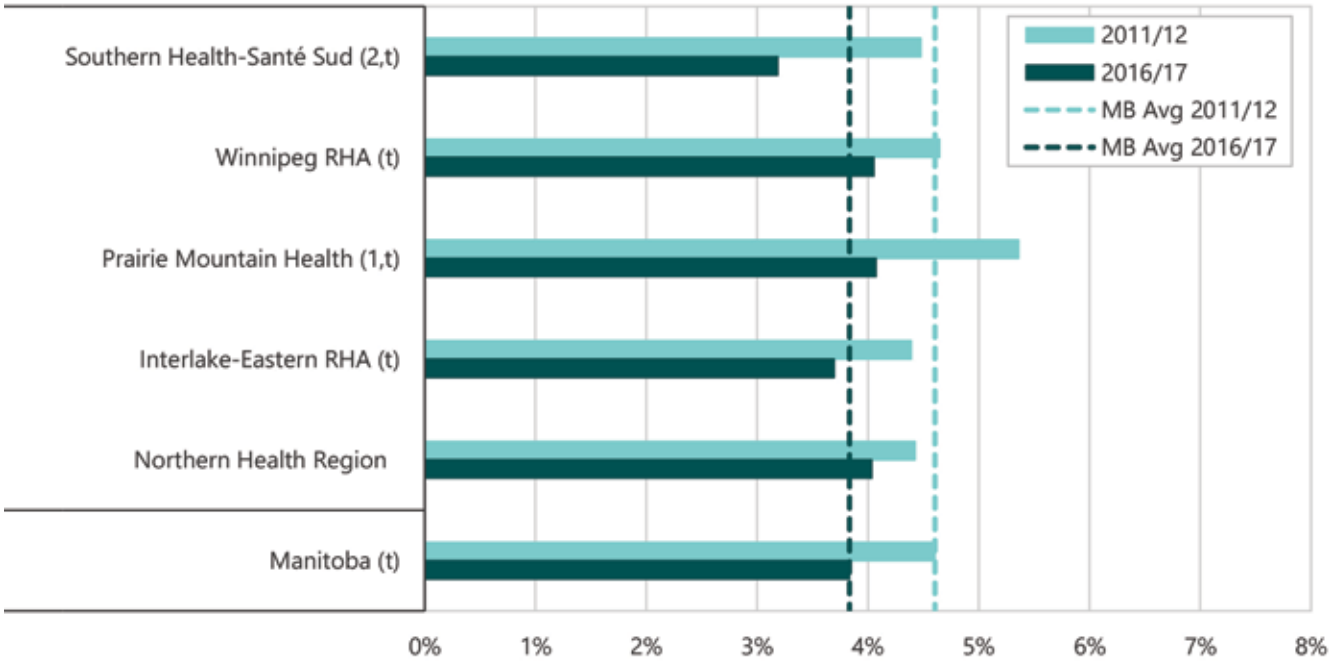
Key Findings

- Osteoporosis prevalence decreased over time from 4.60% to 3.83% of the population age 50 and older. Decreases were seen in every region, though the change in Northern RHA was not statistically significant.
- The prevalence of osteoporosis is notably similar across RHAs: significant differences from the Manitoba average were seen only for Southern in 2016/17 and Prairie Mountain in 2011/12.
- There were no significant relationships between income and osteoporosis prevalence in urban or rural residents. Rates were slightly higher for urban than rural residents.

Comparisons to Previous Findings

- The case definition for osteoporosis used in this report is quite different from that used in previous Atlas reports [1,2]. The definition used here is based on new validation studies and is a more accurate measure. (The previous definition used diagnoses for osteoporosis and osteoporotic bone fractures; the new definition does not include fractures.)
- Previous results show that osteoporosis prevalence had increased from the late 1990s to the mid 2000's, but it has declined since then, and current results extend that trend [1,2,9].

Figure 4.10: Prevalence of Osteoporosis by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of residents age 50+ diagnosed with disorder



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

4.10 Congestive Heart Failure (CHF) Prevalence

Definition: The percent of residents age 40 and older with CHF in a one-year period as defined by either:

- at least one inpatient hospitalization with an ICD–9–CM code of 428 or an ICD–10–CA code of I50, or
- at least two physician visits with ICD–9–CM code 428

Prevalence was calculated for 2011/12 and 2016/17 and was age- and sex-adjusted to the Manitoba population age 40 and older in the first time period. See the online supplement for further details.

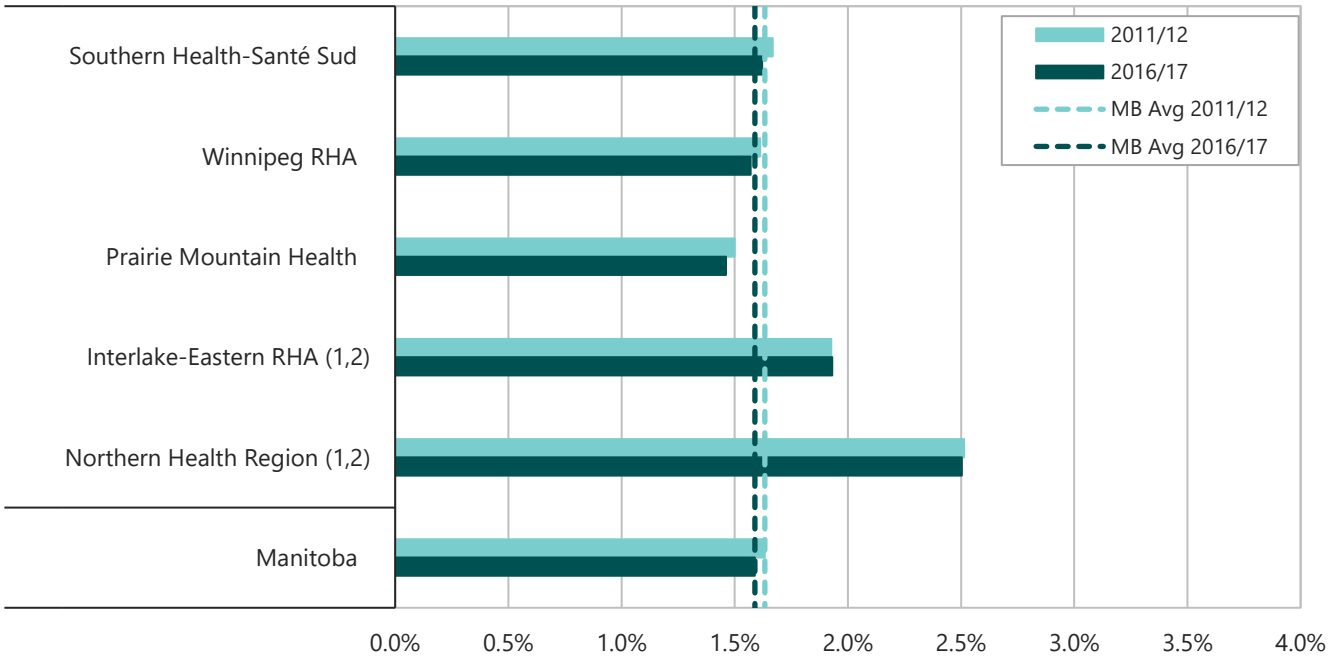
Key Findings

- CHF prevalence was stable over time in Manitoba, decreasing only slightly from 1.63% to 1.59% of the population age 40 and older.
- The prevalence of CHF appears to be weakly related to premature mortality at the regional level, with above average rates in Interlake-Eastern and Northern.
- There were significant relationships between income and CHF prevalence in urban or rural residents in both years, with higher prevalence among lower income residents.

Comparisons to Previous Findings

- The case definition for CHF was modified from that used in the previous report, moving to a one-year window instead of a 3-year window [1]. This was done to match recent validation work conducted in Ontario [13].
- Results in the 2013 Atlas also showed a decreasing prevalence of CHF over time [1].

Figure 4.11: Prevalence of Congestive Heart Failure by RHA, 2011/12 and 2016/17
Age- and sex-adjusted average annual percent of residents age 40+ diagnosed with disorder



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Section B: Chronic Infectious Disease

4.11 Hepatitis C Virus (HCV) Prevalence

Definition: The percent of residents (all ages) diagnosed with HCV on or before December 31, 2017, as defined by one or more positive laboratory tests for HCV since August 31, 2009 (chosen as the start date because the structure and contents of the laboratory data system before that time are quite different). Rates were age- and sex-adjusted to the Manitoba population. The definition for a positive laboratory test for HCV was developed in partnership with Cadham Provincial Laboratory and MHSAL. See the online supplement for further details.

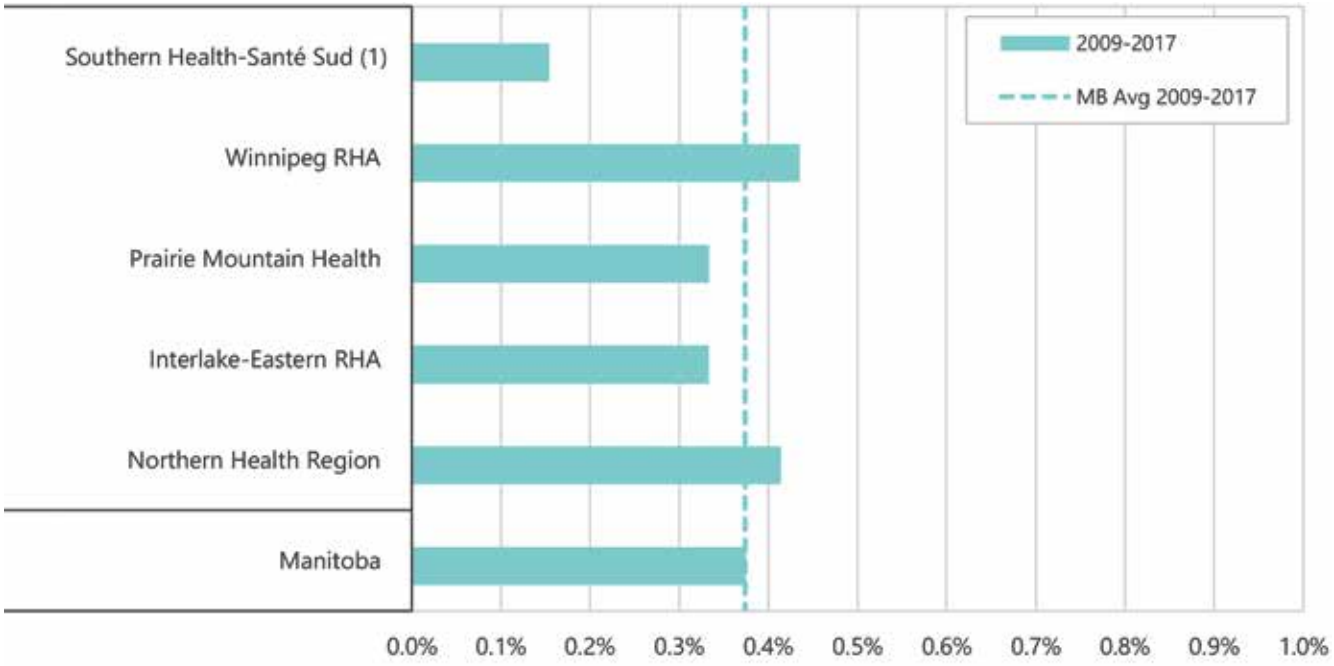
Key Findings

- The prevalence of HCV was similar across regions with the exception of Southern, which had a much lower than average prevalence.
- Because HCV is relatively uncommon, many years of data are needed to produce reliable estimates. Results for a number of RHA districts have been suppressed because of low numbers.
- Existing data do not allow a comparison of rates over time.
- The prevalence of HCV does not appear to be related to premature mortality at the regional level, though the results for Winnipeg NCs showed some relationship with PMR (higher prevalence in areas with higher PMR).
- HCV prevalence was strongly related to income in both urban and rural areas, with higher prevalence among lower income residents.

Comparison to Previous Findings

- This indicator is new to the Atlas report, so comparisons to previous regional findings cannot be made.

Figure 4.12: Prevalence of Hepatitis C Virus by RHA, 2009-2017
Age- and sex-adjusted percent of residents (all ages)



1 indicates area's rate was statistically different from the Manitoba average
s indicates data suppressed due to small numbers

4.12 Human Immunodeficiency Virus (HIV) Prevalence

Definition: The percent of residents (all ages) diagnosed with HIV on or before December 31, 2017, as defined by one or more positive laboratory tests for HIV since August 31, 2009 (chosen as the start date because the structure and contents of the laboratory data system before that time are quite different). Rates were age- and sex-adjusted to the Manitoba population. The definition for a positive laboratory test for HIV was developed in partnership with Cadham Provincial Laboratory and MHSAL. See the online supplement for further details.

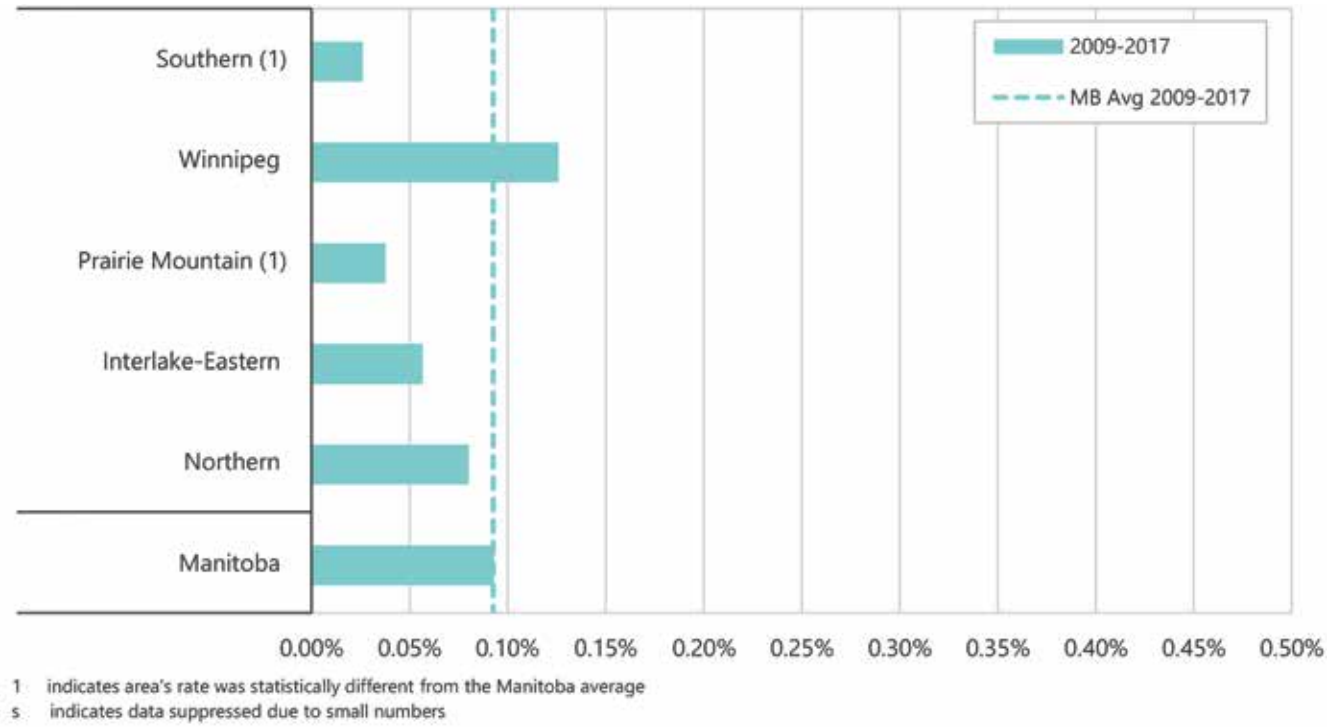
Key Findings

- The prevalence of HIV was higher in Winnipeg RHA than any other region, though this difference was not statistically significant. Southern and Prairie Mountain had significantly lower than average values.
    - The higher rate in Winnipeg may be in part due to people with this disease moving to Winnipeg.
- The trend among regions other than Winnipeg was clearly related to premature mortality, with higher prevalence in regions with higher PMR.
- Because HIV is very uncommon, many years of data are needed to produce reliable estimates at the regional level. Rates could not be calculated for smaller areas (e.g. zones, RHA districts, or Winnipeg NCs).
- Existing data do not allow a comparison of rates over time.
- HIV prevalence was very strongly related to income in both urban and rural areas, with higher prevalence among lower income residents. Prevalence in the lowest urban income quintile was particularly high.

Comparison to Previous Findings

- This indicator is new to the Atlas report, so comparisons to previous regional findings cannot be made.

Figure 4.13: Prevalence of Human Immunodeficiency Virus by RHA, 2009-2017
Age- and sex-adjusted percent of residents (all ages)



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Section C: Adverse Health Event Rates

This section provides average annual rates of key health-related events. They are shown as rates per 1,000 residents per year, not as percent, because these events can happen to the same person more than once over time.

4.13 Acute Myocardial Infarction (AMI) Rates

Definition: The number of hospitalizations or deaths due to acute myocardial infarction (AMI: also known as heart attack) expressed as a rate per 1,000 residents age 40 and older during two five-year periods. AMI was defined by either:

- An inpatient hospitalization with an ICD–9–CM code of 410 or an ICD–10–CA code of I21 and a length of stay of at least three days (unless the patient died from the AMI, in which case they are included regardless of length of stay), or
- AMI listed as the cause of death in Vital Statistics files

Average annual rates were calculated for 2007–2011 and 2012–2016, and were age- and sex-adjusted to the Manitoba population age 40 and older in the first time period. Further details in the online supplement.

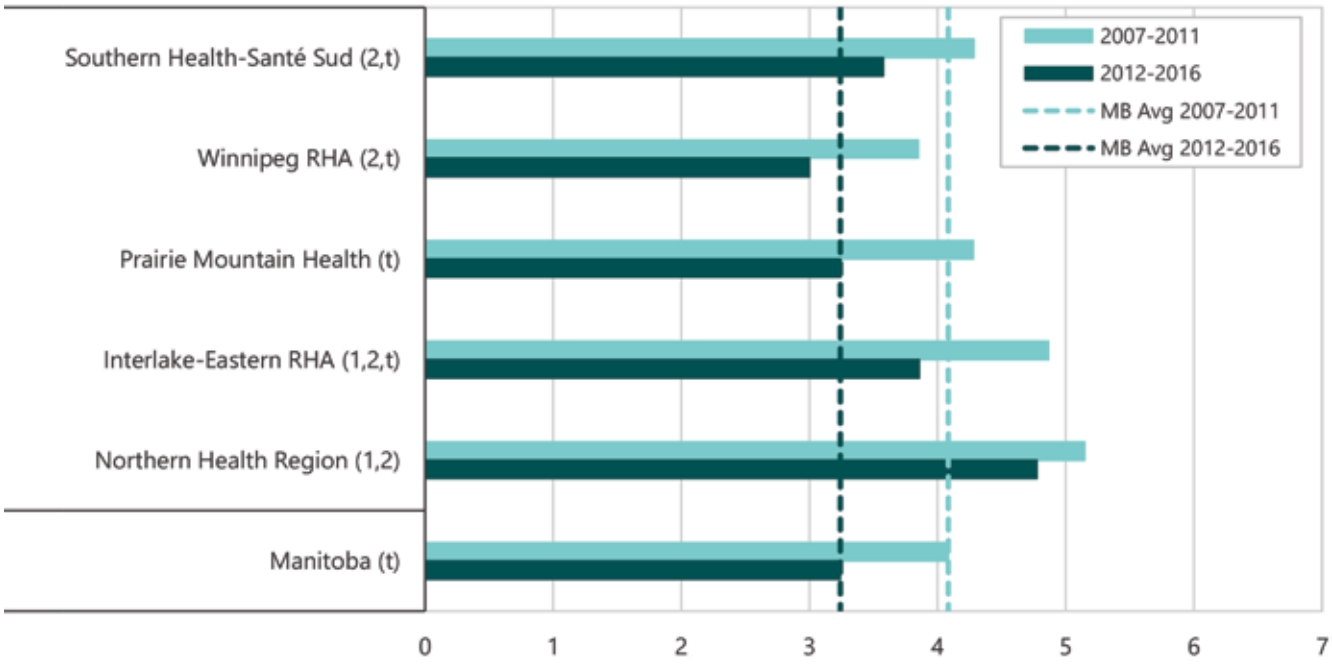
Key Findings

- The AMI rate for Manitobans decreased over time from 4.08 to 3.24 AMIs per 1,000 residents age 40 and older per year.
- Rates dropped in all regions, though the decrease in Northern was not statistically significant.
- AMI rates appear to be related to premature mortality, with higher AMI rates in less healthy areas.
- There was large variation in AMI rates among districts of rural regions, and less but still substantial variation among the 25 NCs in Winnipeg.
- AMI rates were strongly related to income levels for urban and rural residents in both time periods: residents in lower income areas had higher AMI rates. Urban residents had lower rates than rural residents.

Comparison to Previous Findings

- These results are consistent with and extend the results shown in previous Atlas reports, reflecting the ongoing significant reduction in AMI rates over time [1,2].

Figure 4.14: Acute Myocardial Infarction (Heart Attack) Rate by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate of death or hospitalization for AMI per 1,000 residents age 40+



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4.14 Stroke Rates

Definition: The number of hospitalizations or deaths due to stroke, expressed as a rate per 1,000 residents age 40 and older during two five-year periods. Stroke was defined by either:

- at least one hospitalization with an ICD–9–CM code of 431, 434, 436 or an ICD–10–CA code of I61, I63, I64, or
- Stroke listed as the cause of death in Vital Statistics files

Average annual rates were calculated for 2007–2011 and 2012–2016, and were age- and sex-adjusted to the Manitoba population age 40 and older in the first time period. See the online supplement for further details.

Key Findings

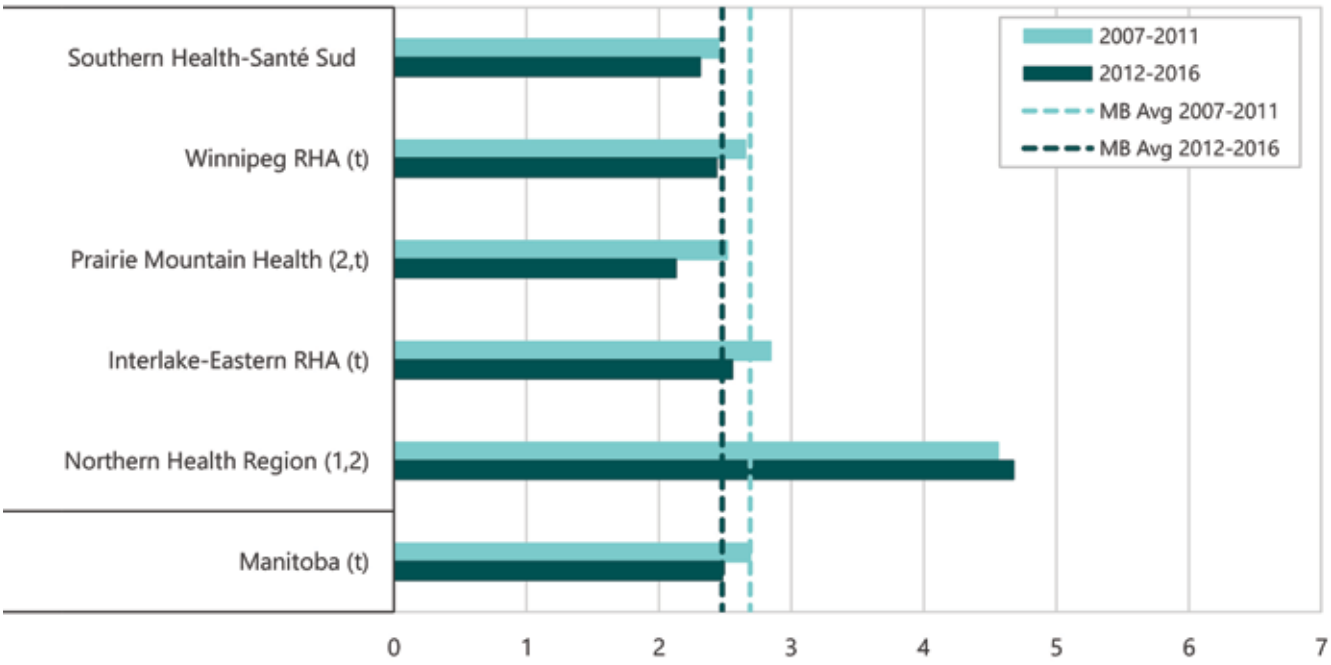
- The stroke rate for Manitobans decreased over time from 2.69 to 2.48 strokes per 1,000 residents age 40 and older per year.
- Rates decreased in most regions, except Northern RHA, which had a non-significant increase. The decrease in Southern was not statistically significant.
- Stroke rates were related to PMR with higher stroke rates in less healthy areas, most notably Northern.
- There was large variation in stroke rates among districts of rural regions, but less variation among the 25 NCs in Winnipeg.
- Stroke rates were strongly related to income levels for urban and rural residents in both time periods: residents in lower income areas had higher stroke rates.

Comparisons to Previous Findings

- These results are consistent with and extend the results shown in previous Atlas reports, reflecting the ongoing significant reduction in stroke rates over time in Manitoba [1,2].
- The exception is Northern RHA, which showed a small increase in the latest time period. This increase was not statistically significant, but still represents a reversal of the longer-term trend of decreases in all RHAs [1,2].

Figure 4.15: Stroke Rate by RHA, 2007-2011 and 2012-2016

Age- and sex-adjusted average annual rate of death or hospitalization for stroke per 1,000 residents age 40+



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4.15 Lower Limb Amputation among Residents with Diabetes

Definition: The percent of residents age 19 and older with diabetes who had a lower limb amputation (below or including the knee) during two five-year time periods, as defined by a surgical procedure code: ICD–9–CM codes 84.10–84.17 or CCI codes 1.VC.93, 1.VG.93, 1.VQ.93, 1.WA.93, 1.WE.93, 1.WJ.93, 1.WK.93, 1.WM.93, or 1.WN.93. Amputations associated with injury were excluded.

Manitoba residents with diabetes were defined using the case definition in Section 4.5 (diabetes prevalence) in the three fiscal years at the start of the five-year study periods 2007/08–2009/10 and 2012/13–2014/15. The percent of Manitoba residents with diabetes age 19 and older who had a lower limb amputation were calculated for 2007/08–2011/12 and 2012/13–2016/17, and were age- and sex-adjusted to Manitoba residents with diabetes age 19 and older in the first time period. See details in the online supplement.

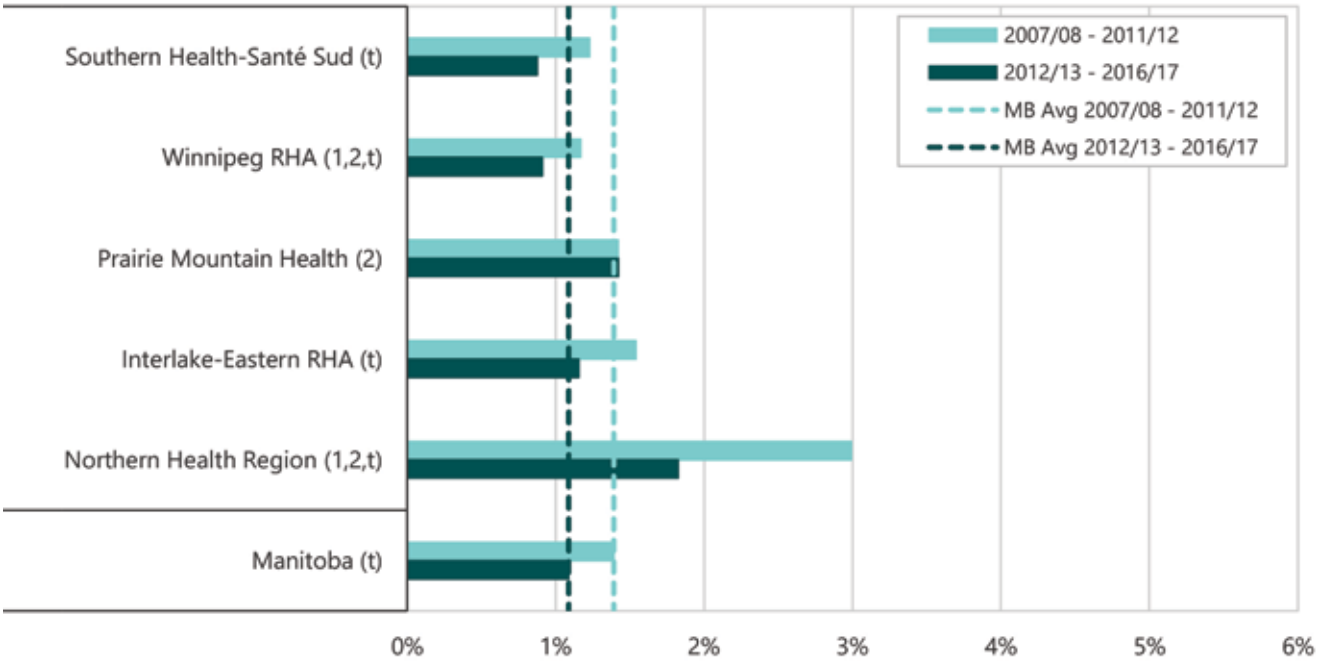
Key Findings

- The percent of Manitobans with diabetes who had a lower limb amputation in a five-year period decreased from 1.39% to 1.09%. Significant decreases were seen in all regions except Prairie Mountain.
- The percent of Manitobans with diabetes receiving a lower limb amputation appears to be associated with premature mortality: amputation rates were higher in areas with higher premature mortality.
- Northern residents had the highest rates in both time periods, but also the largest decrease over time (just under 22%).
- There was large variation across districts in rural regions, from just over 1% in several districts to over 9% in several districts. However, most districts with very low rates were not statistically different from the Manitoba average. There was much less variation among NCs in Winnipeg. Many districts had results suppressed because of low numbers (between 1 and 5 events in a five-year period).
- There were strong relationships between income and amputations in urban and rural areas in both time periods: amputation rates were much higher among residents of lower income areas (see online supplement).

Comparisons to Previous Findings

- The definition used in this report differs from that used in previous Atlas reports [1,2]. Based on ongoing work at MCHP focusing on diabetes, there were a few changes to the details in the definition, which result in slightly higher but more accurate rates (see the online supplement for full details of definition).
- The decrease in amputations over time shown here is consistent with and extends the findings from previous Atlas reports [1,2]

Figure 4.16: Lower Limb Amputation among Residents with Diabetes by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted percent of residents with diabetes age 19+ who had an amputation



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Chapter 5:
Physician and Nurse Practitioner Services

Key Findings in Chapter 5

- Most of the indicators in this report show stable rates of use of physician and nurse practitioner services over time.
- The percent of the population having at least one visit with a physician or nurse practitioner (NP) in a given year decreased slightly, but not significantly.
- The average rate of visits to physicians and NPs increased slightly, but not significantly.
- The rate of consultations with specialists increased slightly but not significantly.
    - Specialist consult rates were inversely related to need, in that residents in lower income and/or less healthy areas had lower rates of consults. This finding warrants further investigation to ensure rates of care provision are equitable.
- Continuity of care decreased slightly but not significantly over time.

Introduction

This chapter provides a number of indicators of the use of physician and nurse practitioner services by residents of Manitoba. In this report, service use is allocated to the area of a patient's residence, regardless of where the service was provided. For example, if a resident of Northern RHA visits a physician in Winnipeg, it would be counted as a visit for a Northern resident. Similarly, if a nurse practitioner normally based in Winnipeg provides services in Prairie Mountain Health, these are counted as services provided to Prairie Mountain Health residents.

The primary indicator of visits to physicians and nurse practitioners is called 'ambulatory visits'; it captures the vast majority of all contacts with physicians and nurse practitioners. Ambulatory visits include visits to providers' offices/clinics, visits to walk–in clinics, home visits, nursing home visits, visits provided in outpatient departments of hospitals, and visits for prenatal care. The only exclusions are visits provided while a patient is admitted to hospital and emergency department visits (because of limitations in the data system).

'Ambulatory consultations' are a subset of ambulatory visits which occur when a physician refers a patient to another physician (usually a specialist

or surgeon) because of the complexity, obscurity, or seriousness of the patient's condition or when the patient requests a second opinion. A consultation (or consult) is the first visit to the specialist, after which the patient usually returns to their family physician for continuing care. The consultation rate is used as an indicator of access to specialist care.

The indicators in this chapter include visits to all licensed medical doctors and nurse practitioners for which claims were submitted to Manitoba Health (via the usual fee-for-service claims or shadow billing claims). Most physicians working under alternative payment schemes (e.g., salary) are encouraged to submit shadow billing claims, but because these data may not be complete, our results may underestimate true visit rates. Analyses in a previous MCHP report suggest that shadow billings appear to be missing for about one-third of all visits provided by salaried physicians [14].

Residents of some First Nation communities (primarily but not exclusively in Northern RHA) often have ambulatory visit rates that are lower than expected because local nursing stations (Figure 1.9) provide the majority of their primary care visits, and that care is not tracked in the medical claims database. Therefore, the ambulatory visit rate is an underestimate of the total amount of care received by these residents.

5.1 Use of Physician and Nurse Practitioner Services

Definition: The percent of residents (all ages) who had at least one ambulatory visit with a physician or a nurse practitioner in a fiscal year. Ambulatory visits include virtually all contacts with physicians and nurse practitioners, except during inpatient hospitalization and emergency department visits (see Introduction). Values were calculated for 2011/12 and 2016/17, and were age- and sex-adjusted to the Manitoba population in 2011/12.

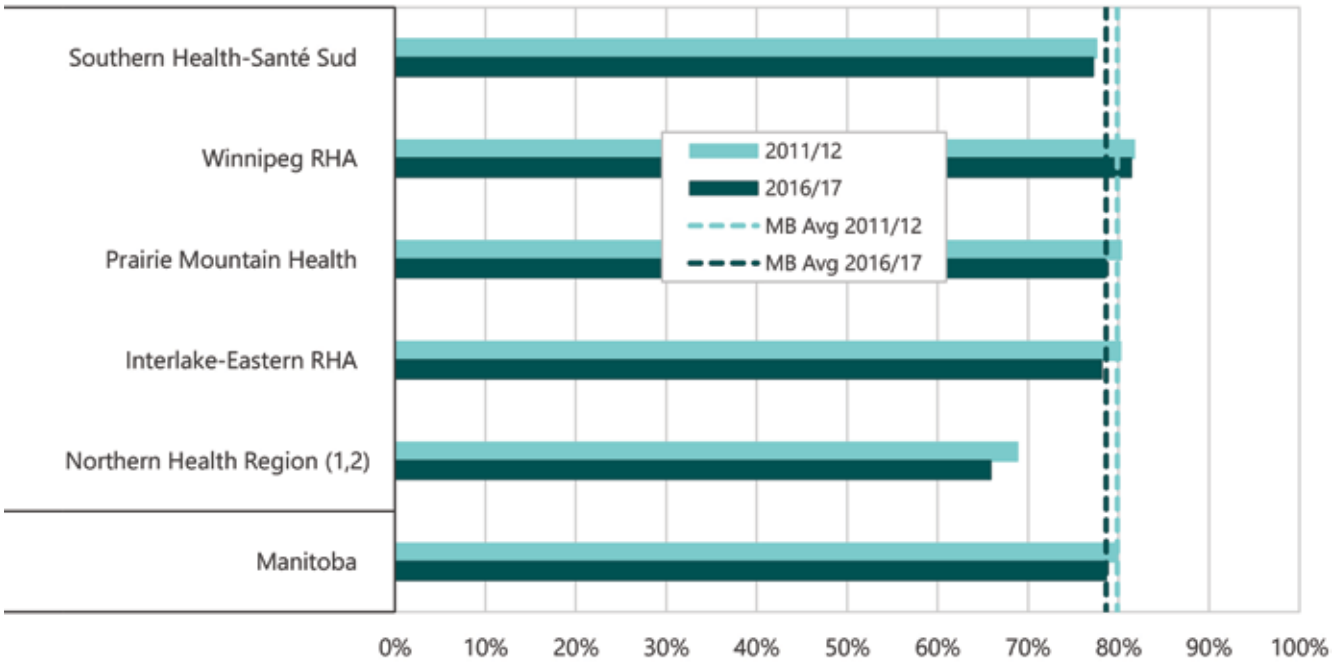
Key Findings

- The percent of residents with at least one visit to a physician or nurse practitioner was stable over time; the slight decrease from 79.9% to 78.7% was not statistically significant. This trend was reflected in all regions.
- Physician/nurse practitioner visit rates were not associated with premature mortality at the regional, district, or Winnipeg NC level.
- Residents of Northern RHA had lower than average rates in both years. However, as described above, this is largely driven by the fact that many residents receive much of their primary care from nurses in local nursing stations. This care is not captured in the medical claims data system. Therefore, these results must be interpreted with caution.
- Use of physician and nurse practitioner services was significantly related to income in rural areas in 2016/17: the percent of residents with at least one visit was lower for residents of lower income areas. A similar trend appeared in 2011/12, but it was not statistically significant.
- In urban areas, there was no relationship between income and visits to physicians and nurse practitioners.

Comparisons to Previous Findings

- These results are similar to those shown in previous Atlas reports: there has been a slow but steady decrease over time from 84% in 1995/96 to 79% in 2016/17 [1,2]. However, comparing rates over time are complicated by two changes in the data system:
  - Data in earlier years included some visits to emergency departments, which are no longer included in the definition of this indicator
  - As of 2005, visits to nurse practitioners are also included in the medical claims data system. Visits to NPs comprise a small but growing percent of visits (0.8% in 2010/11, and 1.4% in 2016/17).

Figure 5.1: Use of Physician and Nurse Practitioner Services by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of residents (all ages) with at least one ambulatory visit in the year



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5.2 Ambulatory Visits to Physicians and Nurse Practitioners

Definition: The average number of visits to physicians and nurse practitioners per resident (all ages) in a given year. Ambulatory visits include almost all contacts with nurse practitioners and physicians (family physicians and specialists): regular office visits, walk-in clinic visits, home visits, nursing home visits, and visits to outpatient departments. Services provided to patients while admitted to hospital and emergency department visits are excluded. Average rates were calculated for 2011/12 and 2016/17 and were age- and sex-adjusted to the Manitoba population in 2011/12.

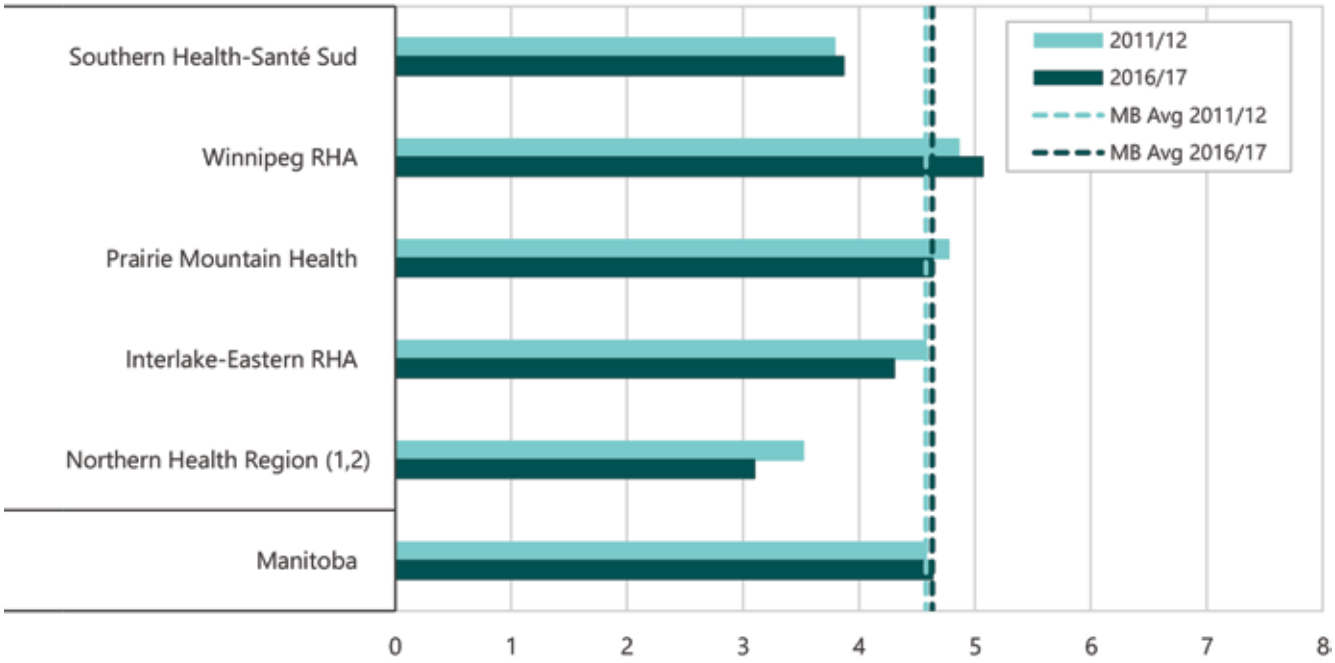
Key Findings

- Overall, the rate of ambulatory visits increased slightly but not significantly over time from 4.58 to 4.63 visits per person per year. Some regions had small increases and others had small decreases but none of the changes were significant.
- Residents of Northern RHA had lower than average rates in both years. However, as described above, this is largely driven by the fact that many residents receive much of their primary care from nurses in local nursing stations. This care is not captured in the medical claims data system. Therefore, these results must be interpreted with caution.
- Visit rates do not appear to be associated with premature mortality across regions, Districts, or Winnipeg NCs.
- There was large variation in visit rates across districts of rural regions, from under two to over seven visits per year. There was much less variation across NCs in Winnipeg.
- The relationships between income and ambulatory visit rates were not statistically significant in urban or rural areas.

Comparisons to Previous Findings

- The results shown here are similar to those shown in previous Atlas reports, which have also shown decreases over time, though most were not statistically significant [1,2].
- Visit rates appear to have decreased from about 5 per year in the year 2000/01, to about 4.6 in 2016/17 [2], but changes to the indicator definition mean this decrease must be interpreted with caution. A significant portion of the decrease (seen between the mid and late 2000s) was due to the exclusion of visits to emergency departments, which was necessary because of the inconsistency in reporting of emergency department visits in medical claims files.

Figure 5.2: Ambulatory Visit Rate by RHA, 2011/12 and 2016/17
Age- and sex-adjusted rate of ambulatory visits to physicians and nurse practitioners per resident (all ages)



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5.3 Ambulatory Visits by Age and Sex

Definition: The average number of visits to physicians and nurse practitioners by resident age and sex. Crude average rates were calculated for 2011/12 and 2016/17.

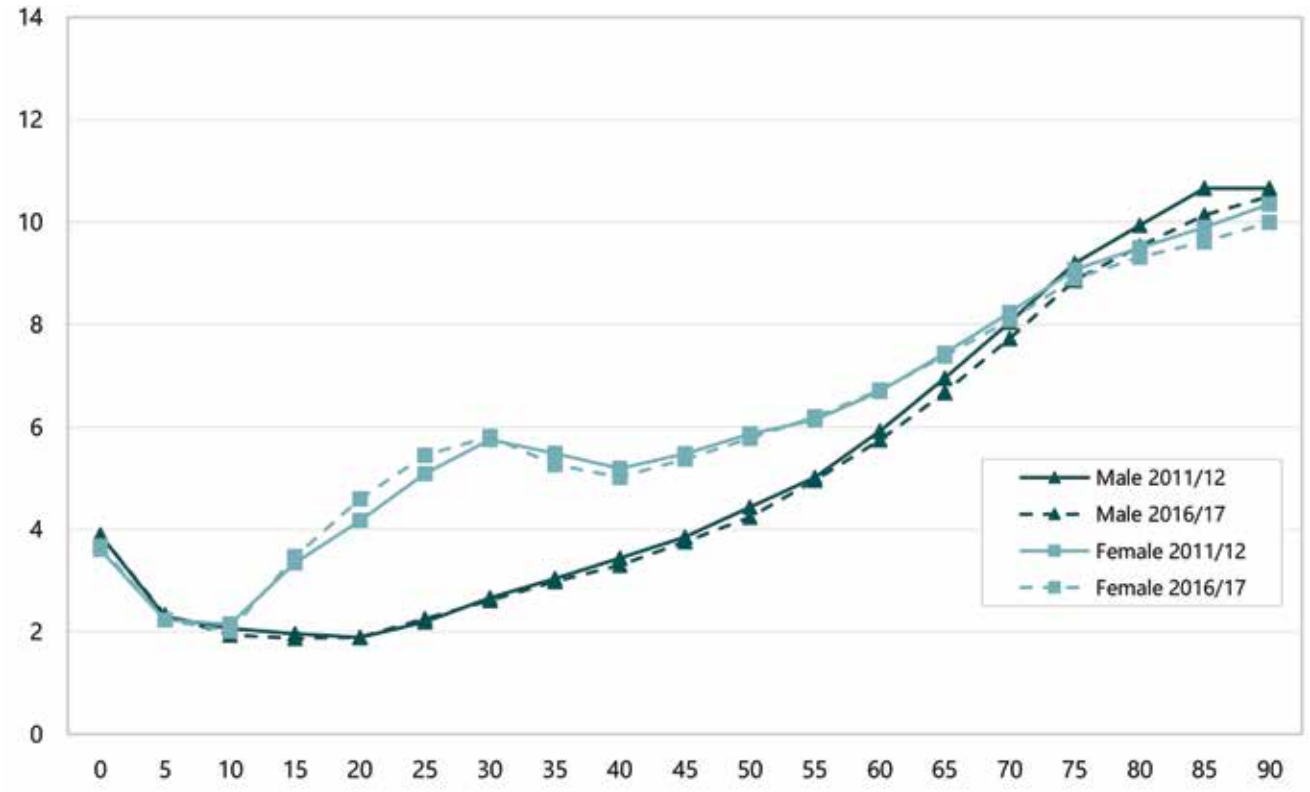
Key Findings

- For males, visit rates in both years were elevated for infants and young children (0 to 4 years), then decreased as the children entered later childhood and young adulthood. From age 20 onward, visit rates increased steadily with age to their peak among the oldest age groups.
- For females, visit rates in both years were elevated for infants and young children, decreased in middle childhood, but then increased sharply in adolescence and into the child-bearing years. Rates decreased slightly from age 30 to 40, then gradually increased with age thereafter, reaching their peak in the oldest age groups.
- There were small differences across health regions (see online supplement), but the overall pattern and trends were similar to the Manitoba results shown.

Comparison to Previous Findings

- These results are very similar to those shown in previous Atlas reports. The basic pattern has been remarkably consistent over time with only slight variation across regions [1,2].

Figure 5.3: Ambulatory Visit Rates by Age and Sex (all Manitoba), 2011/12 and 2016/17
Crude average annual rate of ambulatory visits to physicians and nurse practitioners per resident



5.4 Causes of Ambulatory Visits

Definition: The most common reasons for ambulatory visits to physicians and nurse practitioners are reported for fiscal years 2011/12 and 2016/17. Each visit has only one diagnosis code recorded as the 'cause' for the visit, and these diagnoses were grouped by ICD–9–CM chapter. The most common causes are shown for each RHA and the province overall (shown as crude percent).

Note regarding two key categories:

- Health status and contact: the majority of visits in this category were for general physical examinations, but also include a number of other issues like well-baby care, contraceptive management, and other examinations. For these visits, patients usually were not presenting for a problem related to a specific disease or condition.
- Ill-defined conditions: the majority of visits in this category were for chest and respiratory symptoms, abdominal and pelvic symptoms, and general symptoms. For the majority of these visits, the patient was experiencing a specific problem, but it could not be assigned to a specific disease category.

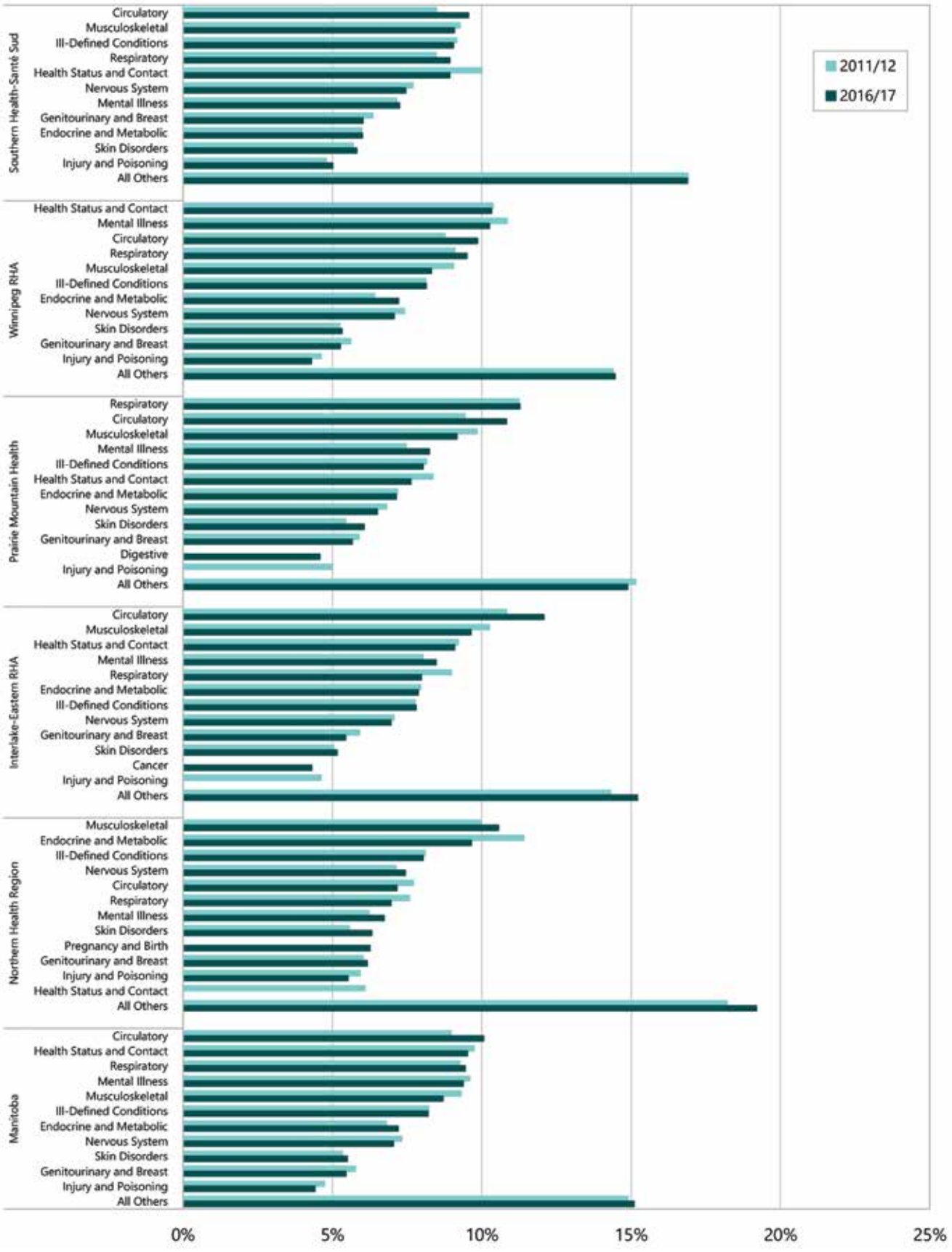
Key Findings

- The diagnoses made during physician and nurse practitioner visits were spread across many diseases at nearly equal percents for the top five or six conditions. Therefore, even though the rankings appear different across regions and time periods, few major differences were found.
- The exclusion of visits to emergency departments (because of inconsistent coding across regions and over time) means that the rankings for 'Injury and Poisoning' are lower than they should be in all regions (many visits to emergency departments are for reasons of Injury and Poisoning, but they are not all coded into the database). This exclusion affects rates for other causes as well, but to a lesser extent.
- There were some differences for Northern RHA residents:
  - Endocrine and metabolic disorders had higher rankings, which seems logical because of the higher prevalence of diabetes among Northern residents (see Chapter 4).
  - The previously mentioned exclusion of emergency department visits considerably reduced the number of visits for Injury and Poisoning. Without this change, Injury and Poisoning would have ranked much higher (likely #3 or #4).
  - These rankings are also strongly affected by the fact that much primary care is delivered in nursing stations, and most of those services are not entered into the medical claims database.
- In both time periods, visits for mental illness were higher-ranking in Winnipeg than in any other region. Part of this could be related to the fact that some patients with severe mental illness move to Winnipeg to be close to essential services.

Comparison to Previous Findings

- These results are very similar to those shown in the 2013 Atlas [1].

Figure 5.4: Most Common Causes of Ambulatory Visits by RHA, 2011/12 and 2016/17
Percent of all visits to physicians and nurse practitioners (all ages)



5.5 Ambulatory Consultation Rates

Definition: The average number of ambulatory consultations per resident (all ages) in a given year. Consultations are a subset of ambulatory visits: they occur when one provider refers a patient to another provider (usually a specialist or surgeon) because of the complexity, obscurity, or seriousness of the patient's condition or when the patient requests a second opinion. Referrals can originate from physicians, nurses, or other allied health professionals, and can be to physicians or nurse practitioners. The consult rate is the best indicator of access to specialty care. See the online supplement for further details. Rates are shown for 2011/12 and 2016/17 and are age- and sex-adjusted to the Manitoba population in 2011/12.

Note: In prior reports, nurse practitioner visits were not included in ambulatory visit counts/rates [1,2]. Tariff codes 8622, 8107, 8108, 8140, 8620, and 8139 were added for this report.

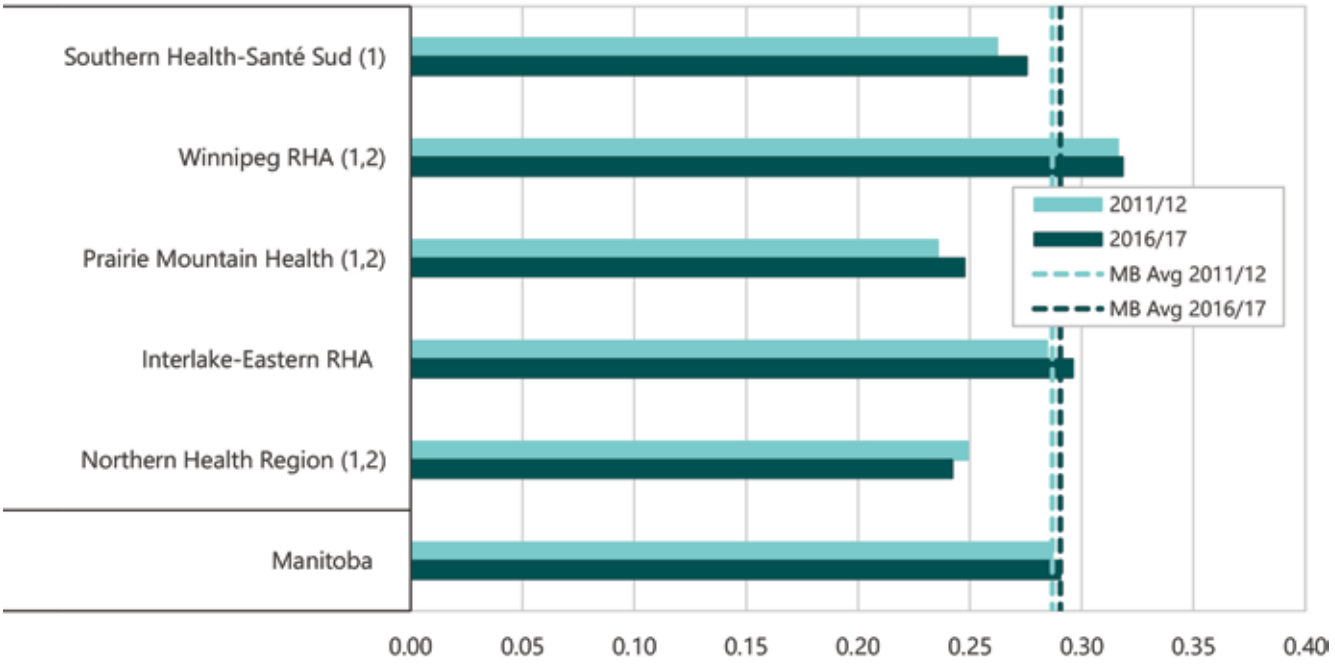
Key Findings

- The average number of consultations per resident per year increased slightly, but the difference did not reach statistical significance. An increase was seen in all regions except Northern.
- Rates were above average in Winnipeg, and lower than average in Prairie Mountain, Northern, and Southern (2011/12 only).
- Consultation rates do not appear to be associated with premature mortality at the regional, District, or Winnipeg NC levels.
- Consultation rates were significantly related to income in both urban and rural areas, in both time periods: residents of lower income areas had fewer consultations than those in higher income areas.
    - This trend is opposite of what might be expected in a universal needs-based healthcare system: given that residents of lower income areas have poorer health status and higher levels of chronic disease, it would be expected that they would have higher consultation rates than high-income residents.
- The data reported here do not reveal whether these differences are brought about by differences in the rate at which referrals are recommended, or the rate at which they actually get attended, or both. Either way, these results warrant further investigation, as it would be better if residents in poorer health had higher visit rates.

Comparison to Previous Findings

- These results are very similar to and extend those in previous Atlas reports [1,2].

Figure 5.5: Ambulatory Consultation Rate by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of consults (first referral) per resident (all ages)



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t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

5.6 Continuity of Care Index

Definition: The Continuity of Care Index weighs both the frequency of ambulatory visits to primary care providers (which includes both family physicians and nurse practitioners) and the dispersion of visits among different providers. The possible index values range from zero (if all visits are made to different providers) to one (if all visits are made to a single provider). Residents with fewer than three ambulatory visits over the three-year period were excluded. Values were calculated for 2009/10–2011/12 and 2014/15–2016/17, and were age- and sex-adjusted to the Manitoba population in the first time period.

Note: this definition is quite different from that used in previous reports (more information below).

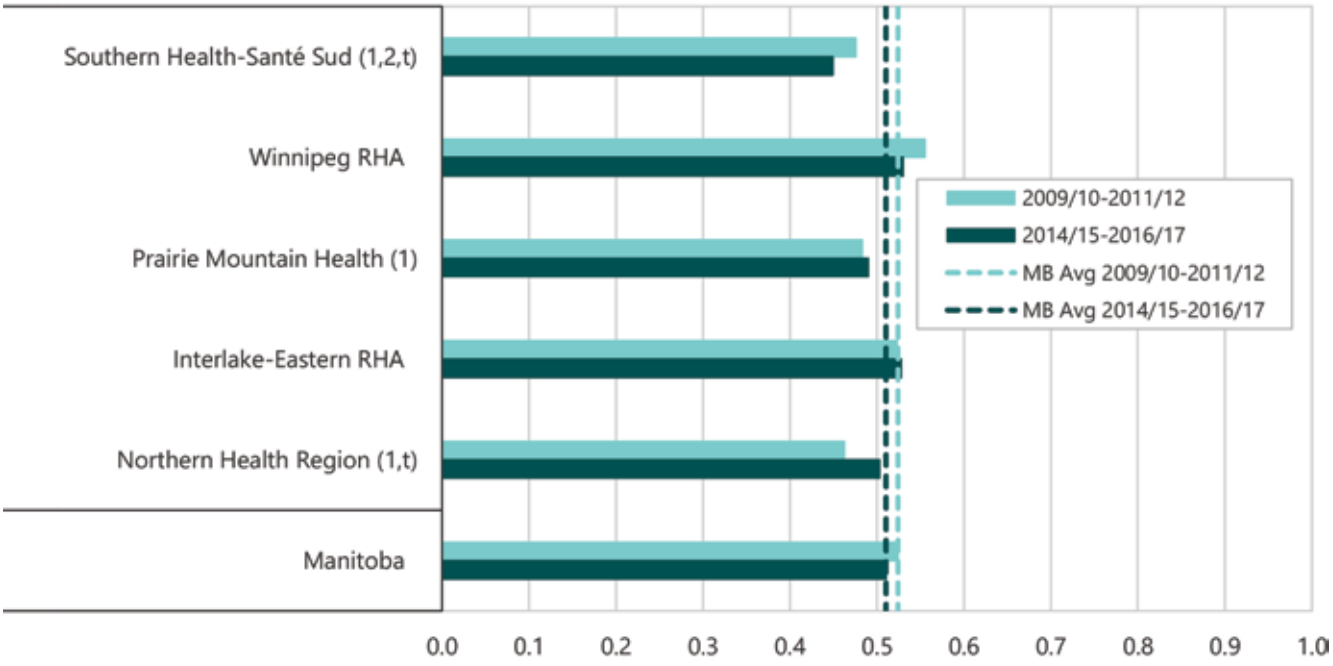
Key Findings

- For Manitoba overall, continuity of care decreased slightly but not significantly over time, though the results varied across regions:
  - Southern had lower than average continuity of care and a significant decrease over time.
  - Winnipeg had slightly higher than average continuity of care and a slight decrease over time, but neither of these differences were statistically significant.
  - Prairie Mountain and Northern had rates below the provincial average in the first time period, though Northern had a significant increase over time – bringing it to just below the provincial average.

Comparisons to Previous Findings

- Previous Atlas reports provided results for continuity of care, but it was calculated quite differently from the newer Continuity of Care Index. The previous indicator reported the percent of residents who received more than 50% of their visits from a single provider [1,2]. The newer index accounts for both the number of providers seen and the distribution of visits among those providers.
- Despite these differences in calculation, the overall pattern of continuity of care across RHAs is similar to that seen in previous Atlas reports [1,2].
- That said, there are some differences in the results, which may reflect the fact that the new index captures visit patterns differently than the previous measure [1,2]. (For example, the previous indicator applied to the current data in Northern RHA would have shown no change over time, whereas the new indicator shows a significant increase over time.)

Figure 5.6: Continuity of Care Index by RHA, 2009/10-2011/12 and 2014/15-2016/17
Age- and sex-adjusted index values (all ages)



1 indicates area's index value was statistically different from Manitoba average in first time period
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5.7 Location of Visits to Family Physicians and Nurse Practitioners

Definition: The percent of ambulatory visits made by residents to family physicians (FPs) or nurse practitioners (NPs) in the patient's home RHA district ('in district'), elsewhere in their home RHA, in another RHA, or in Winnipeg. For each month, every FP and NP in Manitoba is assigned to the area (RHA district) from which the majority of their patients came. Each visit they had that month is then deemed to have taken place that area. For Winnipeg residents, all visits received within the city were called 'in district.' Only visits made by Manitoba residents within Manitoba were included. Crude values are shown for 2011/12 and 2016/17.

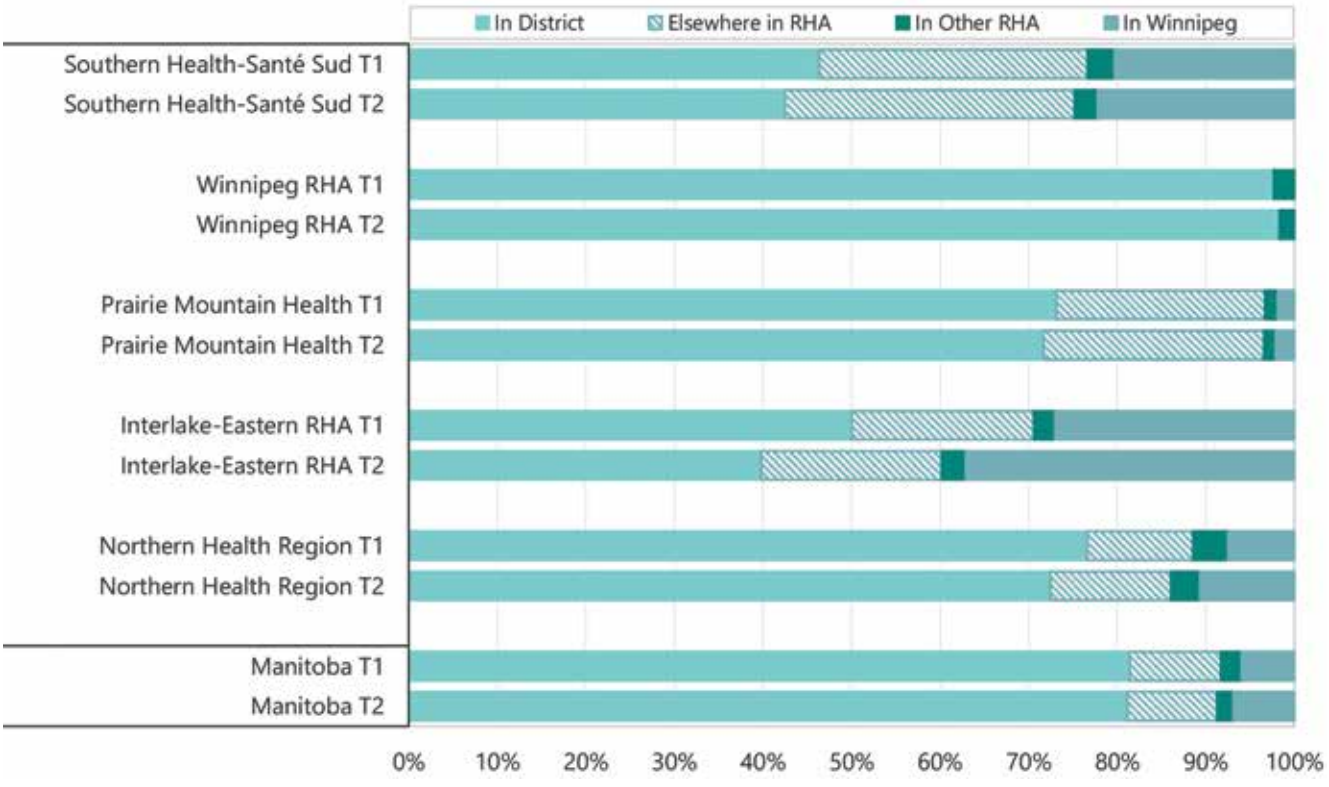
Key Findings

- For Manitoba, over 80% of all visits in both time periods occurred in the district where the patient lived, though this was strongly affected by the high values for Winnipeg.
- Among non-Winnipeg residents, there was a slight increase in the percent of visits received in Winnipeg. This was most prominent in Interlake-Eastern, followed by Northern and Southern regions; the impact was minimal in Prairie Mountain.
- Results varied dramatically across regions, though there were similarities between Southern and Interlake-Eastern residents:
  - Southern and Interlake-Eastern residents made under 50% of their visits within their home district with a significant portion outside their home district but within the RHA. Winnipeg was a major influence for residents of both regions, likely reflecting the fact that many residents of these regions get care in the city because they live close to, work in, or regularly visit the city.
- Residents of Prairie Mountain and Northern received over 70% of their visits in their home district, but their patterns diverged after that:
  - In Prairie Mountain, residents received another 20% elsewhere in the region (primarily Brandon), and a small percent in other RHAs and in Winnipeg.
  - In Northern, residents received about 10% of their visits elsewhere in their RHA (primarily Thompson) and about 10% in Winnipeg.

Comparisons to Previous Findings

- The overall results are very similar to those shown in previous Atlases, though the results for each RHA vary somewhat from year to year [1,2].
- The addition of nurse practitioner visits to this indicator had limited impact, as they comprised less than 1% of visits in 2011/12, and 1.4% of visits in 2016/17.

Figure 5.7: Location of Visits to Family Physicians and Nurse Practitioners by RHA, 2011/12 and 2016/17
T1 = 2011/12 T2 = 2016/17



Chapter 6: Quality of Primary Care

Key Findings in Chapter 6

The results in this chapter reveal a mixed picture regarding the quality of primary care received by Manitobans:

- Rates of recommended physician follow-up after new prescriptions for antidepressants decreased over time.
- Appropriate asthma care rates did not change over time.
- Rates of eye examinations among residents with diabetes increased over time, whereas rates of appropriate beta-blocker prescriptions decreased among heart attack patients.
- Potentially inappropriate use of benzodiazepines among older adults decreased, both among those living in nursing homes and those living in community settings.

Introduction

This chapter contains a number of indicators of the quality of primary care received by Manitoba residents. The indicators were adapted from MCHP's 2004 report "Using Administrative Data to Develop Indicators of Quality in Family Practice" [15], with some revisions and updated data.

Because all of the indicators in this chapter relate to quality of care, we present crude rates rather than adjusted rates; good quality care should be provided to all patients who meet the criteria for treatment, regardless of age. (For most other indicators in this report, adjusted rates are used because many health conditions and health services are more common among older residents, so rates for different areas cannot be fairly compared without accounting for differences in age structure of local populations.)

6.1 Antidepressant Prescription Follow-Up

Definition: The percent of residents (all ages) with a diagnosis of depression (ICD–9–CM codes 296 or 311) and a new dispensation of antidepressants (ATC class N06A) who had at least three family physician or nurse practitioner visits within four months of the prescription being filled. The crude percent was calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17.

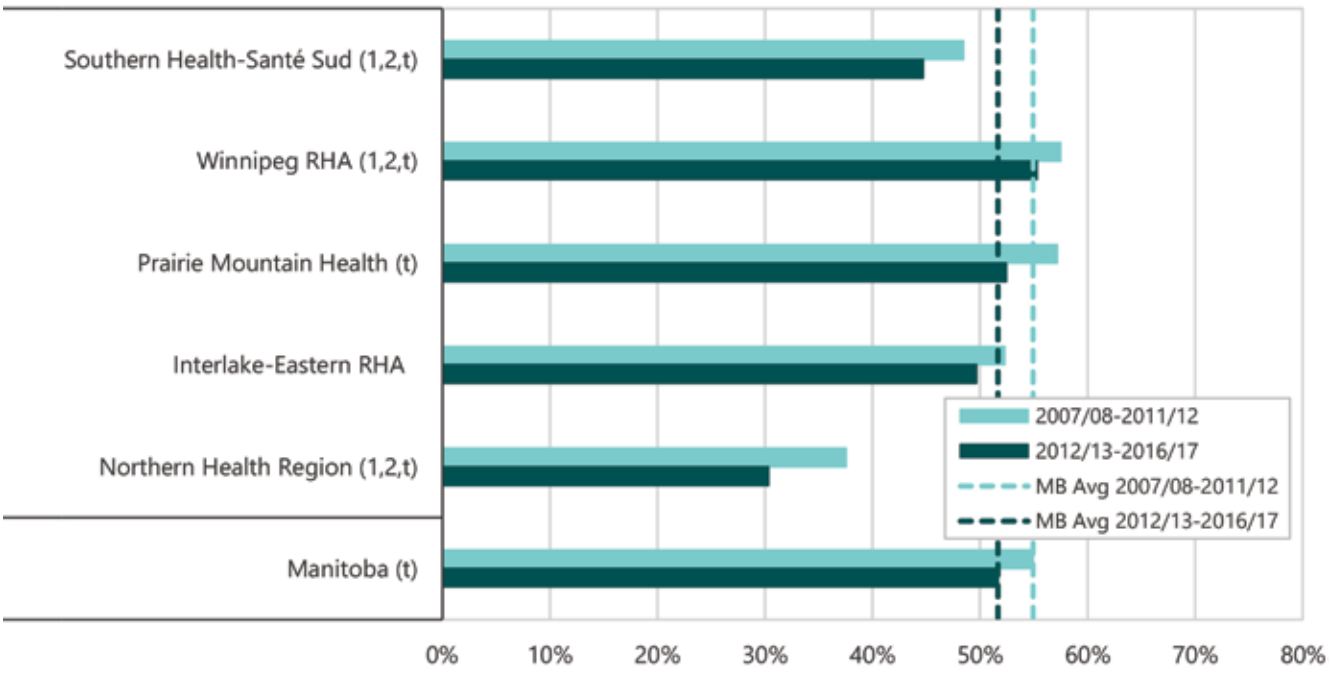
Key Findings

- The rate of antidepressant prescription follow-up decreased over time from 54.9% to 51.7%. Rates decreased in all regions of Manitoba, though the decrease in Interlake-Eastern was not statistically significant.
- There was relatively little variation in rates across regions, and no clear relationship between antidepressant follow-up and PMR at the regional, district, or Winnipeg NC level.
- Northern had the lowest rates of follow-up, but this finding should be interpreted with caution given previously mentioned challenges with data regarding primary care visits for residents of Northern RHA (see Chapter 5).
- Relationships with income were modest, though in rural areas there were significantly higher rates of follow-up among residents of higher income areas in both time periods.

Comparison to Previous Findings

- The values shown here are consistent with and extend those shown in previous Atlas reports, showing the continuing decrease in the percent of residents who receive recommended medical follow-up after antidepressant prescription [1,2].

Figure 6.1: Antidepressant Prescription Follow-Up by RHA, 2007/08-2011/12 and 2012/13-2016/17
Crude percent of residents (all ages) with a new dispensation of antidepresseants who visited a physician 3+ times in four months



1 indicates area's rate was statistically different from Manitoba average in first time period
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6.2 Asthma Care: Controller Medication Use

Definition: The percent of residents (all ages) being treated for asthma and receiving medications recommended for long-term control of their disease. Asthma was defined by two or more dispensations of beta 2-agonists (ATC codes R03AA, R03AB, or R03AC). Recommended long-term controller medications included inhaled corticosteroids (ATC R03BA), leukotriene modifiers (ATC code R03DC), or adrenergics and other drugs for obstructive airway diseases (ATC code R03AK). Patients receiving ipratropium bromide (ATC codes R01AX03, R03AK04, or R03BB01) were excluded as likely chronic obstructive pulmonary disease patients. Crude rates were calculated for 2011/12 and 2016/17.

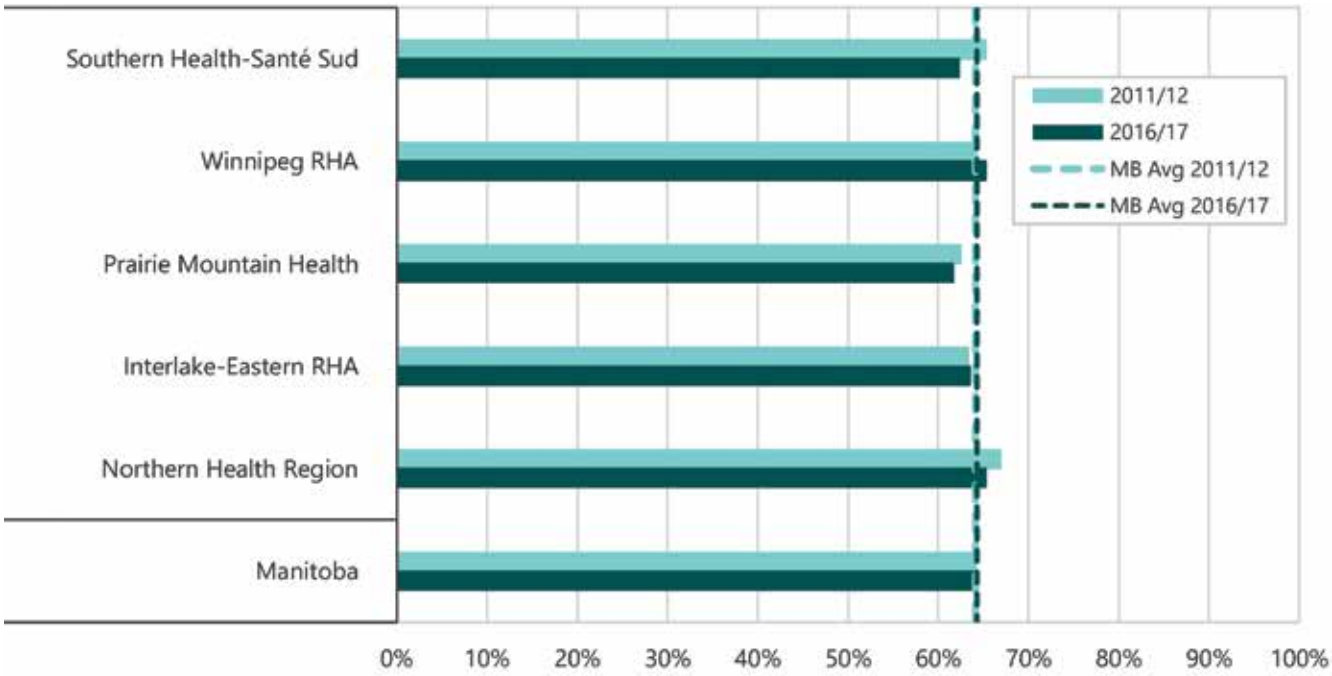
Key Findings

- There was no change in the percent of Manitoba residents with asthma filling the prescriptions recommended for long-term control (64%). This stability was reflected in all regions.
- There was remarkably little variation across regions and Winnipeg NCs, and relatively little variation across the districts of rural regions.
- There was no relationship between asthma care and premature mortality at the regional, district, or NC level.
- In both rural and urban areas and in both time periods, residents of higher income areas had higher rates of recommended care, though the trend in rural areas did not reach statistical significance in the first time period (p=0.052).

Comparison to Previous Findings

- The results shown here are consistent with those shown in the 2013 Atlas, which also showed no change over time [1]. The 2009 report showed some improvement from the early to the mid-2000s, but rates have remained near 64% since 2005 [2].

Figure 6.2: Asthma Care: Controller Medication Dispensations by RHA, 2011/12 and 2016/17
Crude percent of residents (all ages) treated for asthma who filled at least one dispensation of inhaled steroids



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6.3 Diabetes Care: Eye Examinations

Definition: The percent of residents age 19 and older with diabetes who had an eye exam in a given year, as defined by a visit to an ophthalmologist or an optometrist. Diabetes was defined as described in Chapter 4. Crude percent was calculated for 2011/12 and 2016/17.

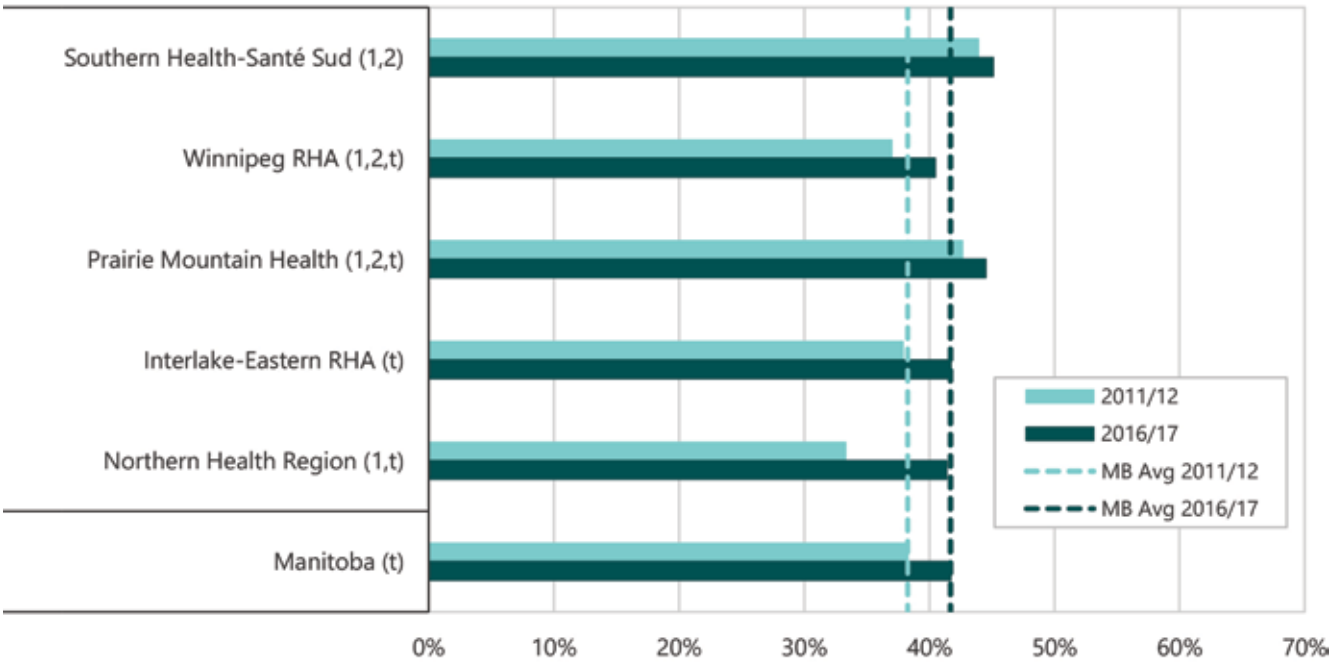
Key Findings

- The percent of residents with diabetes receiving an eye exam increased over time from 38.7% to 41.7%. Rates increased significantly in all regions.[3]
- Eye exam rates do not appear to be related to premature mortality at the regional, district or Winnipeg NC levels.
- Relationships with income showed significant inverse trends for both urban and rural residents in both time periods: residents of lower income areas had lower eye exam rates. The differences are modest, but these results warrant further investigation, as they may signal problems with access to medical care among lower-income residents with diabetes.

Comparison to Previous Findings

- These results are consistent with and extend the findings of previous Atlas reports, reflecting the continuing increase over time in eye exam rates among residents with diabetes [1,2].

Figure 6.3: Diabetes Care: Eye Examinations by RHA, 2011/12 and 2016/17
Crude percent of residents age 19+ with diabetes who had an eye examination



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3 It is possible that a portion of this increase may be due to improved data collection. When routine eye exams were de-insured years ago, patients with diabetes were exempted, so the exam remained an insured service for those patients. However, not all patients and physicians were aware of this, so some may have received the care but paid for it privately. In such a case, a medical claim would not have been submitted to Manitoba Health, and that file is the data source for this indicator. If more patients and physicians became aware of the continued coverage, then the claims may have increased over time, increasing rates for this indicator, even though actual care patterns may not have changed.

6.4 Post-AMI Care: Beta-Blocker Dispensations

Definition: The percent of residents age 20 and older hospitalized for acute myocardial infarction (AMI: ICD–9–CM code 410, ICD–10–CA code I21) who filled at least one prescription for a beta-blocker (ATC C07AA, C07AB) within four months of hospital discharge. Patients with a hospitalization for an AMI in the three years prior to the index AMI hospitalization were excluded. Patients with a diagnosis of asthma, chronic obstructive pulmonary disease, or peripheral vascular disease (coding details in the online supplement) were also excluded, because beta-blockers should not be used by those patients. Crude percent was calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17.

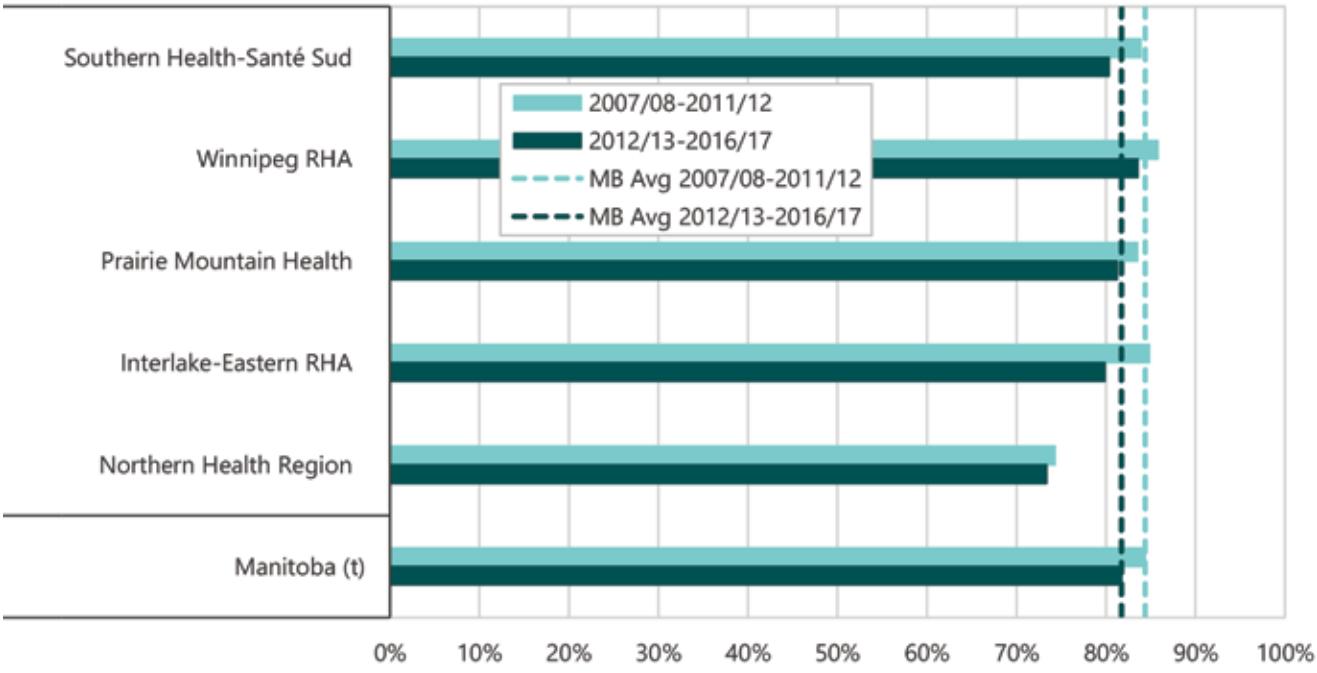
Key Findings

- The percent of AMI patients receiving recommended beta-blocker dispensations decreased slightly over time from 84.4% to 81.7%. Rates decreased in all regions, though none of the individual regional decreases was statistically significant.
- There was very little variation across regions, and no relationship with premature mortality at the regional, district, or Winnipeg NC level.
- There were no significant relationships between beta-blocker dispensation rates and income in urban or rural areas, though residents of lower income rural areas had somewhat lower rates than higher income rural residents, particularly in the second time period.

Comparison to Previous Findings

- The values shown here suggest a small decrease in beta-blocker use among AMI patients, contrasting with results from previous Atlas reports that showed stable (2013) and increasing (2009) rates [1,2].

Figure 6.4: Post-AMI Care: Beta-Blocker Dispensations by RHA, 2007/08-2011/12 and 2012/13-2016/17
Crude percent of residents age 20+ with a hospitalization for AMI who filled a prescription for a beta-blocker within four months



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6.5 Benzodiazepine Dispensations for Community-Dwelling Older Adults

Definition: The percent of residents age 75 and older living in the community (i.e., not in a personal care home) who filled at least two prescriptions for benzodiazepines (ATC codes N05BA, N05CD, N05CF, and N03AE01) or at least one dispensation of benzodiazepines with a greater than 30 day supply dispensed. Use of benzodiazepines is not recommended for older adults, so lower rates are considered better. Crude percent was calculated for two five-year periods: 2010/11–2011/12 and 2015/16–2016/17.

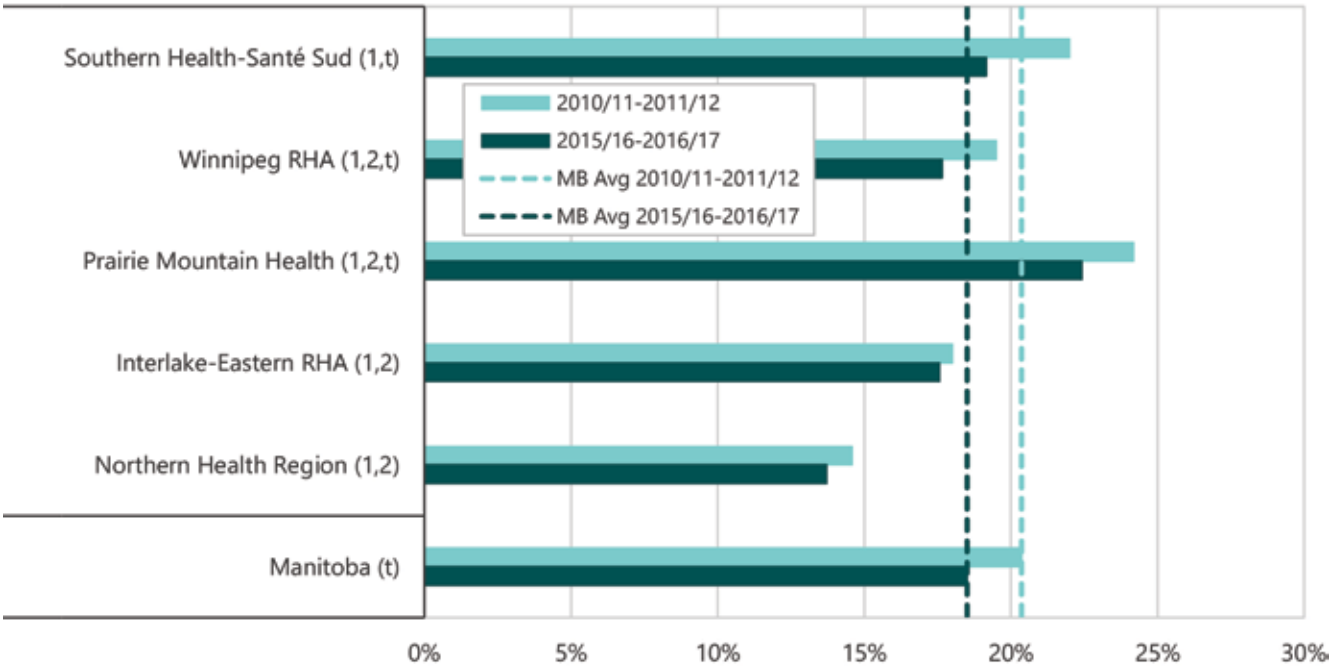
Key Findings

- Overall, the percent of community-dwelling older adults (age 75 and older) using benzodiazepines decreased over time from 20.4% to 18.5%. Decreases were seen in all regions, though in some the decrease was not statistically significant.
- There appears to be an inverse relationship with premature mortality at the regional level, with lower rates among regions that had higher PMR values. There was a similar trend among NCs in Winnipeg, but no visible trend among the districts of rural regions.
- There were significant inverse relationships between benzodiazepine use and income in both urban and rural areas: in lower income areas, a higher percent of seniors received the drugs (see online supplement).
    - The relationship was stronger and more stepwise among rural residents. In urban areas, the trend was largely driven by the higher rates among residents of the lowest income areas, whereas residents of the other urban quintiles had rates that were similar to each other.

Comparison to Previous Findings

- These results represent an improvement over the results shown in previous Atlas reports, which showed stable (2013) or increasing (2009) rates [1,2].

Figure 6.5: Benzodiazepine Dispensations for Community-Dwelling Older Adults by RHA, 2010/11-2011/12 and 2015/16-2016/17
Crude percent of residents age 75+ not living in a PCH with 2 dispensations or more than a 30-day supply



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6.6 Benzodiazepine Dispensations for Residents of Personal Care Homes (PCH)

Definition: The percent of PCH residents age 75 and older who filled at least two prescriptions for benzodiazepines (ATC codes N05BA, N05CD, N05CF, and N03AE01) or at least one dispensation of benzodiazepines with a greater than 30 day supply dispensed. PCHs with hospital-based pharmacies are excluded from this analysis as their prescription data were unavailable. Use of benzodiazepines is not recommended for older adults, so lower rates are considered better. Crude percent was calculated for two five-year periods: 2010/11–2011/12 and 2015/16–2016/17.

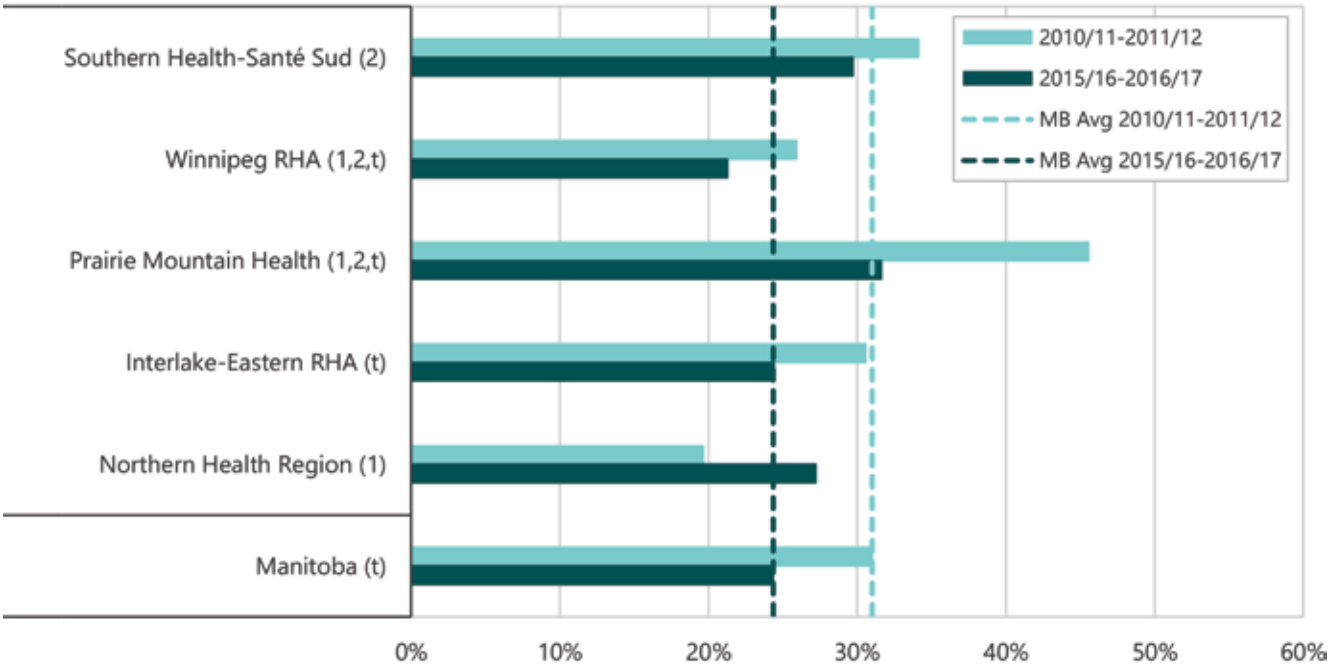
Key Findings

- Overall, the percent of PCH residents age 75 and older receiving benzodiazepines decreased significantly over time from 30.0% to 24.4%. Decreases were seen in all regions except Northern, which increased – though not significantly.
- Rates varied across regions: Winnipeg and Northern had lower than average rates, whereas Prairie Mountain and Southern had higher than average rates.
- There appears to be no relationship between benzodiazepine dispensations among seniors in PCH and premature mortality at the regional or CA level.

Comparison to Previous Findings

- The values shown here are consistent with and extend the findings of previous Atlas reports, showing a continuing decrease in benzodiazepine use over time [1,2].

Figure 6.6: Benzodiazepine Dispensations for Residents of Personal Care Homes by RHA, 2010/11-2011/12 and 2015/16-2016/17
Crude percent of residents age 75+ living in a PCH with 2 dispensations or more than a 30-day supply



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Chapter 7:
Hospital Services

Key Findings in Chapter 7

- Almost all of the indicators in this chapter show a decrease in the use of hospitals over time, though many of the decreases were not statistically significant.
- Together, the new indicators 'Hospital Days for Acute Care' and 'Hospital Days for Alternate-Level-of-Care' reveal that the vast majority of days of hospital care provided to Manitobans are for acute care: 77% of the more than 1 million patient-days of hospital care in 2016/17 were coded as acute care. That said, the rate of use of ALC days increased over time (though not statistically significantly).
- Results for all indicators in this chapter show that hospital care continues to be responsive to need: rates are higher in areas where population health status and income are lower.
- Analyses of the location of hospitalization of regional residents and the 'catchment' of regional hospitals show good and stable results: over 75% of all hospitalizations happen in the patient's home region, along with over 85% of their days of care. Similarly, over 75% of the hospitalizations, and over 85% of the days of hospital care provided by regional hospitals, are to patients from that region.
- The most common causes of inpatient hospitalization were spread across many disease categories and did not change much over time. Pregnancy and birth were the leading causes in all regions, followed by either circulatory diseases or digestive disorders, depending on the region. Analysis of days used revealed different rankings, as expected (e.g., hospitalization for child birth is common, but usually a very short number of days).

Introduction

This chapter provides a number of indicators of the use of acute care hospital services by residents of Manitoba: the number of hospitalizations, the number of hospital days, where these hospitalizations occurred, and the reasons for hospitalization. Service use is allocated to the area of residence of the patient, regardless of the location of the hospital. For example, if a resident of Southern uses a Winnipeg hospital, it would be counted as a hospitalization for a Southern resident. That said, the report also includes detailed results regarding where residents of each region were hospitalized.

Most of the indicators in this chapter are based on information taken from hospital discharge abstracts, which are created for each admission to hospital and day surgery procedure performed in Manitoba. These hospital analyses exclude care provided in nursing stations, personal care homes, and long term care facilities (e.g., Deer Lodge Centre and Riverview Health Centre in Winnipeg, and similar facilities in other regions).

Note: During 2005-2012, the Norway House hospital was not truly functioning as an acute care hospital because of changes in physician staffing. Therefore, it was excluded from the analyses in this chapter (as was done in the 2013 Atlas) [1].

For the hospital days analyses, two new indicators are presented in this report: Use of hospital days for acute care, and use of hospital days for alternate-levels-of-care (ALC). This represents an advance in our ability to separate acute from non-acute hospital care that has come about because of the relatively recent practice of identifying and coding ALC days in hospital. Previous reports attempted to estimate acute vs non-acute days using semi-arbitrary cutoffs intended to distinguish acute vs non-acute services (e.g., in the 2013 Atlas, stays less than 14 days were considered acute, sometimes called 'short stays', while stays 14 days or longer were considered chronic). However, the new system is more accurate in that many patients who experience long stays in hospital are truly acute at first (which itself can extend for many days in some cases), and only become non-acute later in their stay. That said, many still worry that not all days that patients spend as ALC actually get correctly documented by clinical staff, and coded into the data system. The rate of ALC days shown in this report likely underestimates the true level of use of hospital resources by ALC patients, to the extent that such care is not fully documented.

7.1 Use of Hospitals

Definition: The percent of residents who were admitted to an acute care hospital at least once in a fiscal year. Note that patients receiving day surgery (Section 7.4) are not included in this indicator (see the online supplement for further details). Values were calculated for 2011/12 and 2016/17, and were age- and sex-adjusted to the Manitoba population in 2011/12.

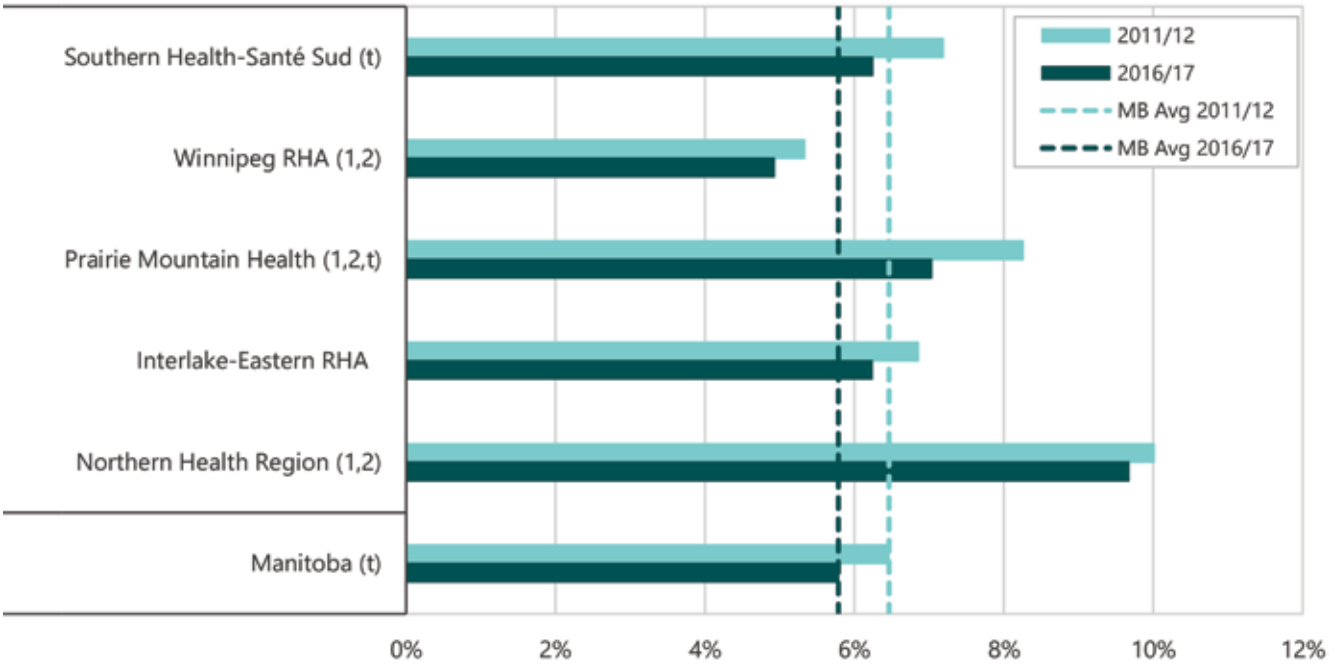
Key Findings

- The percent of residents hospitalized at least once in a given year decreased from 6.46% to 5.79%. All regions had decreasing values, but the magnitude of the change varied by region.
- Hospital use rates appear to be related to health status (premature mortality) at the regional level, though the relationship was not linear, mostly because of Winnipeg.
    - It is likely that geography and transportation systems also play a role: more residents of Northern live in remote areas without ready access to hospitals, so they are more likely to be admitted to (and stay longer in) hospitals than those living in areas with easier access to hospitals.
- There were large differences in hospitalizations across RHAs from 5% of Winnipeg residents to just under 10% of Northern residents (in 2016/17).
- In rural regions, rates were particularly low in some districts of Southern and Interlake-Eastern, several of which are relatively close to Winnipeg. Rates were higher in most districts of Northern RHA.
- There was also substantial variation among NCs in Winnipeg, from under 4% to over 11%, though most NCs were below the provincial average.
- Hospital use rates were strongly related to income in urban and rural areas in both time periods: a higher percent of residents of lower income areas were hospitalized at least once (see online supplement).
- Rural residents were considerably more likely to have been hospitalized than urban residents.

Comparison to Previous Findings

- The values shown here are consistent with and extend the findings of previous Atlas reports, showing a continuing reduction over time in the percent of residents admitted to a hospital at least once in a given year [1,2].

Figure 7.1: Use of Hospitals by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of residents (all ages) with at least one inpatient hospital stay per year



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7.2 Inpatient Hospitalization

Definition: The total number of inpatient hospital separations per 1,000 residents per year. In any given period, a resident could be hospitalized more than once, so this indicator shows the total number of hospitalizations from acute care facilities by all residents of the area. See the online supplement for further details. Rates were calculated for 2011/12 and 2016/17 and were age- and sex-adjusted to the Manitoba population in 2011/12.

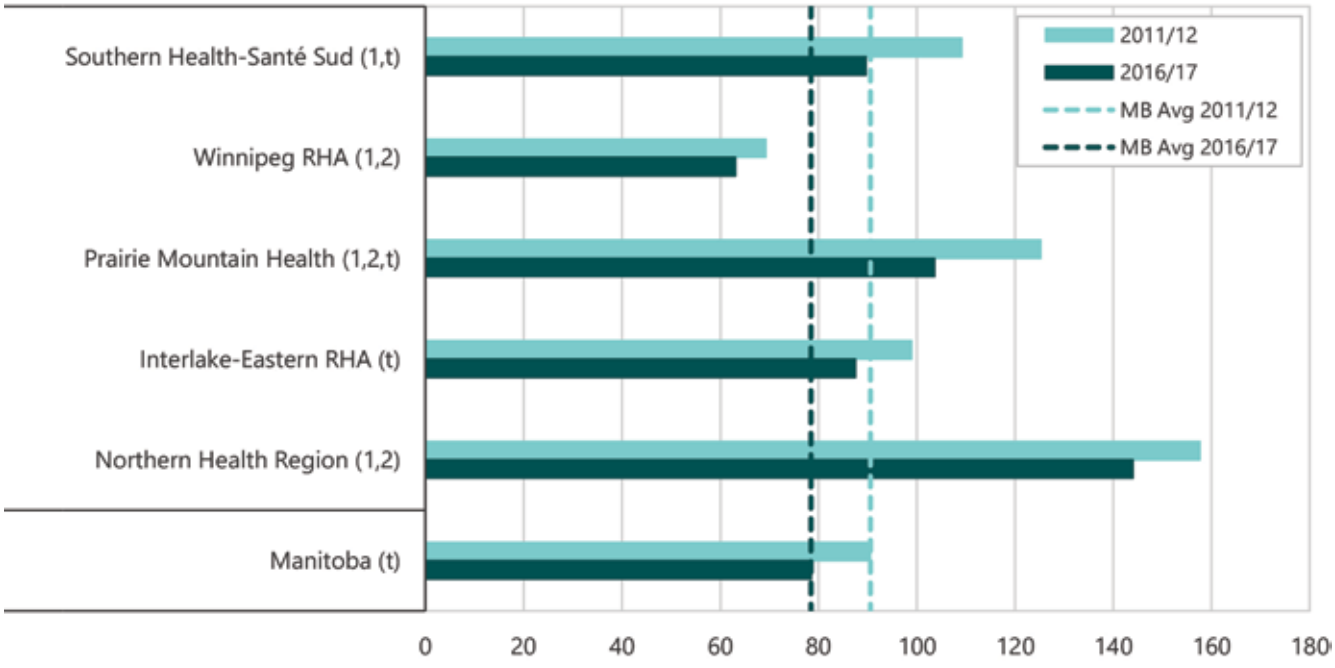
Key Findings

- The overall inpatient hospitalization rate decreased significantly over time from 90.6 to 78.4 per 1,000 residents per year.
- Hospitalization rates appear to be related to health status (premature mortality) at the regional level, though the relationship was not linear, mostly because of the very low rate for Winnipeg.
    - It is likely that geography and transportation systems also play a role: more residents of Northern live in remote areas without ready access to hospitals, so they are more likely to be admitted to hospital than those with easier access to acute care facilities.
- In each rural region, there were at least one or two districts with particularly high rates. In Northern, most districts had high rates.
    - These results correspond with health status, in that the areas with high hospitalization rates were also those where residents had poorer health status and higher disease prevalence – suggesting that hospital care is logically related to population health.
- Winnipeg residents had substantially lower hospitalization rates than residents of any other region, though rates varied considerably across NCs.
- Inpatient hospitalization rates were very strongly related to income in urban and rural areas in both time periods: residents of lower income areas had much higher hospitalization rates than residents of higher income areas (see online supplement).

Comparisons to Previous Findings

- The results shown here are consistent with and extend those shown in previous Atlas reports: there has been a steady decline in inpatient hospitalization rates over many years [1,2].
- Part of this might be related to the increase in the rates of day surgery, as many procedures which used to require hospitalization are now done as outpatient procedures

Figure 7.2: Inpatient Hospitalization Rate by RHA, 2011/12 and 2016/17
Age- and sex-adjusted rate of hospitalizations per 1,000 residents (all ages)



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7.3 Causes of Inpatient Hospitalization

Definition: The most common reasons for inpatient hospitalization in acute care facilities are reported for fiscal years 2011/12 and 2016/17. Each hospital separation has a 'most responsible' diagnosis – the diagnosis that describes the most significant condition of a patient which required the hospital stay (and which may not be the same as the admitting diagnosis). These diagnoses were grouped by ICD–10–CA chapter; the ten most common causes are shown for each RHA and the province overall (as average annual crude percent).

Notes regarding two key groups of causes:

- Health status and contact: hospitalizations in this broad category included a large number of issues not necessarily connected to a specific diagnosis or disease: colonoscopies, convalescence and follow-up after surgery, sterilization procedures, palliative care, and others.
- Ill-defined conditions: hospitalizations in this group were most commonly related to non-specific pain in the abdomen or chest, though a variety of other issues were also coded, including malaise and fatigue, fainting, and pain in other areas of the body. For the majority of these cases, the patient was experiencing a specific problem, but it could not be assigned to a specific disease category.

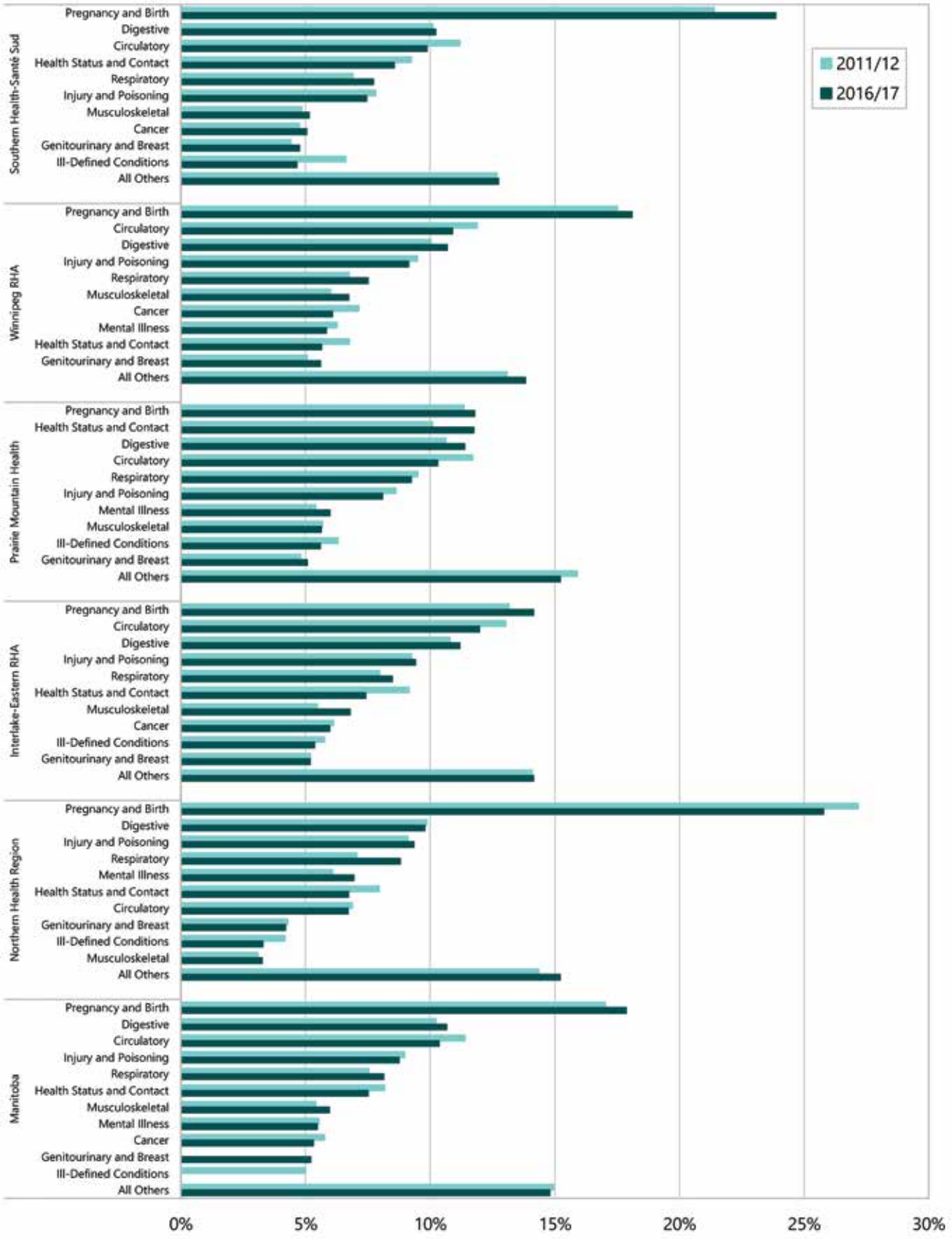
Key Findings

- The results show that the most common causes of hospitalization were spread across many disease categories, and did not change much over time. Pregnancy and birth was the leading cause in all regions, followed by circulatory diseases, digestive disorders, or health status & contact, depending on the region. Other leading causes were injury & poisoning, and respiratory diseases.

Comparison to Previous Findings

- The trends in most common causes of hospitalization have been very stable in Manitoba for many years, as reflected above [1,2]. However, since this report includes separate analyses for the most common causes of inpatient hospitalizations and day surgery, the results shown here cannot be directly compared to those in previous Atlas reports (which combined inpatient and day surgery cases together) [1,2].

Figure 7.3: Most Common Causes of Inpatient Hospitalizations in Acute Care Facilities by RHA, 2011/12 and 2016/17
Annual crude percent of hospitalizations (all ages)



7.4 Day Surgery

Definition: The number of hospitalizations for day surgery procedures per 1,000 residents in a given year. This includes surgeries and procedures for which patients do not typically stay overnight, as defined by the Canadian Institute for Health Information (CIHI). Since a person could receive multiple surgeries in a year, this indicator shows the total rate of procedures provided to all residents. Rates were calculated for 2011/12 and 2016/17 and were age- and sex-adjusted to the Manitoba population in 2011/12.

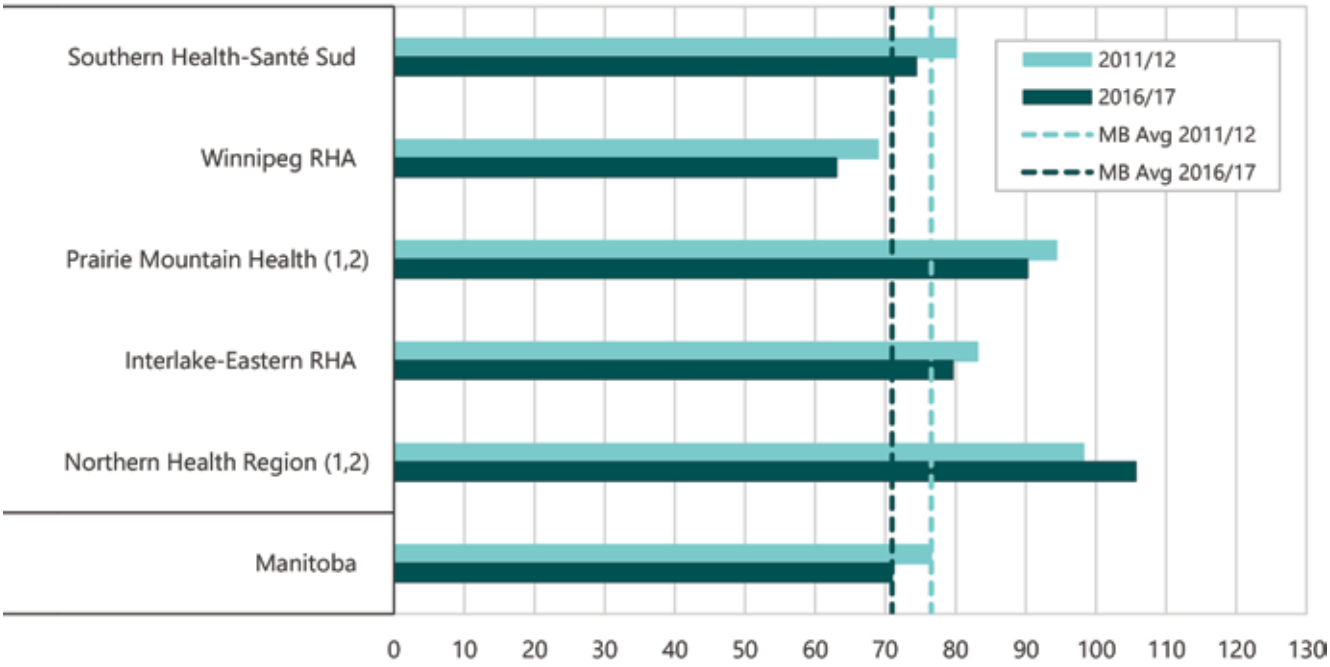
Key Findings

- The rate of day surgery procedures decreased over time from 76.5 to 71.0 per 1,000 residents per year, but the drop was not statistically significant. Most regions had slight decreases over time, though the rate in Northern increased; none of these changes were significant.
- Rates were higher than average in Prairie Mountain and Northern in both years.
- Day surgery rates were related to premature mortality at the regional level, but the relationship was not linear, due to the relatively low rate in Winnipeg.
- Compared to other indicators in this report, there was relatively less variation in day surgery rates among the districts within each RHA, and among the NCs in Winnipeg.
- Day surgery rates were related to income in rural but not urban areas in both time periods: residents of lower income rural areas had higher rates of day surgery than residents of higher income rural areas.

Comparisons to Previous Findings

- These results contrast with those in the 2013 Atlas, which showed stable rates over time [1]. This indicator was defined very differently in the 2009 and previous reports, so a longer-term comparison cannot be made [2,9].
- The relationships between day surgery rates and income reported here are very similar to those shown in the 2013 Atlas [1].

Figure 7.4: Hospitalization Rate for Day Surgery by RHA, 2011/12 and 2016/17
Age- and sex-adjusted rate of hospitalizations per 1,000 residents (all ages)



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

7.5 Causes of Day Surgery

Definition: The most frequent reasons for day surgery, defined as surgical services received on an outpatient basis in acute care facilities, reported for 2011/12 and 2016/17. Each day surgery abstract has a 'most responsible' diagnosis – the diagnosis that describes the most significant condition of the patient who required day surgery. These diagnoses were grouped by ICD–10–CA chapter; the ten most common causes are shown for each RHA and the province overall (as average annual crude percent).

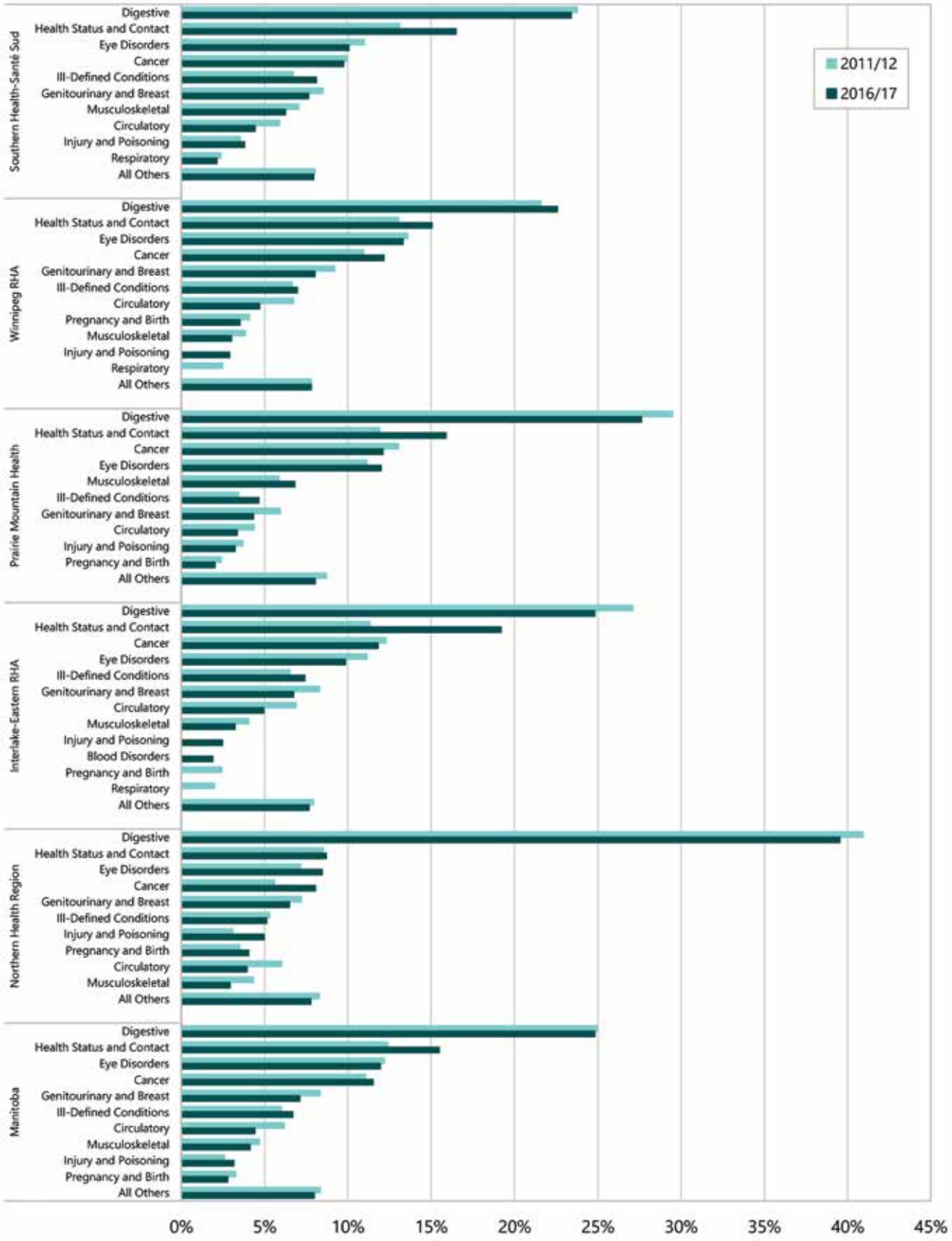
Key Findings

- The most prominent cause of day surgery in Manitoba and in every RHA was in the ICD chapter of digestive disorders. Within this chapter, the single most common specific cause was surgery for preschoolers to remove multiple teeth affected by dental caries. This procedure is also included as its own indicator in Chapter 10.
- The other leading causes were also the same across RHAs, though there was some variation in the order of in the groups. They were: health status and contact, eye disorders, cancer, and genitourinary & breast.
    - Within the health status & contact category, the leading specific causes were screening for cancer in the digestive tract and follow-up care after surgery for cancer or other conditions.

Comparison to Previous Findings

- This indicator was not included in previous Atlas reports, so comparison to previous regional findings cannot be made.

Figure 7.5: Most Common Causes of Day Surgery Hospitalizations by RHA, 2011/12 and 2016/17
Annual crude percent of hospitalizations (all ages)



7.6 Hospital Days for Acute Care

Definition: The number of hospital days coded as being for acute care (as opposed to ALC – see Section 7.8) per 1,000 residents. Residents could have had more than one acute care hospitalization in a year, so the acute days used in all hospitalizations were summed. See the online supplement for further details. Rates were calculated for 2011/12 and 2016/17 and were age- and sex-adjusted to the Manitoba population in 2011/12.

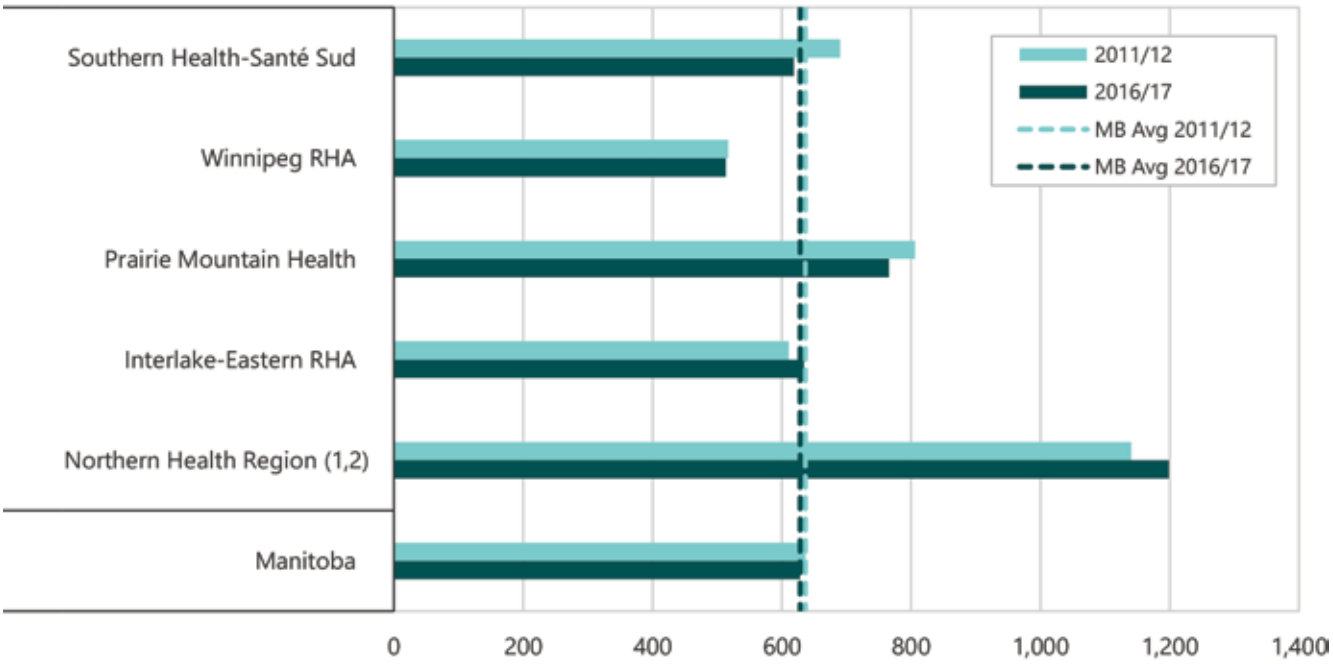
Key Findings

- The rate of use of hospital days for acute care was stable over time for Manitoba; most regions had just slight changes, none of which were significant.
- Rates of acute care hospital day use appear to be related to health status (premature mortality) at the regional, district, and Winnipeg NC levels, with higher rates among less healthy areas (higher PMR).
- Winnipeg residents had substantially lower use of acute care hospital days than residents of any other region, though rates varied considerably across NCs.
- Use of acute care days was very strongly related to income in urban and rural areas in both time periods: residents of lower income areas had much higher rates than residents of higher income areas (see online supplement).

Comparisons to Previous Findings

- This indicator has not been used before at MCHP, so comparisons with previous regional findings cannot be made.
- Previous reports examined rates of 'days used in short stays' (defined as less than 14 days) as a proxy for 'acute care', as there was no way to define acute care at that time [1,2].

Figure 7.6: Acute Care Hospital Days by RHA, 2011/12 and 2016/17
Age- and sex-adjusted per 1,000 residents (all ages)



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

7.7 Causes of Hospital Days Used for Acute Care

Definition: The most common reasons for hospital days coded only as acute care (i.e., no ALC days) during inpatient hospitalizations in 2011/12 and 2016/17. Each hospital abstract has a 'most responsible' diagnosis – the diagnosis that describes the most significant condition of a patient that contributed to their days in hospital. Diagnoses were grouped by ICD–10–CA chapter, and the most common causes are shown for each RHA and the province overall (as average annual crude percent).

Notes regarding two key groups of causes:

- Health status and contact: hospitalizations in this category included a large number of issues not necessarily connected to a specific diagnosis or disease, including palliative care, convalescence after surgery, physical therapy, and rehabilitation.
- Ill-defined conditions: for hospitalizations in this category, the patient was experiencing a specific problem (including malaise and fatigue, fainting, chest and abdominal pain), but it could not be assigned to a specific disease category.

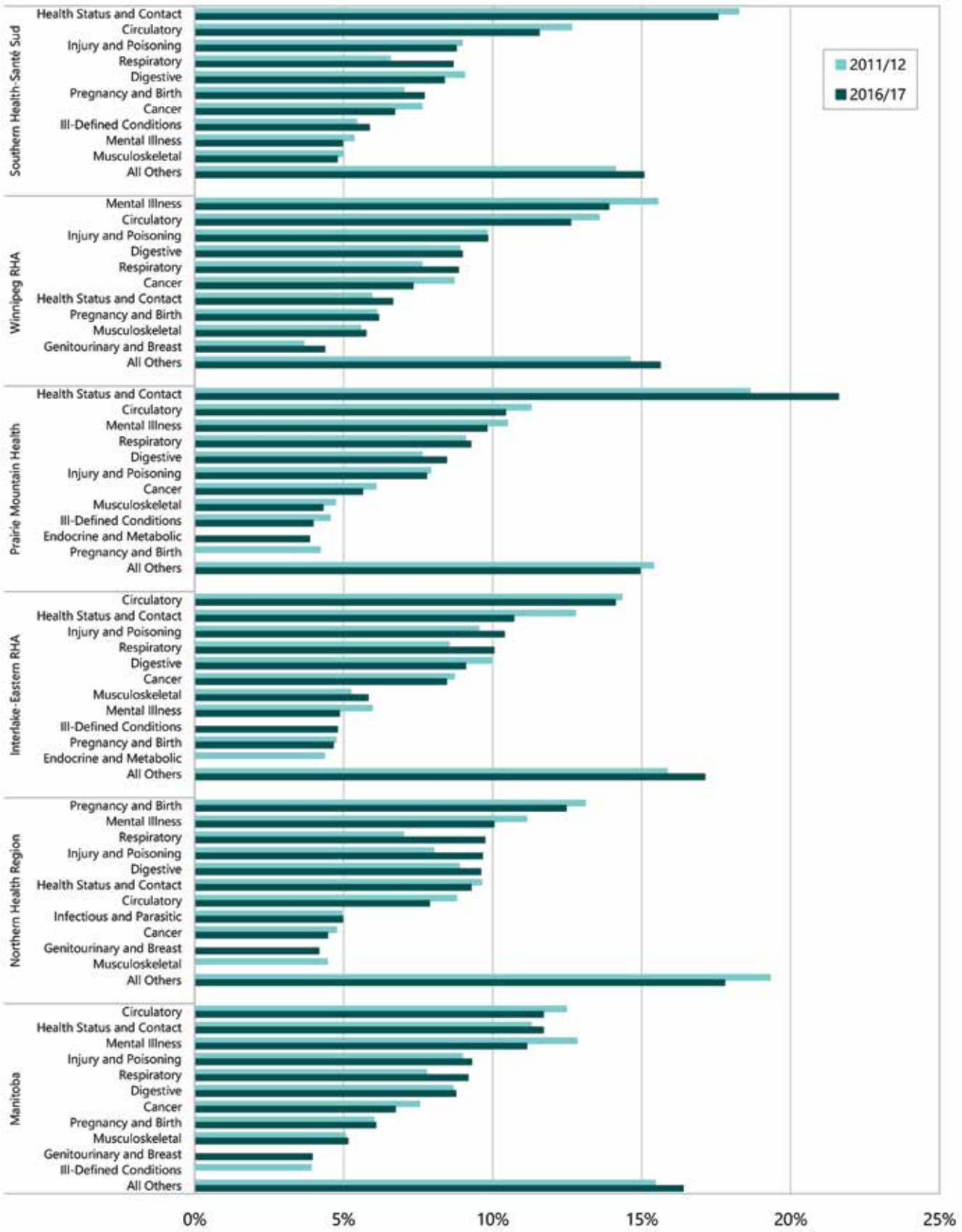
Key Findings

- The most prominent causes of acute care hospital days used by Manitobans were: circulatory diseases (including heart attack and stroke), health status and contact, and mental illness. For Manitoba overall, these rankings did not change much over time; but they varied considerably by region, as shown in Figure 7.7.
    - Within health status and contact, the top diagnoses were people awaiting placement in personal care homes, palliative care, rehabilitation and other services.
    - Within ill-defined conditions, the top diagnoses were malaise and fatigue, tendency to fall, and other unspecified pain.
- Causes of acute care days used show a distinctly different distribution than causes of hospitalization because length of stay varied by cause. For example, childbirth was the most common reason for hospitalization, but ranked much lower in terms of days used because most stays were quite short.

Comparison to Previous Findings

- This indicator has not been used before at MCHP, so comparisons with previous regional findings cannot be made.

Figure 7.7: Most Common Causes of Acute Care Hospital Days by RHA, 2011/12 and 2016/17
Annual crude percent of hospital days (all ages)



7.8 Hospital Days for Alternate Level of Care (ALC) Stays

Definition: The number of hospital days coded as being for ALC (as opposed to being for acute care) per 1,000 residents. Most patients with ALC days were admitted to hospital for acute reasons (e.g., stroke), but then became designated as ALC later in their stay. The majority of ALC days in hospital are used by patients who are either being assessed for potential placement in nursing homes, or have been assessed and are awaiting placement, but there many other ALC reasons. Residents could have had ALC days in more than one hospitalization in a year, so the ALC days used in all hospitalizations were summed. See the online supplement for further details. Rates were calculated for 2011/12 and 2016/17 and were age- and sex-adjusted to the Manitoba population in 2011/12.

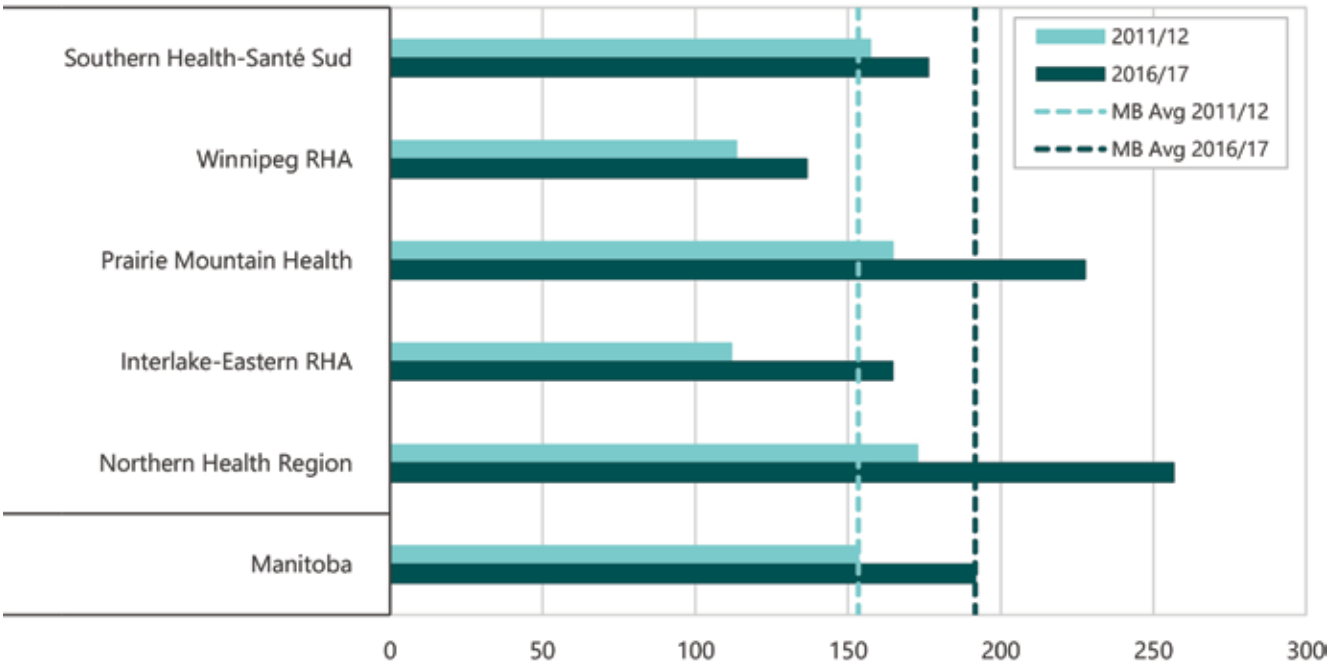
Key Findings

- The rate of use of hospital days for alternate-levels-of-care (ALC) increased over time for Manitoba and in every region, but the increase did not reach statistical significance.
- Winnipeg and Interlake-Eastern residents had lower than average use of ALC days, whereas Prairie Mountain and Northern had higher than average rates, but none of these differences were statistically significant.
- Rates of ALC day use appear to be related to health status (premature mortality) at the regional and Winnipeg NC levels, but not among districts of rural regions, where there was dramatic variation.
- Use of ALC days was very strongly related to income in urban areas in both time periods, and rural areas in the second time period: residents of lower income areas had much higher rates than residents of higher income areas (online supplement).
- Urban residents had considerably lower rates of ALC days than rural residents.

Comparisons to Previous Findings

- This indicator has not been included in previous Atlas reports, so comparisons with previous regional findings cannot be made.
- Previous reports examined rates of 'days used in long stays' (defined as 14+ days) as a proxy for 'non-acute care', as there was no way to define acute care at that time [1,2].

Figure 7.8: Hospital Days for Alternate Level of Care Stays by RHA, 2011/12 and 2016/17
Age- and sex-adjusted per 1,000 residents (all ages)



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

7.9 Hospital Readmission

Definition: The age- and sex-adjusted percent of hospital episodes after which the patient was readmitted to any hospital within 1-30 days of the preceding discharge. Only unplanned inpatient readmissions were counted, defined by admission category 'U' for urgent/emergent admissions. (Hospital episodes combine multiple inpatient admissions of the same person to create a single continuous stay in the hospital system, linking transfers between hospitals; readmissions less than 24 hours after discharge were considered to be part of the same hospital episode). See the online supplement for further details. Values were calculated for 2011/12 and 2016/17 and were age– and sex–adjusted to the Manitoba population in 2011/12.

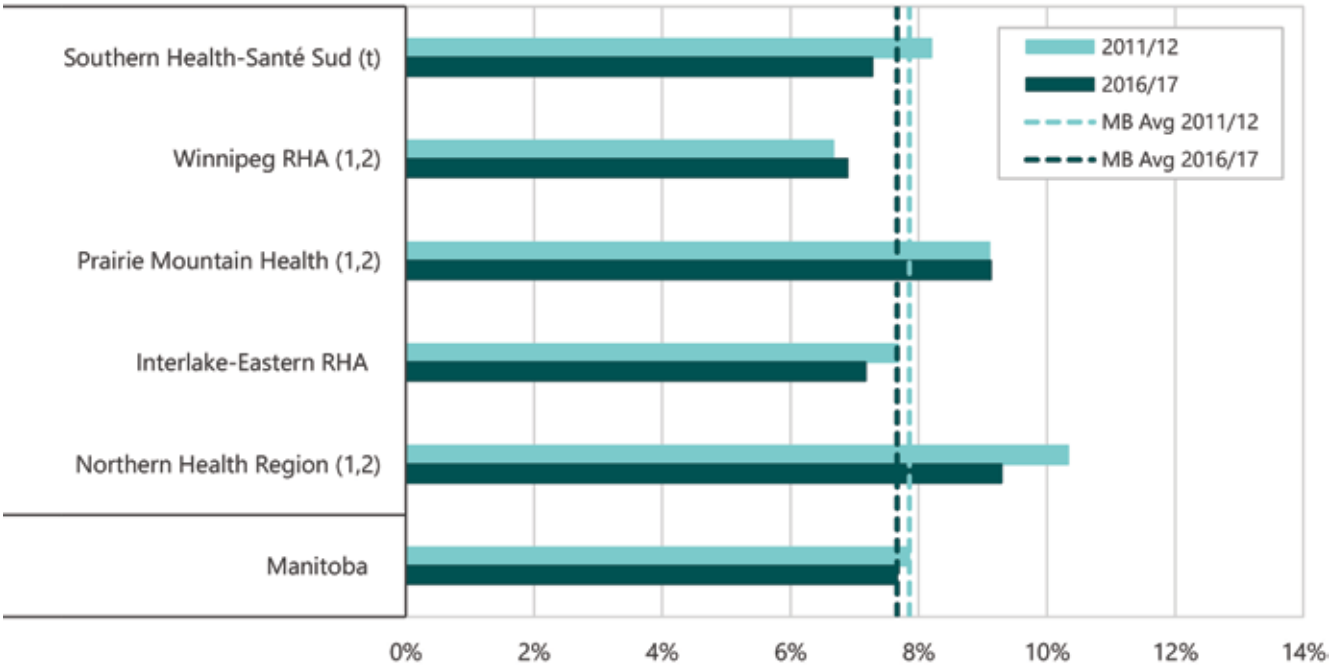
Key Findings

- Overall, hospital readmissions within 30 days decreased slightly but not significantly over time in Manitoba. Rates decreased in Southern, Interlake-Eastern and Northern, though only the drop in Southern was statistically significant. Rates increased slightly but not significantly in Winnipeg and Prairie Mountain.
- In both years, rates were below the provincial average in Winnipeg, and above average in Prairie Mountain and Northern.
- Readmission rates were related to premature mortality, but the relationship was not linear. Winnipeg and Interlake-Eastern residents had relatively low rates.
- Rates varied markedly across the districts of the rural regions, but less among NCs within Winnipeg.
- Readmission rates were strongly related to income in both urban and rural areas in both time periods, with higher readmission rates for residents of lower income areas. Rates were lower among urban than rural areas.

Comparison to Previous Findings

- These results are similar to those shown in the 2013 Atlas, though the decrease over time shown here is smaller [1].

Figure 7.9: Hospital Readmission by RHA, 2011/12 and 2016/17
Age- and sex-adjusted percent of hospital episodes with a readmission within 30 days of discharge



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

7.10 Hospitalization Rates for Ambulatory Care Sensitive (ACS) Conditions

Definition: The number of inpatient hospital separations for ACS conditions among residents age 0-74 per 1,000 residents age 0-74 in a given year. ACS conditions are a group of 25 diseases and diagnoses for which it is thought that timely and effective outpatient care can reduce the risk of hospitalization. These conditions include asthma, angina, gastroenteritis, and congestive heart failure. The grouping was created by Billings and colleagues [16,17], but has been revised over time; see the online supplement for details. Rates are shown for 2011/12 and 2016/17 and age- and sex-adjusted to the Manitoba population age 0-74 in 2011/12.

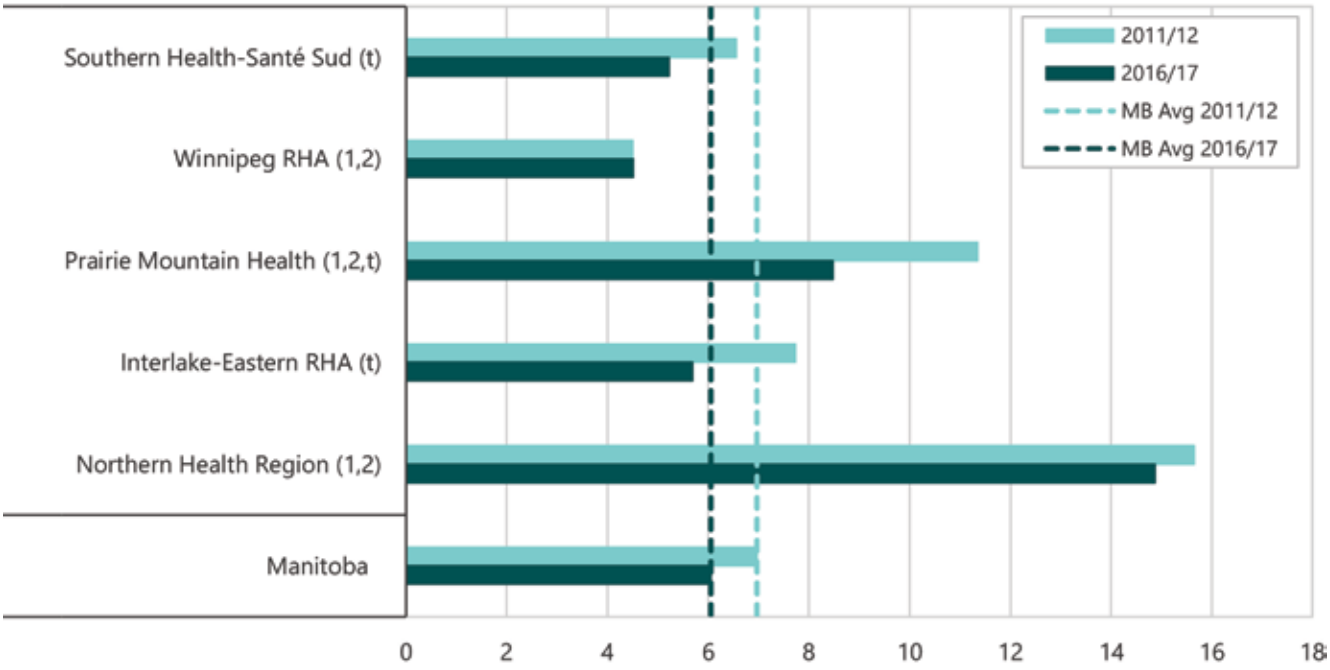
Key Findings

- The rate of hospitalization for ACS conditions decreased over time, though the decrease did not quite reach statistical significance for Manitoba. However, the decreases in Southern, Prairie Mountain and Interlake-Eastern were significant.
- Rates were related to premature mortality at the region, district, and Winnipeg NC levels; but the relationships were not linear.
- Rates were below the provincial average in Winnipeg, and above average in Prairie Mountain and Northern.
- Rates varied dramatically across districts of rural regions, from 1 to over 36 ACS hospitalizations per 1,000 residents per year. There was also substantial variation across NCs within Winnipeg.
- Rates were very strongly related to income in urban and rural areas in both time periods: rates for residents of lower income areas were 3-4 times higher than those for residents of higher income areas (see online supplement).

Comparison to Previous Findings

- The results shown in this report are consistent with and extend the findings of previous Atlas reports, reflecting the continuing decrease in rates of hospitalization for ACS conditions [1,2].

Figure 7.10: Hospitalization Rate for Ambulatory Care Sensitive Conditions by RHA, 2011/12 and 2016/17
Age- and sex-adjusted per 1,000 residents age 0-74



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

7.11 Hospital Location: Where RHA Residents Were Hospitalized (Hospitalizations)

Definition: The portion of all hospital separations for residents of each RHA that occurred in a hospital within their (home) RHA, another RHA, in Winnipeg[4], or out-of-province. If a patient was transferred between hospitals, each stay was counted as a separate event and was attributed to the appropriate location. Area of residence was assigned based on the patient's postal code provided in the hospital abstract at the time of hospitalization. See the online supplement for further details. Crude values for hospital location are shown for 2011/12 and 2016/17.

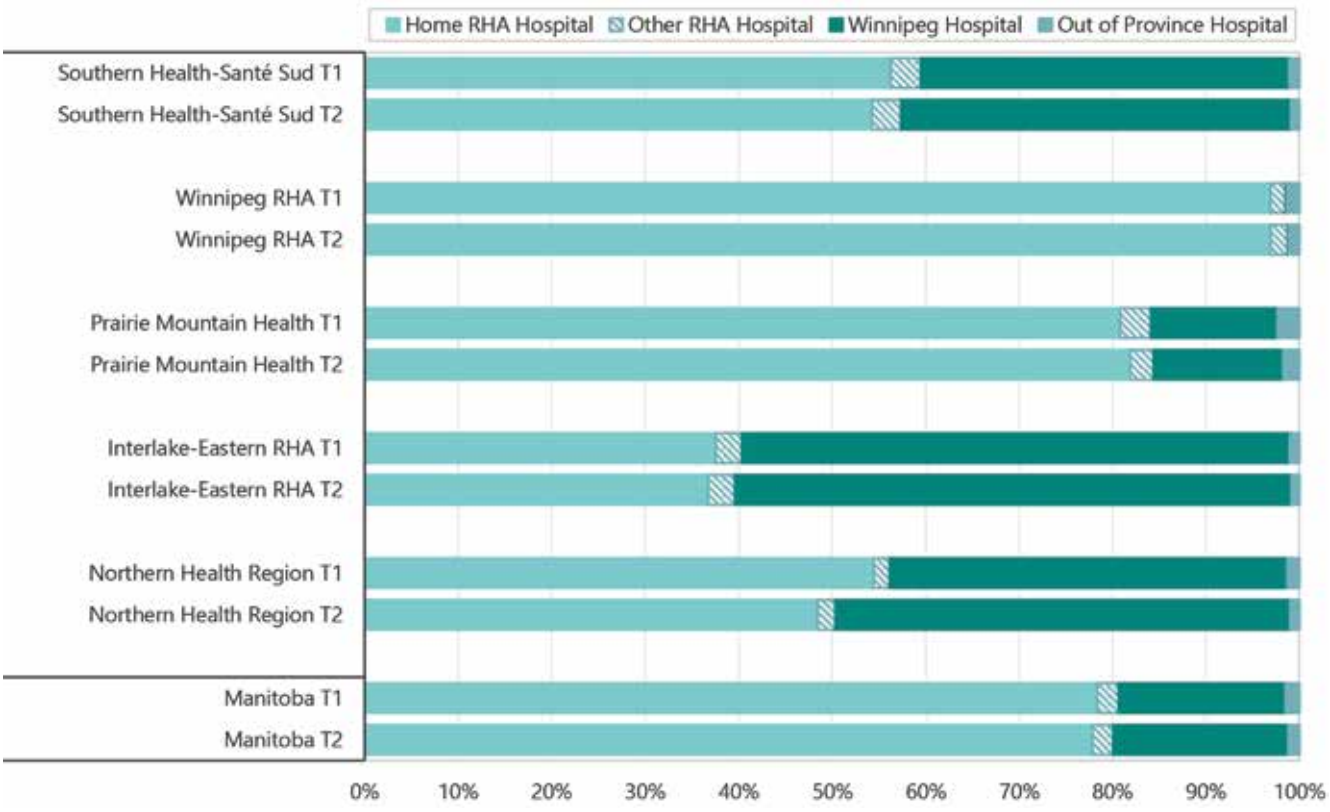
Key Findings

- The vast majority of hospitalizations of Manitoba residents occurred either in their home region or in Winnipeg, and this has remained stable over time.
- The distribution of hospitalizations varied substantially by region (2016/17 values cited):
  - Winnipeg and Prairie Mountain residents had the highest percent of hospitalizations in their home regions at 96.9% and 81.9%, respectively.
  - Southern and Northern residents had about half of their hospitalizations in their home region and about 40% in Winnipeg.
  - Interlake-Eastern residents had 36.7% of their hospitalizations in their home region and 59.6% in Winnipeg.
  - Out-of-province hospitalizations were uncommon among Manitoba residents of all regions and decreased over time; the highest value was 1.7% (for residents of Prairie Mountain).

Comparison to Previous Findings

- These results are very similar to those shown in the 2013 Atlas [1]. Patterns were different in earlier reports, because they were prior to the 2012 RHA amalgamation, but the underlying patient travel patterns have not changed significantly [2,9].

Figure 7.11: Hospital Location: Where Patients were Hospitalized by RHA, 2011/12 and 2016/17
T1 = 2011/12 T2 = 2016/17



4 Since residents of Churchill are part of the Winnipeg RHA, our indicators needed to appropriately reflect that sometimes being hospitalized 'within region' may still be quite far from home:

- If a resident who lived in Winnipeg (i.e., the city) was hospitalized in any of the hospitals within the city, this was classified as their home RHA.
- Similarly, if a resident of Churchill was treated in the Churchill hospital, this was also called their home RHA.
- If a Churchill resident was hospitalized in Winnipeg, this was called 'Winnipeg hospital' to reflect the distance travelled, even though they were still technically within their home region.

7.12 Hospital Location: Where RHA Residents Were Hospitalized (Days in Hospital)

Definition: The portion of all hospital days used by the residents of each RHA that occurred in a hospital within their (home) RHA, another RHA, in Winnipeg[5], or out-of-province. If a patient was transferred between hospitals, each stay was counted as a separate event and the days spent in each hospital were attributed to that hospital's location. Area residence was assigned based on the patient's postal code provided in the hospital abstract at the time of hospitalization. See the online supplement for further details. Crude values are shown for 2011/12 and 2016/17.

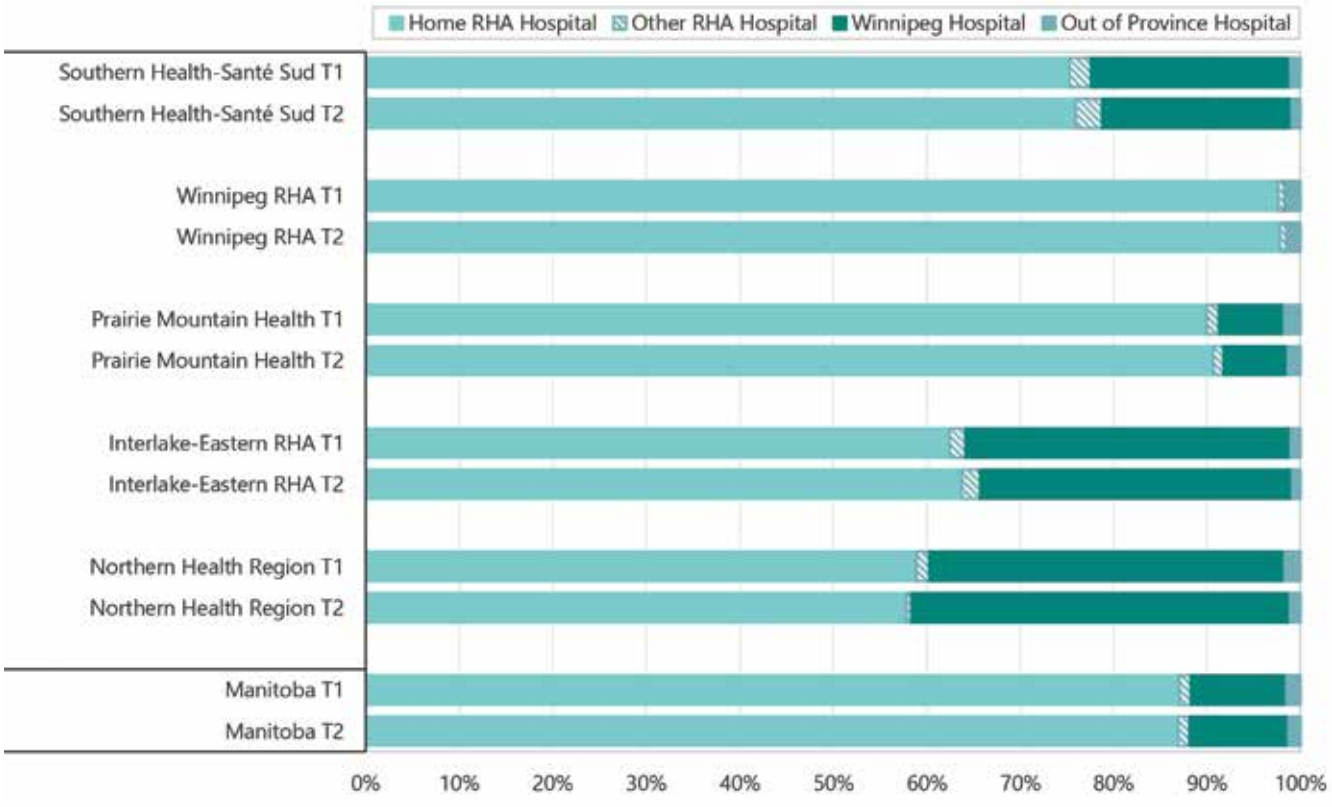
Key Findings

- The vast majority of hospital days used by Manitoba residents were either in their home region (87%) or in Winnipeg (10-11%), and this has remained stable over time.
- The percents vary substantially by region (2016/17 values cited):
  - Winnipeg and Prairie Mountain residents had the highest percent of hospital days in their home regions at 97.8% and 90.7%, respectively.
  - Southern residents had 75.9% of their hospital days in their home region and 20.3% in Winnipeg.
  - Interlake-Eastern and Northern residents had about 60% of their hospital days in their home region and 30-40% in Winnipeg.
  - A very low percent of hospital days used by Manitoba residents were spent in out-of-province hospitals: the maximum was 1.42% for Winnipeg residents.

Comparison to Previous Findings

- These results are very similar to those shown in the 2013 Atlas [1]. Patterns were different in earlier reports, because they were prior to the 2012 RHA amalgamation, but the underlying patient travel patterns have not changed significantly [2,9].

Figure 7.12: Hospital Location: Where Patients Spent Days in Hospital by RHA, 2011/12 and 2016/17
T1 = 2011/12 T2 = 2016/17



5 Since residents of Churchill are part of the Winnipeg RHA, our indicators needed to appropriately reflect that sometimes being hospitalized 'within region' may still be quite far from home:

- If a resident who lived in Winnipeg (i.e., the city) was hospitalized in any of the hospitals within the city, this was classified as their home RHA.
- Similarly, if a resident of Churchill was treated in the Churchill hospital, this was also called their home RHA.
- If a Churchill resident was hospitalized in Winnipeg, this was called 'Winnipeg hospital' to reflect the distance travelled, even though they were still technically within their home region.

7.13 Hospital Catchment: Where Patients Using RHA Hospitals Came From (Hospitalizations)

Definition: The portion of all hospital separations by all hospitals in each RHA that were provided to residents of the (home) RHA, another RHA, Winnipeg[6], or out-of-province residents. If a patient was transferred between hospitals, each stay was counted as a separate event and was attributed to the appropriate hospital. Area residence was assigned based on the patient's postal code provided in the hospital abstract at the time of hospitalization. See the online supplement for further details. Crude values are shown for 2011/12 and 2016/17.

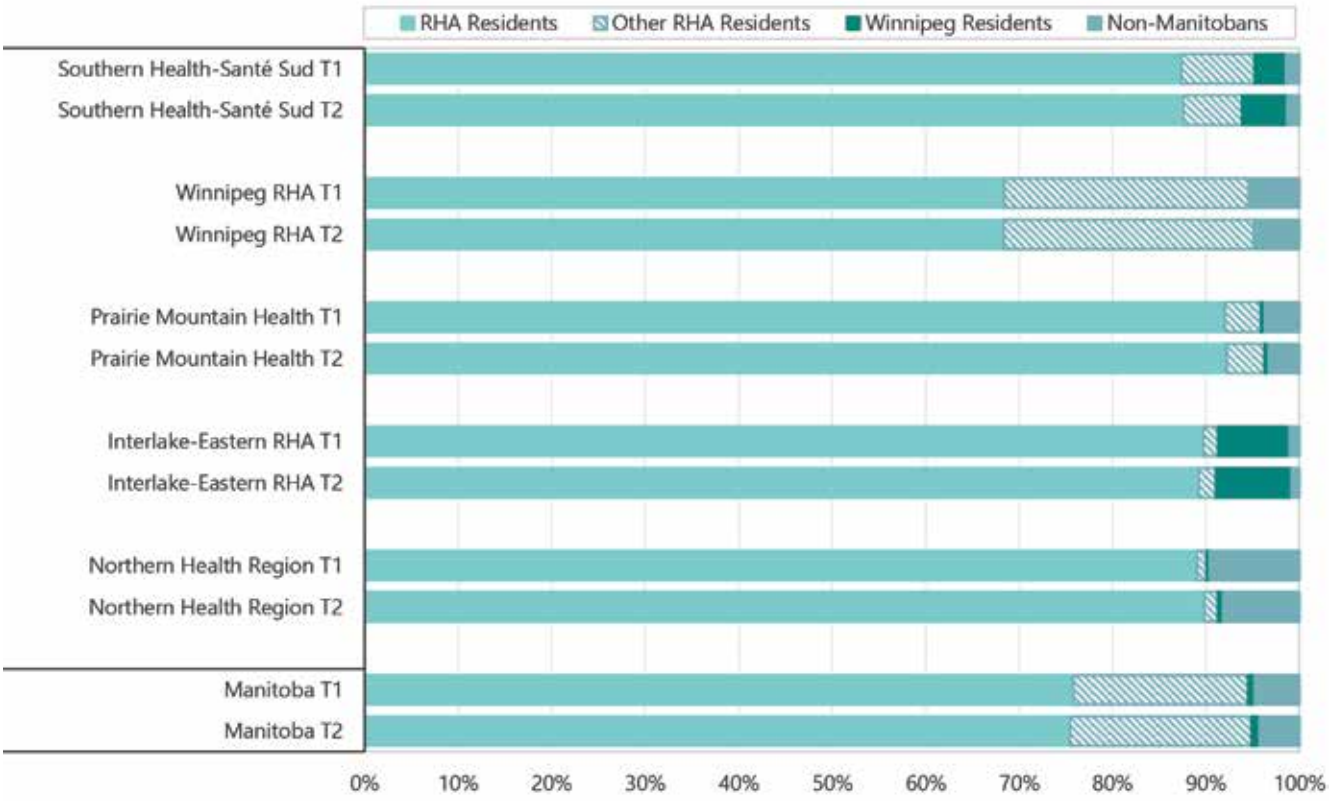
Key Findings

- In every health region in Manitoba, the vast majority of hospitalizations in that region's hospitals (70-90%) were for residents of that region. This finding has remained stable over time.
- Winnipeg has a unique profile. It provides hospital care for residents of all other regions because many services and procedures are only available in Winnipeg hospitals.
- Among rural regions (2016/17 results cited):
  - Interlake-Eastern provided the highest percent of hospitalizations to residents of Winnipeg at about 8.11%.
  - Southern provided the highest percent of hospitalizations to residents from other regions at about 6.34%.
- Manitoba hospitals also provided care to non-Manitoba residents, though this was limited at 4.24% overall, with a maximum of 8.14% for hospitals in Northern.

Comparison to Previous Findings

- These results are very similar to those shown in the 2013 Atlas [1]. Patterns were different in earlier reports, because they were prior to the 2012 RHA amalgamation, but the underlying patient travel patterns have not changed significantly [2,9].

Figure 7.13: Hospital Catchment: Where Hospital Patients Came from (Hospitalizations) by RHA, 2011/12 and 2016/17
T1 = 2011/12 T2 = 2016/17



6 For this analysis, all the hospitals in each region were analyzed together to describe the regions from which their patients came. Since Churchill is part of the Winnipeg region, their facilities are combined in the results for Winnipeg RHA.

7.14 Hospital Catchment: Where Patients Using RHA Hospitals Came From (Days in Hospital)

Definition: The portion of all days of care in the hospitals in each RHA that were provided to residents of the (home) RHA, another RHA, in Winnipeg[7], or out-of-province residents. If a patient was transferred between hospitals, each stay was counted as a separate event and the days spent in each hospital were attributed to that hospital's catchment. Area residence was assigned based on the patient's postal code provided in the hospital abstract at the time of hospitalization. See the online supplement for further details. Crude values are shown for 2011/12 and 2016/17.

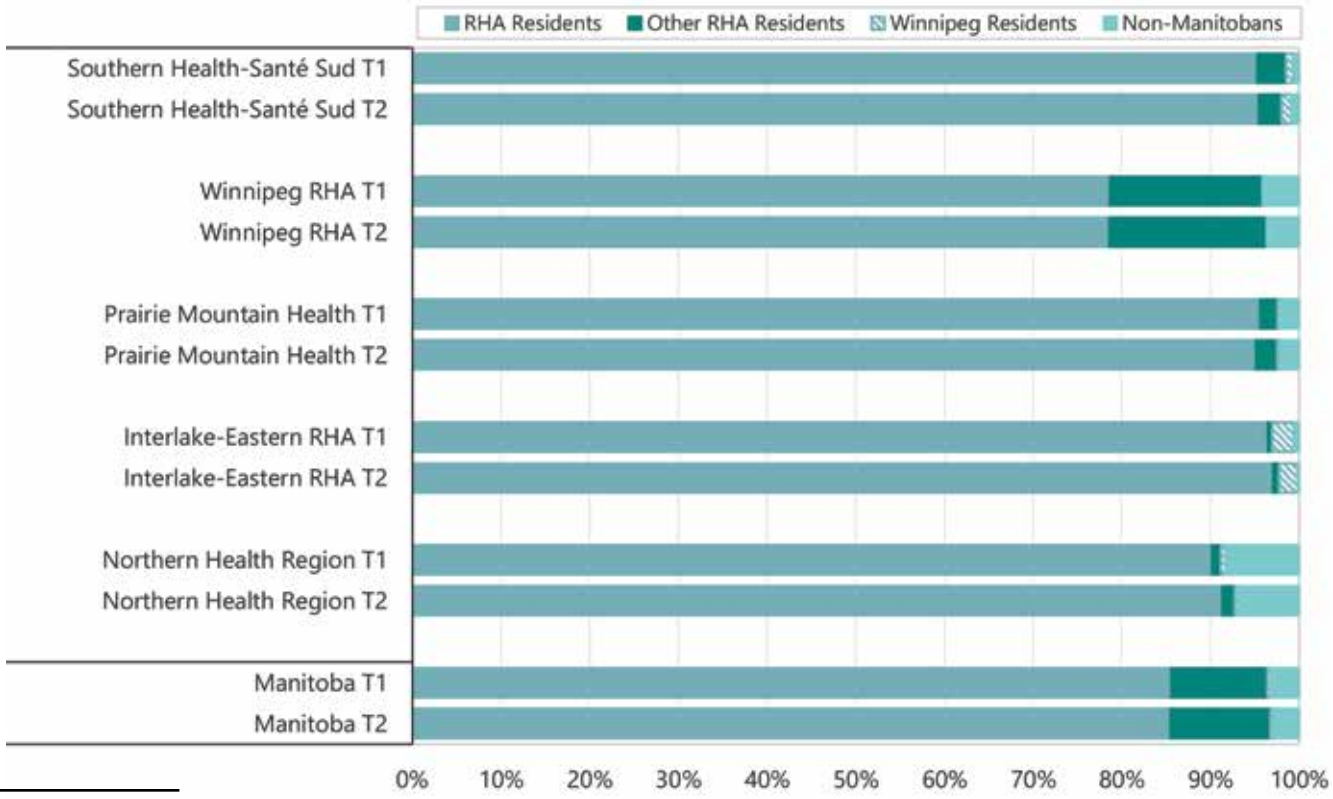
Key Findings

- In every health region in Manitoba, the vast majority of hospital days provided by that region's hospitals were provided to residents of that region. These findings have remained stable over time.
- Winnipeg has a unique profile. It provides hospital care for residents of all other regions because many services and procedures are only available in Winnipeg hospitals.
  - However, the percent of days of care provided to non-Winnipeg residents was lower than the percent of hospitalizations (Section 6.13).
- Among rural regions (2016/17 results cited):
  - Interlake-Eastern provided the highest percent of hospital days to residents of Winnipeg at 2.06%.
  - Southern provided the highest percent of hospitalizations to residents from other regions at 2.59%.
- Manitoba hospitals also provide some care to non-Manitoba residents, though this was limited at 2.91% overall, with a maximum of 6.89% for hospitals in Northern.

Comparison to Previous Findings

- These results are very similar to those shown in the 2013 Atlas [1]. Patterns were different in earlier reports, because they were prior to the 2012 RHA amalgamation, but the underlying patient travel patterns have not changed significantly [2,9].

Figure 7.14: Hospital Catchment: Where Hospital Patients Came From (Days in Hospital) by RHA, 2011/12 and 2016/17
T1 = 2011/12 T2 = 2016/17



7 For this analysis, all the hospitals in each region were analyzed together to describe the regions from which their patients came. Since Churchill is part of the Winnipeg region, their facilities are combined in the results for Winnipeg RHA.

Chapter 8:
High-Profile Surgical and Diagnostic Services

Key Findings in Chapter 8

The indicators in this chapter reveal a mix of results across the services analyzed:

- Cardiac catheterization (diagnostic angiography) rates increased slightly, but not significantly, whereas bypass surgery rates decreased significantly in all regions.
- PCI (percutaneous coronary intervention, i.e., angioplasty and/or coronary stent insertion) rates increased significantly in all regions.
- Hip replacement rates increased slightly, but not significantly.
- Knee replacement and cataract surgery rates decreased slightly, but not significantly.
- MRI scan rates increased significantly in all regions except Winnipeg.
- MRI scan and hip replacement rates were inversely related to need: rates were lower in areas with lower population health status and income – the opposite of the trends expected in a universal needs-based system. These findings warrant further investigation to ensure service provision is distributed fairly in the population.

Introduction

This chapter includes indicators of a number of high-profile surgical and diagnostic procedures that MCHP has tracked in previous Atlas reports. Most of the procedures are services that a resident could receive more than once in a given period, so the indicators count each event and reflect the sum of all such services to area residents, regardless of the location of service provision. For example, if a resident of Southern receives a service in Brandon, it is attributed to the rate for Southern.

Magnetic resonance imaging (MRI) and computed tomography (CT) scans were counted differently than the other procedures because separate records are kept for individual scans of different body sites, even if the scans are performed during the same scanning session. Therefore, our indicators count the number of 'person-visits' to the imaging service each day. So if a resident has an MRI scan of the head and the neck, we count these as one use of the MRI service for that person that day.

Note Regarding Incomplete Data

MRI and CT scan data are not complete for children, so the indicators include only residents age 20 and older. Furthermore, individual-level data are incomplete for adult MRI and CT scans done in some hospitals, though the data are improving over time. Therefore, rates likely underreport actual scan rates to some extent. CT results are shown only for the more recent year, as earlier results were deemed too incomplete.

8.1 Cardiac Catheterization (Diagnostic Angiogram) Rates

Definition: The number of cardiac catheterizations performed on residents age 40 and older per 1,000 residents age 40 and older. This included CCI code 3.IP.10 in any intervention field in a hospital abstract. Cardiac catheterizations were only performed at the two tertiary hospitals in Manitoba (St. Boniface General Hospital and Health Sciences Centre); 'out of hospital' interventions were excluded to avoid double-counting. Average annual rates were calculated for two three-year periods: 2009/10–2011/12 and 2014/15–2016/17, and age- and sex-adjusted to the Manitoba population age 40 and older in the first time period.

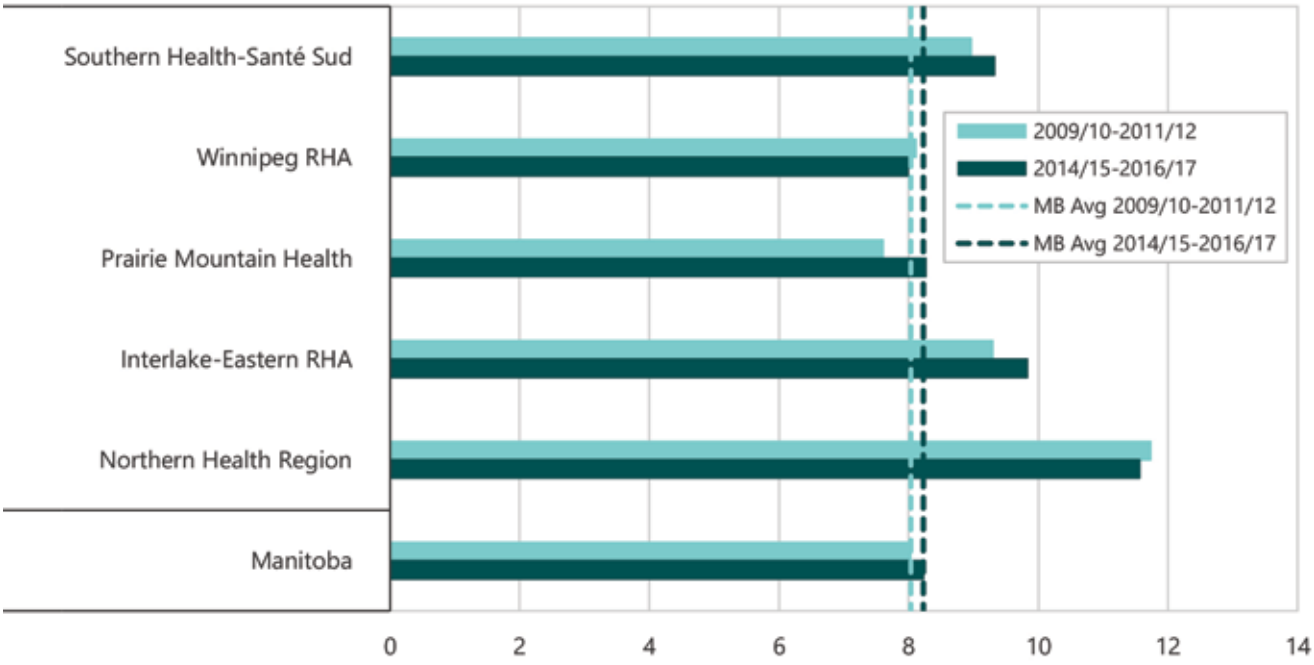
Key Findings

- The rate of cardiac catheterizations increased slightly but not significantly in Manitoba. Rates decreased slightly in Winnipeg and Northern.
- Cardiac catheterization rates were not related to health status (premature mortality) at the regional level, though the highest rate was in Northern.
- Rates varied dramatically across districts from under 5 to over 20. There was less variation across NCs in Winnipeg.
- Cardiac catheterization rates were not related to income in rural areas. In urban areas, there appeared to be relationships (with higher rates among residents of lower income areas), but in both time periods the association did not reach statistical significance.

Comparison to Previous Findings

- These results are different from the increase over time shown in the 2013 Atlas, but similar to the stable rates shown in the 2009 Atlas [1,2].

Figure 8.1: Cardiac Catheterization Rate by RHA, 2009/10-2011/12 and 2014/15-2016/17
Age- and sex-adjusted average annual rate per 1,000 residents age 40+



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

8.2 Percutaneous Coronary Intervention (PCI; Angioplasty) Rates

Definition: The number of PCIs (angioplasty with or without stent insertion) performed on residents age 40 and older per 1,000 residents age 40 and older. This included CCI codes 1.IJ.50 and 1.IJ.57 in any procedure field in a hospital abstract. PCIs were performed only at the two tertiary hospitals in Manitoba (St. Boniface General Hospital and Health Sciences Centre); 'out of hospital' interventions were excluded to avoid double–counting. Annual average rates were calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17 and age- and sex-adjusted to the Manitoba population age 40 and older in the first time period.

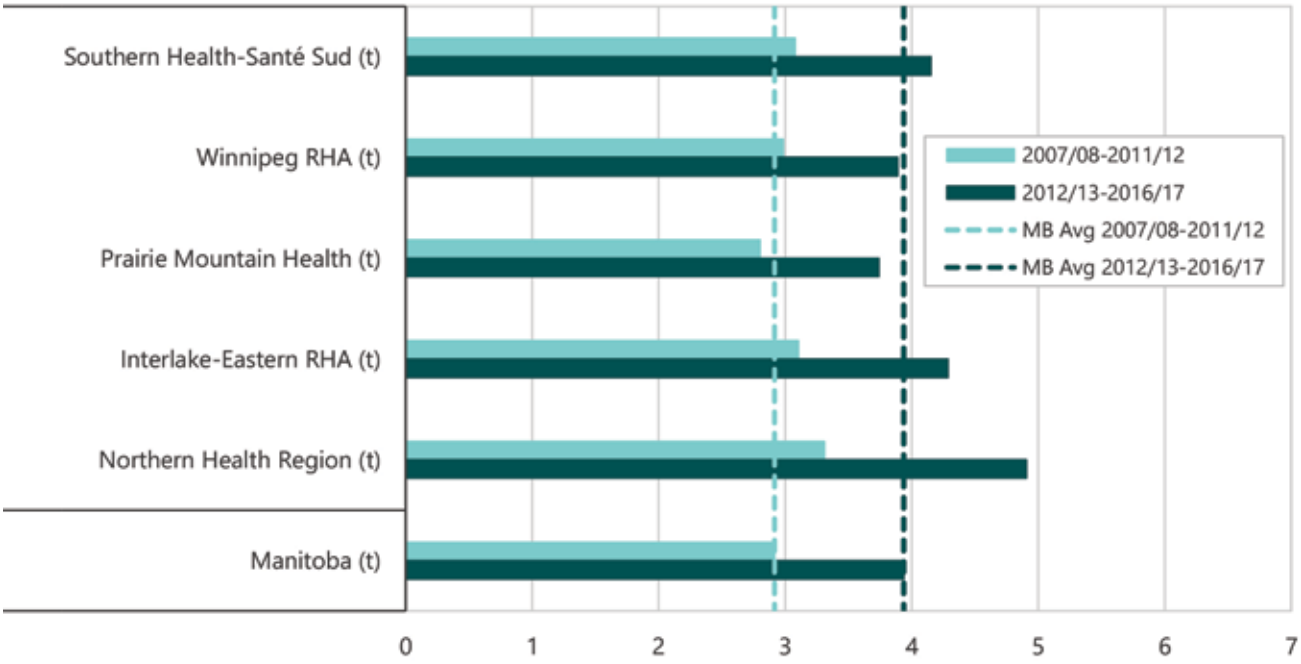
Key Findings

- The PCI rate in Manitoba increased from 2.92 to 3.94 procedures per 1,000 residents age 40 and older per year. Significant increases were seen in all regions.
    - This finding is consistent with continuing changes in clinical practice, including the use of PCI as a primary treatment for heart attack patients, and the use of stents among many patients for whom bypass surgery would previously have been recommended.
- There was very little variation in PCI rates across RHAs and within Winnipeg NCs, and no clear relationship between PCI rates and premature mortality at the regional, district, or NC levels.
- District-level rates showed high variation, likely related to the small population size in some districts.
- In rural areas, there was no significant relationship between PCI rates and income, but in urban areas, residents of lower income areas had higher rates, though this trend was only statistically significant in the second time period.

Comparison to Previous Findings

- These results are consistent with and extend those in previous Atlas reports, which have shown significant increases in PCI rates over time [1,2].

Figure 8.2: Percutaneous Coronary Intervention Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted average annual rate per 1,000 residents age 40+



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
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8.3 Coronary Artery Bypass Surgery Rates

Definition: The number of bypass surgeries performed on residents age 40 and older per 1,000 residents age 40 and older. Bypass surgery was defined by CCI code 1.IJ.76 in any intervention field in a hospital abstract. These procedures were performed only at the two tertiary hospitals in Manitoba (St. Boniface General Hospital and Health Sciences Centre). 'Out of hospital' interventions were excluded to avoid double-counting. Annual average rates were calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17, and age- and sex-adjusted to the Manitoba population age 40 and older in the first time period.

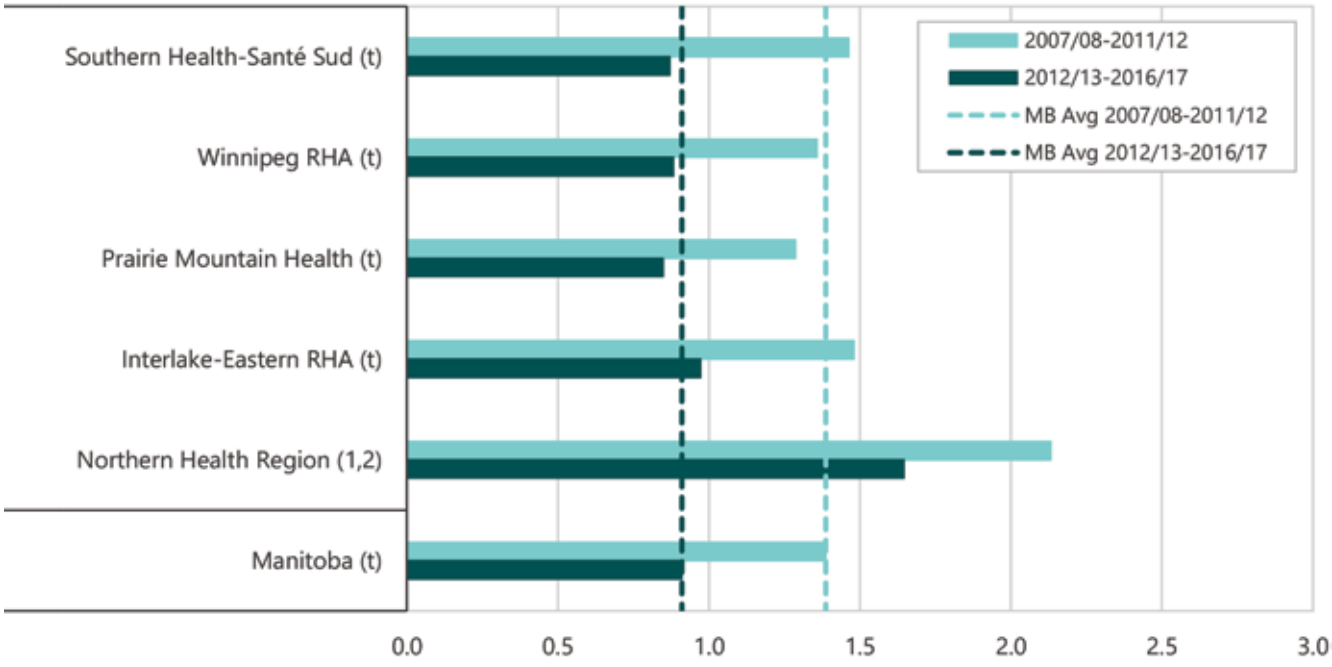
Key Findings

- The rate of coronary artery bypass surgery in Manitoba decreased significantly over time from 1.39 to 0.91 surgeries per 1,000 residents per year. This trend was reflected in all regions.
- Bypass surgery rates were not related to premature mortality, though the highest rates were among residents of Northern RHA.
- Bypass surgery rates were related to income in both urban and rural areas in both time periods, with higher rates among residents in lower income areas, though the rural trend in the first time period did not quite reach statistical significance (p=0.054).

Comparisons with Previous Findings

- Results in previous Atlas reports have consistently shown small but non-significant decreases in bypass surgery rates over time, but this is the first report in which the change was statistically significant [1,2].
- This is likely related to the continuing increases in PCI rates (Section 8.2), as many patients that may previously have been treated with bypass surgery are now treated with PCI.

Figure 8.3: Coronary Artery Bypass Surgery Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted average annual rate per 1,000 residents age 40+



1 indicates area's rate was statistically different from Manitoba average in first time period
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8.4 Hip Replacement Surgery Rates

Definition: The number of hip replacements (complete removal and replacement of joint) performed on residents age 40 and older per 1,000 residents age 40 and older. Hip replacements were defined by ICD–9–CM codes 81.50, 81.51, and 81.53 or CCI codes 1.VA.53.LA–PN and 1.VA.53.PN–PN in any procedure field in a hospital abstract. 'Out of hospital' procedures were excluded to avoid double-counting. Average annual rates were calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17, and age- and sex-adjusted to the Manitoba population age 40 and older in the first time period.

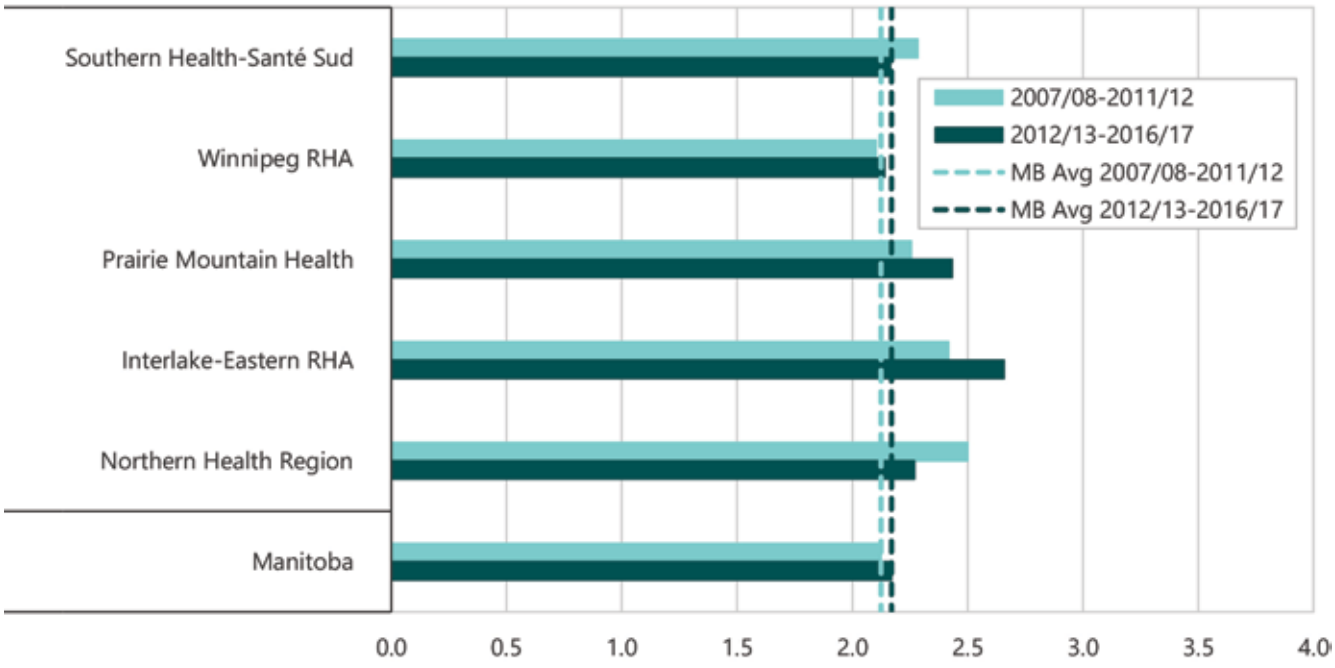
Key Findings

- The rate of hip replacements increased slightly but not significantly over time from 2.12 to 2.17 procedures per 1,000 residents age 40 and older per year. The changes over time varied by RHA with some slight increases and some slight decreases.
- There was relatively little variation in hip replacement rates across regions. Regional rates were not strongly correlated with premature mortality.
- District-level results showed more variation in rates, but also had no clear relationship with health status.
- Among Winnipeg NCs, there was considerable variation, with some less-healthy areas having lower than average rates of hip replacements.
- Among urban residents, hip replacement rates were significantly higher among residents of high income areas in both time periods. The same trend was seen among rural residents in the second time period, but not in the first.
    - These trends are the opposite of what is expected in a universal needs-based system, and warrant further investigation to ensure services are being provided equitably among the population.

Comparison to Previous Findings

- These results are different from the 2013 Atlas, which documented significant increases in hip replacement rates over time, but similar to results in the 2009 Atlas [1,2].

Figure 8.4: Hip Replacement Surgery Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted average annual rate per 1,000 residents age 40+



1 indicates area's rate was statistically different from Manitoba average in first time period
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8.5 Knee Replacement Surgery Rates

Definition: The number of knee replacement surgeries (complete removal and replacement of joint) performed on residents age 40 and older per 1,000 residents age 40 and older. Knee replacements were defined by ICD–9–CM codes 81.54 and 81.55 or CCI codes 1.VG.53.LA–PN and 1.VG.53.LA–PP in any procedure field in a hospital abstract. 'Out-of-hospital' procedures were excluded to avoid double-counting. Average annual rates were calculated for two five-year periods: 2007/08–2011/12 and 2012/13–2016/17, and age- and sex-adjusted to the Manitoba population age 40 and older in the first time period.

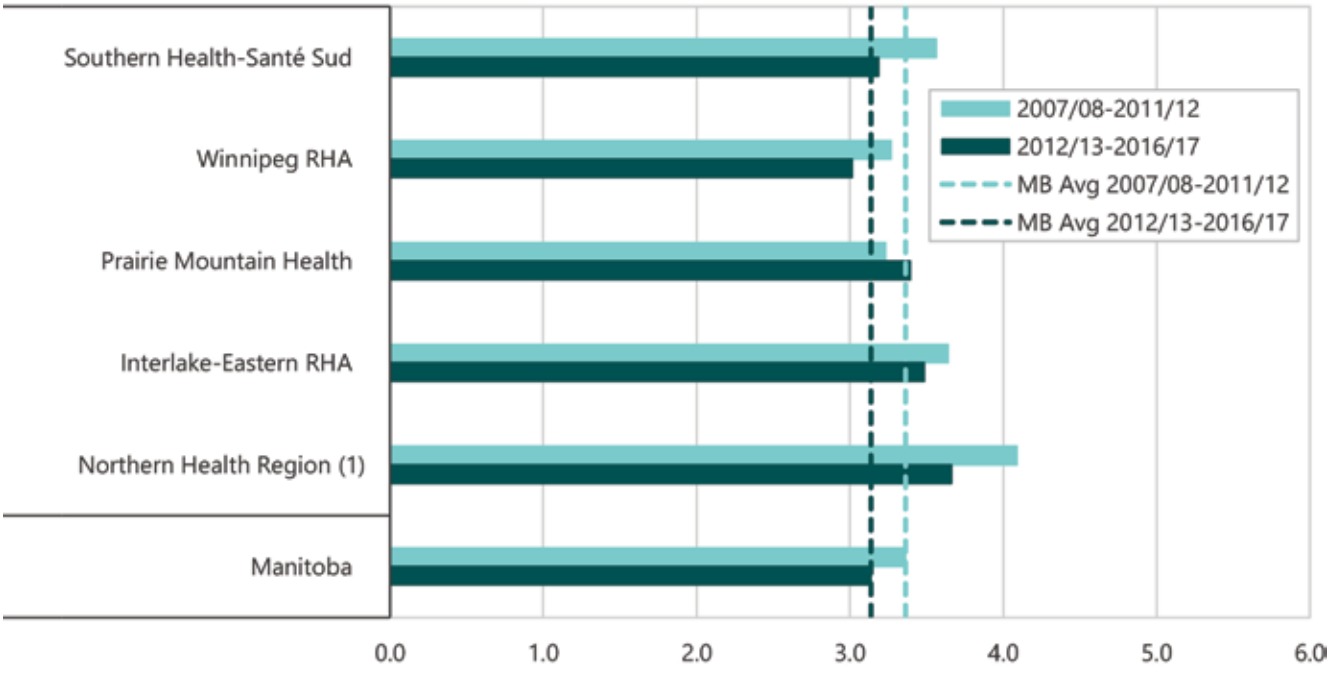
Key Findings

- Knee replacement rates decreased from 3.36 to 3.14 per 1,000 residents, though this decrease was not statistically significant.
- There appears to be only a modest association between knee replacement rates and health status (premature mortality) at the regional level, but no relationship at district or Winnipeg NC levels.
- Knee replacement rates were significantly related to income among urban residents in the second time period (with higher income residents having higher rates), but not the first. There was no relationship among rural residents in either time period.

Comparison to Previous Findings

- These results contrast sharply with those in previous Atlas reports, which consistently showed increases in knee replacement rates over time [1,2].

Figure 8.5: Knee Replacement Surgery Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age- and sex-adjusted average annual rate per 1,000 residents age 40+



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8.6 Cataract Surgery Rates

Definition: The number of cataract surgeries performed on residents age 50 and older per 1,000 residents age 50 and older. Cataract surgery was defined by a physician service claim with tariff codes 5611, 5612 and tariff prefix '2' (surgery); or a hospital abstract with ICD–9–CM procedure codes 13.11, 13.19, 13.2, 13.3, 13.41, 13.42, 13.43, 13.51, or 13.59; or CCI code 1.CL.89. Additional cataract surgeries for Manitoba residents were added from medical reciprocal claims for out-of-province procedures, including Alberta (tariff code 27.72) and Saskatchewan (tariff codes 135S, 136S, 226S, and 325S). Rates were calculated for 2011/12 and 2016/17, and age- and sex-adjusted to the Manitoba population age 50 and older in 2011/12.

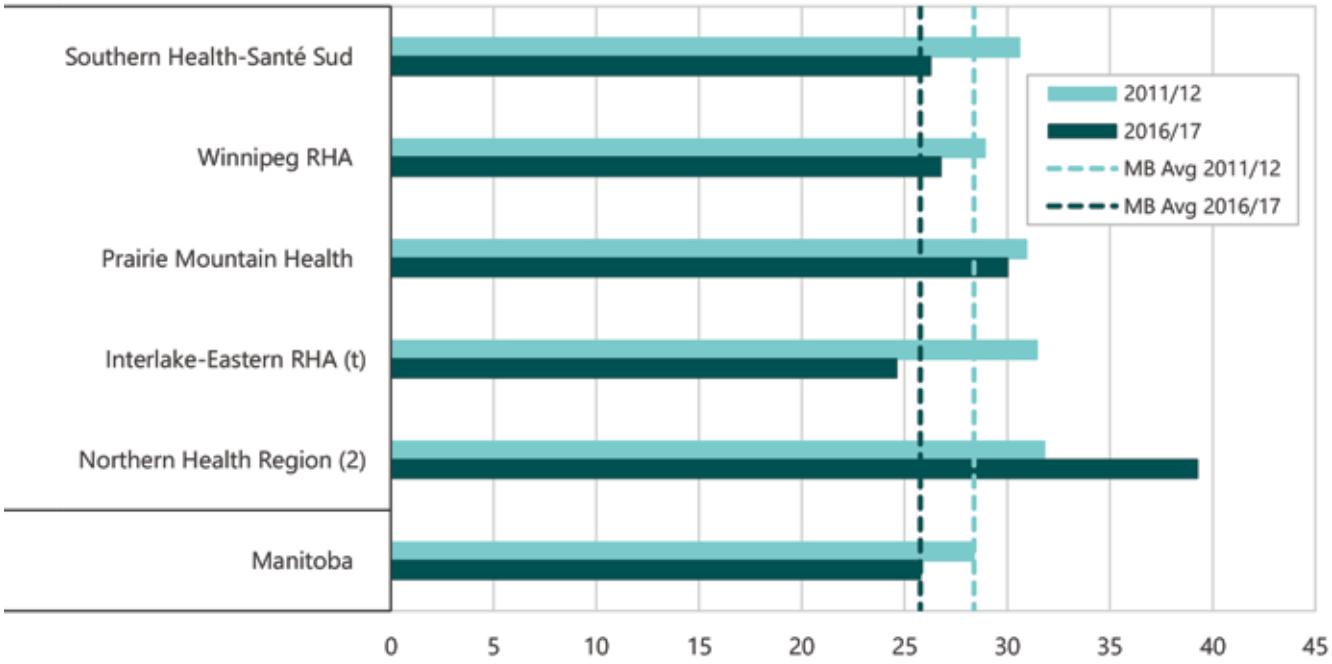
Key Findings

- The rate of cataract surgeries decreased from 28.4 to 25.8 surgeries per 1,000 residents age 50 and older, though this decrease was not statistically significant. Most regions showed decreases over time, though the change was significant in Interlake-Eastern only. Northern had a non-significant increase.
    - The actual number of procedures increased over time, but this change did not keep pace with the increase in the number of residents age 50 and older, causing a slight decrease in the rate per 1,000 residents age 50 and older.
- There appears to be a weak association between cataract surgery rates and premature mortality in 2016/17, but not in 2011/12. There was no clear pattern among districts or Winnipeg NCs.
- There were no associations between cataract surgery rates and income in urban or rural areas in either year.

Comparison to Previous Findings

- These results are comparable to those in previous Atlas reports, which have consistently shown only modest changes in cataract surgery rates over time [1,2].

Figure 8.6: Cataract Surgery Rate by RHA, 2011/12 and 2016/17
Age- and sex-adjusted rate per 1,000 residents age 50+



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8.7 Rates of Computed Tomography (CT) Scans

Definition: The number of CT scans performed on residents age 20 and older per 1,000 residents age 20 and older. CT scans were defined by a physician claim with tariff codes 7112–7115 or 7221–7230. Residents with multiple claims for CT scans in a day (e.g., multiple body parts scanned) were assigned only one scan for that day. Adjusted rates are shown for 2016/17. CT scan rates shown in this report underestimate the 'true' rates, as individual-level information regarding CT scans performed in some rural hospitals is incomplete.

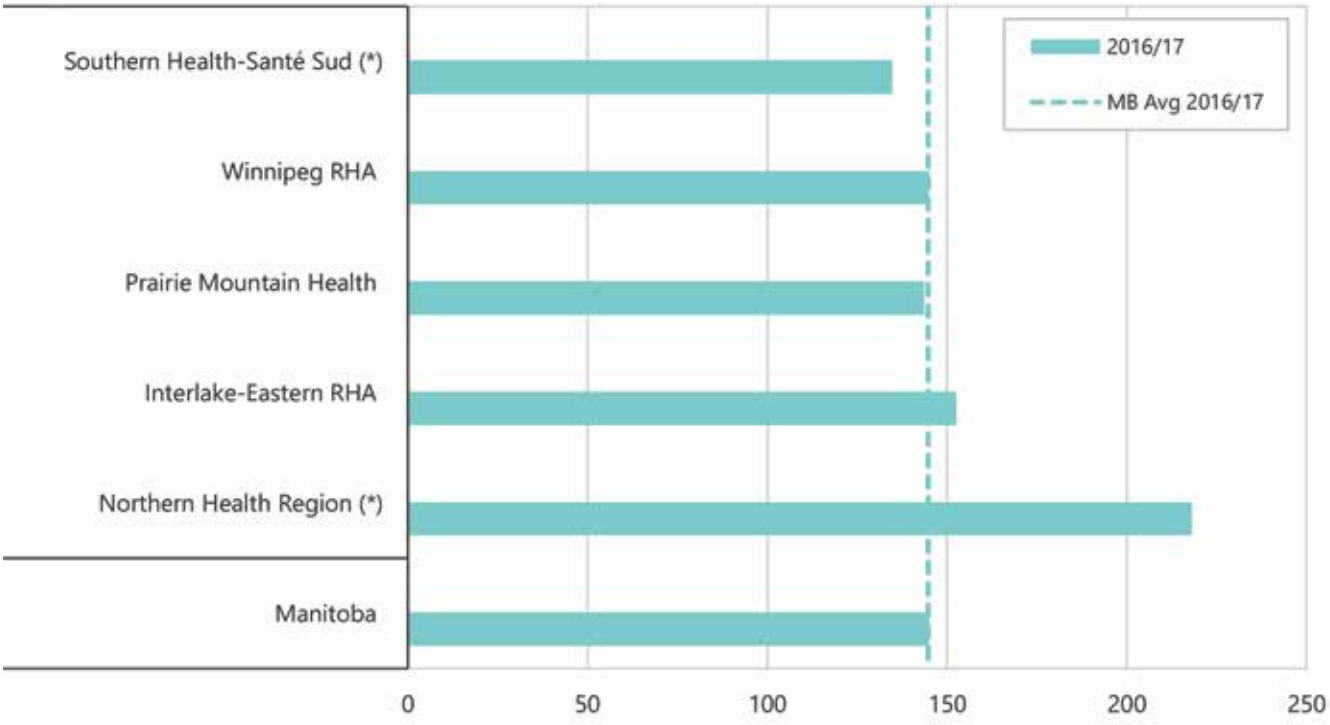
Key Findings

- The CT scan rate for adults in Manitoba was 145 per 1,000 residents age 20 and older in 2016/17. Individual-level data for previous years are known to be incomplete, so rates could not be compared over time.
- CT scan rates appear to be related to premature mortality, with higher rates in regions with less healthy populations.
- CT scan rates were significantly related to income in both urban and rural areas: residents of lower income areas had higher CT scan rates.

Comparison to Previous Findings

- CT scan rates were not reported in the 2009 Atlas due to incomplete records, though data collection improved over time, and they were shown in the 2013 report (120 per 1,000 residents per year) [1]. It was hoped that this report could compare rates from 2011/12 to those for 2016/17, but in examining the data again, it became clear that the results for 2011/12 are less reliable than previously thought, so it was decided to not show rates for 2011/12.

Figure 8.7: Computed Tomography (CT) Scan Rate by RHA, 2016/17
Age- and sex-adjusted rate per 1,000 residents age 20+



* indicates area's rate was statistically different from the Manitoba average
s indicates data suppressed due to small numbers

8.8 Rates of Magnetic Resonance Imaging (MRI) Scans

Definition: The number of magnetic resonance imaging (MRI) scans performed on residents age 20 and older per 1,000 residents age 20 and older. MRI scans were defined by physician claims with tariff codes 7501–7528. Residents with multiple claims for MRI scans in one day (e.g., multiple body parts scanned) were assigned only one scan for that day. Rates are shown for 2011/12 and 2016/17, and age- and sex-adjusted to the Manitoba population 20 and older in 2011/12.

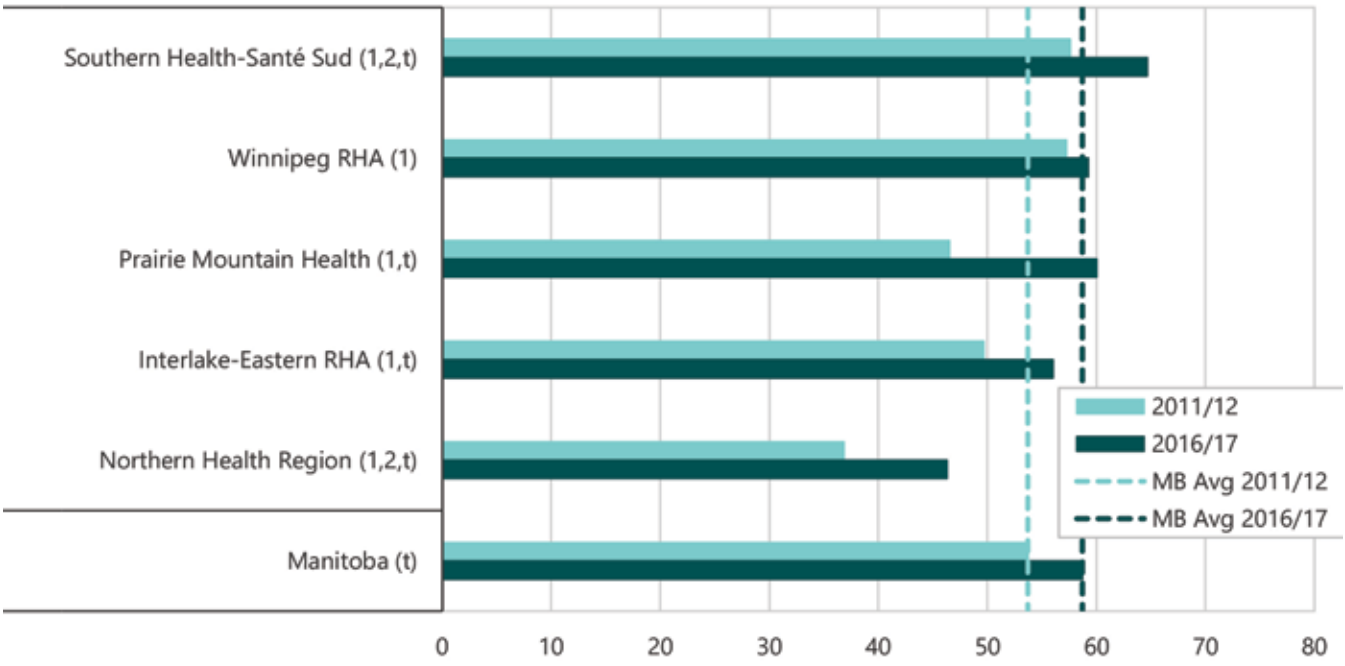
Key Findings

- The rate of MRI scans increased significantly from 53.7 to 58.7 scans per 1,000 Manitoba residents age 20 and older. Rates increased in all areas, though the increase in Winnipeg was not statistically significant.
- There was an inverse relationship between MRI scan rates and premature mortality at the regional level: RHAs with the least healthy residents had the lowest MRI scan rates in both years.
    - This trend is the opposite of what might be expected for health services in a universal system based on medical need, but the medical indications for MRI scans may not be correlated with overall health status as measured by PMR. Therefore, these results should be interpreted with caution.
- Analyses by income quintile showed significant linear relationships: MRI scan rates were lower among residents of lower income urban and rural areas, in both time periods.
    - As with regional rates above, this pattern of lower rates among residents of lower income areas is the opposite of what might be expected for health services in a universal system based on medical need, but the indications for MRI scans may not be correlated with area-level income. Therefore, these results should be interpreted with caution.

Comparisons to Previous Findings

- Results in previous Atlas reports showed that MRI scan rates doubled between the early and mid-2000s, then doubled again between the mid-2000s and 2011/12 [1,2]. The results here show that the dramatic growth rate in MRI scans has slowed, but rates still increased significantly over time.
- The inverse relationships with area-level income have been consistent over time, and warrant further investigation to ensure that MRI scans are being provided to all Manitobans equitably.

Figure 8.8: Magnetic Resonance Imaging (MRI) Scan Rate by RHA, 2011/12 and 2016/17
Age- and sex-adjusted rate per 1,000 residents age 20+



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Chapter 9:
Use of Personal Care Homes (PCHs)

Key Findings in Chapter 9

The results in this chapter indicate continued decreases in the rate at which Manitobans (age 75 and older) use personal care homes:

- PCH admission rates decreased over time.
- The percent of older adults living in PCHs ('prevalence') decreased, though the change was not statistically significant.
- Wait times to PCH admission decreased among patients panelled in hospital, but increased (non-significantly) among those panelled in community settings.
- The level of care of PCH residents at the time of admission increased over time.
- The average length of stay for PCH residents decreased slightly over time.

Introduction

This chapter contains a number of indicators of the use of PCHs (also known as nursing homes) in Manitoba. PCHs are residential facilities for people (predominantly older adults) living with significant chronic disease or disability.

Indicators in this chapter are based on Manitobans age 75 years and older, as they comprise the vast majority of all PCH residents in Manitoba. In addition, the rates have all been age- and sex-adjusted (within the 75+ population) to enable a fair comparison of regions within Manitoba that have different age and sex compositions. Most indicators are reported according to the region where the PCH is located because once a person is admitted to a PCH, they become a resident of that region. Analyses were done for RHAs and Winnipeg community areas (CAs) only because many districts of rural regions and Winnipeg neighbourhood clusters (NCs) do not have any PCHs within their boundaries. Analyses were not done by income quintile because income data in the census are not collected for institutionalized persons.

Data Issues

Complete individual-level data are not available for all PCH services in Manitoba: there are facilities in First Nation communities in several regions that are operated by the federal government or through federal transfer agreements. Individual-level data on PCH bed use are not available from these facilities – which means that they cannot be included in the indicators in this report. As a consequence, the results shown in this report underestimate the use of PCH beds in those regions to some degree. The discrepancy is largest in Northern RHA.

This report includes PCH use data for those admitted to the Misericordia Health Centre in Winnipeg. These data were inadvertently missed in the analyses for the 2013 Atlas, so results shown here are more accurate than those in the previous report, though the differences are modest.

Note Regarding Churchill

A small number of beds in the Churchill Regional Health Centre function as a PCH, but this is not a truly separate and licensed PCH facility. Consequently, the Churchill data are not reported exactly the same as for other PCHs. Churchill's population (especially its older adult population) is quite small, so small numbers of events can cause large differences in rates. Many results for Churchill residents are suppressed due to small numbers.

9.1 Rate of Admission to Personal Care Homes (PCH)

Definition: The percent of residents age 75 and older who were admitted to a PCH in a given year. Area of residence was assigned based on where people lived at the time, which is determined by the location of the PCH (using postal code and municipal code). Average annual values are shown for two two-year periods (2010/11–2011/12 and 2015/16–2016/17), and are age- and sex-adjusted to the population of Manitobans age 75 and older in the first time period.

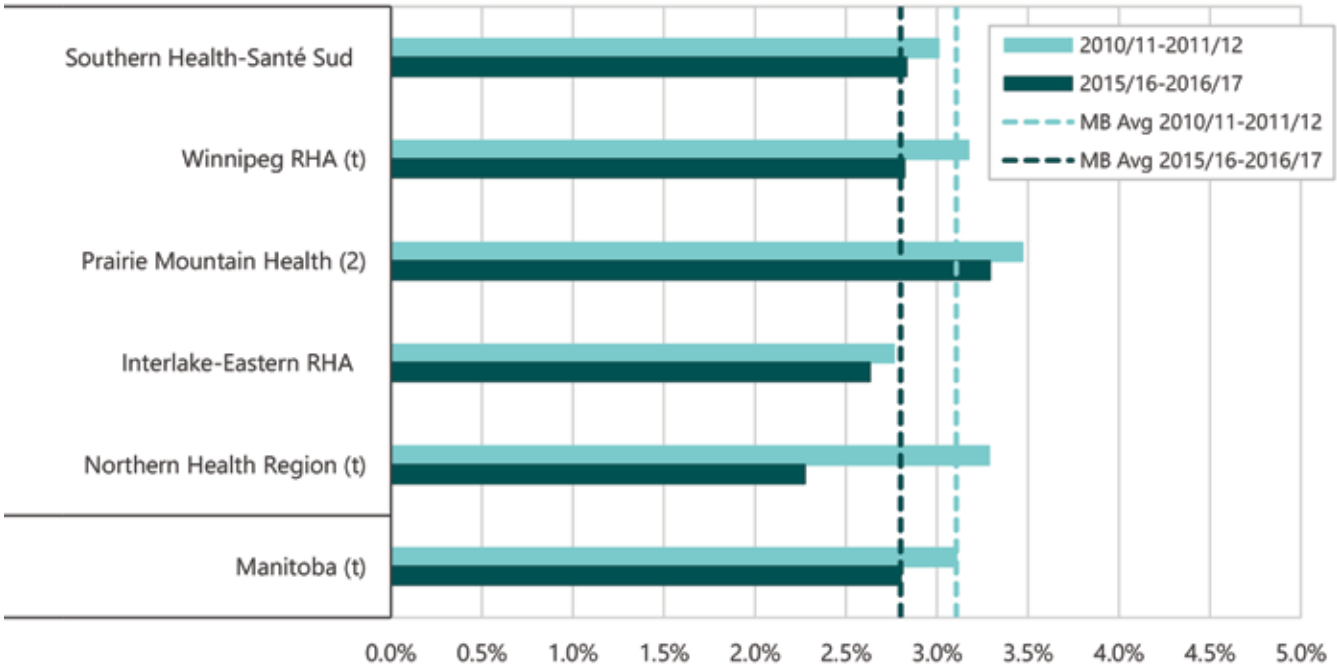
Key Findings

- Overall, there was a decrease in the percent of Manitoba residents age 75 and older admitted to a PCH each year from 3.11% to 2.80%. Rates decreased in all regions, though only the changes in Winnipeg and Northern reached statistical significance.
- PCH admission rates do not appear to be related to premature mortality at the regional or CA levels. Rates varied markedly across CAs in Winnipeg.

Comparisons to Previous Findings

- These results are consistent with and extend those shown in previous Atlas reports, documenting the long-term reduction in the rate at which older adults are admitted to PCHs [1,2]. The rate of growth of the population age 75 and older has been higher than the increases in PCH bed numbers – but alternative services like supportive housing have been introduced to provide the necessary services.
- The modest difference in values for 2010/11–2011/12 in this report compared to the 2013 Atlas are due to the inclusion of data from Misericordia Health Centre in this report (as noted in the introduction) [1].

Figure 9.1: Admission to Personal Care Homes by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted average annual percent of residents age 75+ admitted to a PCH



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9.2 Residents of Personal Care Homes

Definition: The percent of residents age 75 and older who lived in a PCH in a given year. Area of residence was assigned based on where people lived at the time, which is determined by the location of the PCH (using postal code and municipal code). Average annual values are shown for two two-year time periods (2010/11–2011/12 and 2015/16–2016/17), and are age- and sex-adjusted to the population of Manitobans age 75 and older in the first time period.

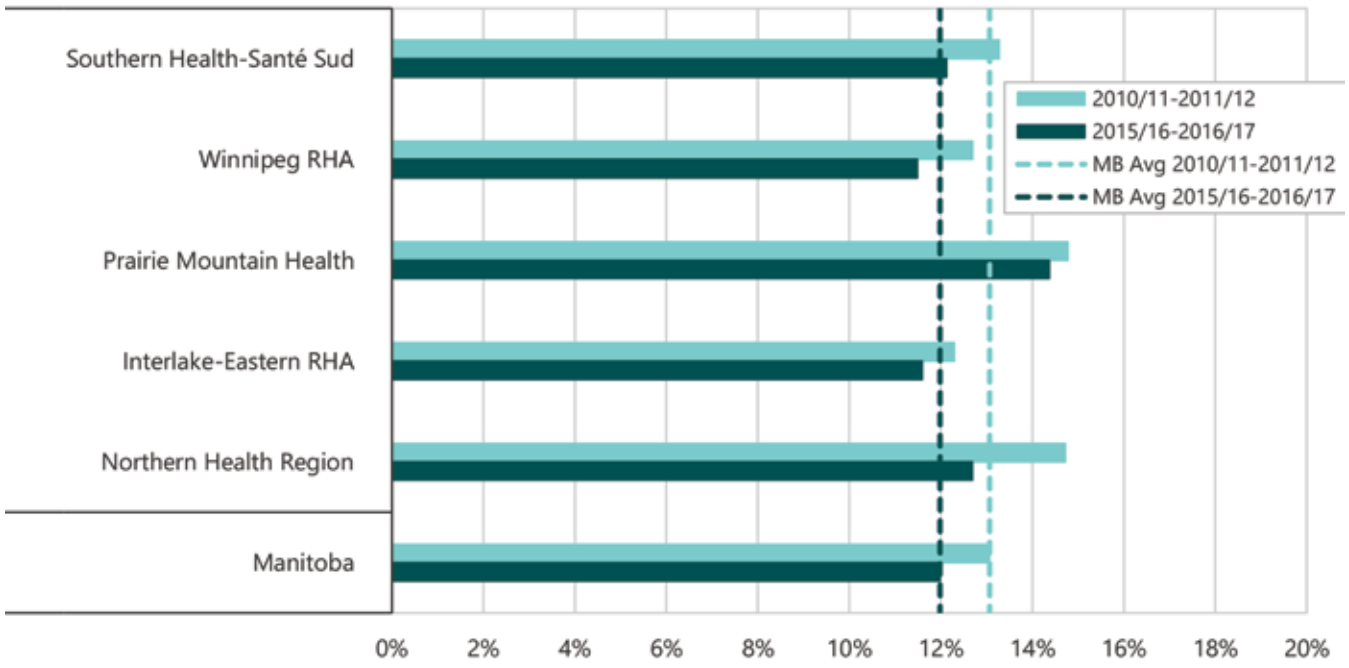
Key Findings

- Overall, there was a decrease in the percent of the population age 75 and older who were PCH residents from 13.1% to 12%, but this decrease did not reach statistical significance. A decrease was seen in all regions, though this decrease was non-significant.
- Rates of PCH residents do not appear to be related to premature mortality at the regional or CA levels. Rates varied markedly across CAs in Winnipeg.

Comparisons to Other Findings

- These results are consistent with and extend those shown in previous Atlas reports, documenting the long-term reduction in the percent of older adults who live in PCHs [1,2]. The rate of growth of the population age 75 and older has been higher than the increases in PCH bed numbers – but alternative services like supportive housing have been introduced to provide the necessary services.
- The modest difference in values for 2010/11–2011/12 in this report compared to the 2013 Atlas are due to the inclusion of data from Misericordia Health Centre in this report (as noted in the introduction) [1].

Figure 9.2: Residents of Personal Care Homes by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted average annual percent of residents age 75+ living in a PCH



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9.3 Wait Times for PCH Admission from Hospital

Definition: The 50th percentile of wait time (in weeks) experienced by those admitted to a PCH from a hospital; i.e., half of the population waited less than this amount of time, and half waited longer. Area of residence was assigned based on where people lived prior to admission to a PCH based on their postal code of residence (not where they were hospitalized). Median values were calculated for two two-year periods (2010/11–2011/12 and 2015/16–2016/17), and were adjusted for age, sex, RHA, and time period.

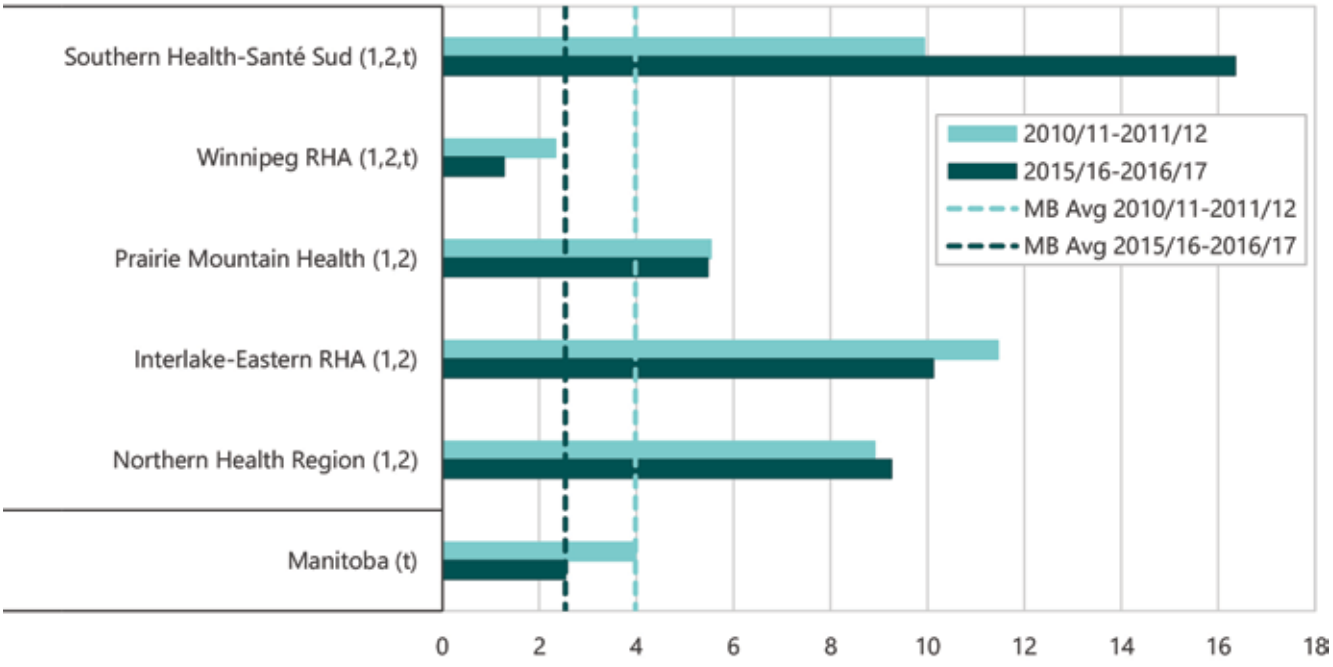
Key Findings

- There was a significant decrease in median wait times for PCH admission from hospital in Manitoba from 3.98 to 2.53 weeks. However, RHAs varied markedly: Southern had a significant increase, Winnipeg had a significant decrease, and the others did not change significantly.
- There was no relationship between wait times for PCH admission from hospital and premature mortality at the regional or CA levels.

Comparisons to Previous Findings

- These results contrast with those shown in the 2013 Atlas, which was the first to separate wait times for PCH admissions from hospital vs those from community settings (see section 9.3). In the 2013 report, wait times from hospital increased over time [1], but in this report, wait times have decreased for Manitoba overall, though with significant regional variation.
- The modest difference in values for 2010/11–2011/12 in this report compared to the 2013 Atlas are due to the inclusion of data from Misericordia Health Centre in this report (as noted in the introduction) [1].

Figure 9.3: Wait Times for Personal Care Home Admission from Hospital by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted median number of weeks from assessment to admission into a PCH by residence prior to admission per 1,000 residents age 75+



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9.4 Wait Times for PCH Admission from the Community

Definition: The 50th percentile of wait time (in weeks) experienced by those admitted to a PCH from a community setting (i.e., not a hospital); i.e., half of this population waited less than this amount of time, and half waited longer. Area of residence was assigned based on where people lived prior to admission. Median values for two two-year periods were calculated (2010/11–2011/12 and 2015/16–2016/17), and were adjusted for age, sex, RHA, and time period.

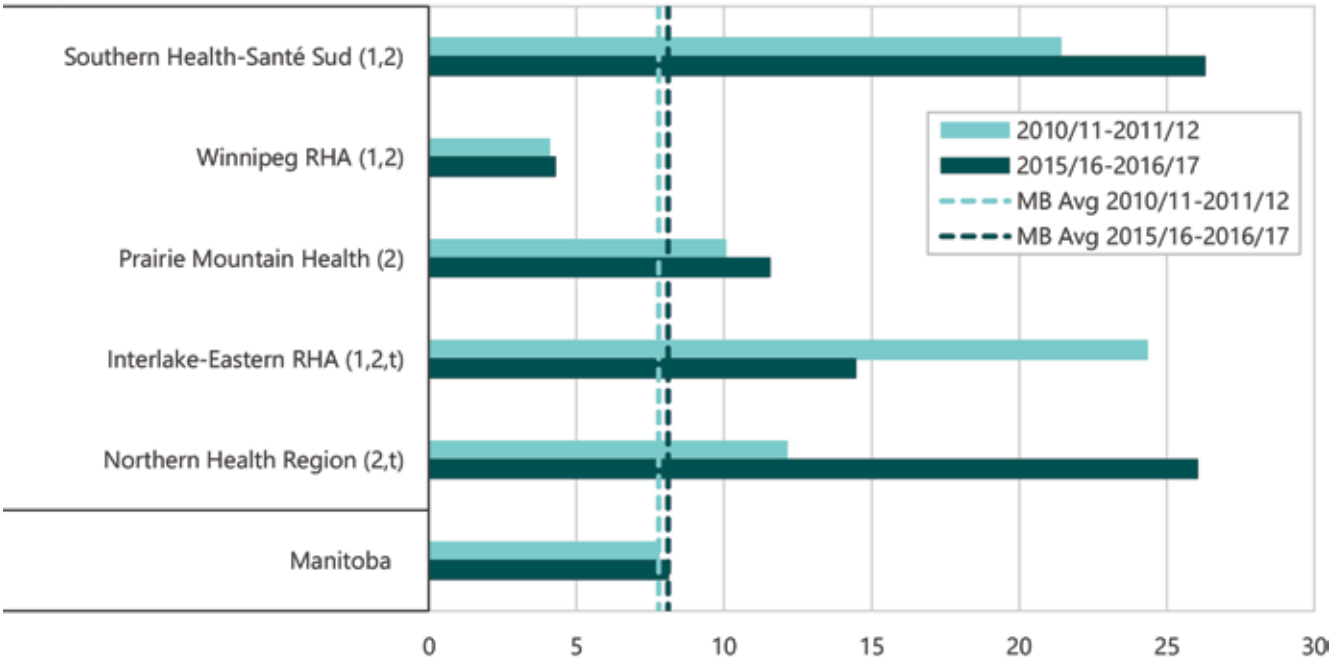
Key Findings

- Overall, median wait times for PCH admission from the community did not change over time; the small increase from just under to just over 8 weeks was not statistically significant.
- However, the actual wait times, and how they changed over time, varied dramatically across rural regions and within Winnipeg CAs.
  - Wait times were lower than average in Winnipeg, and higher in all other regions.
  - Wait times increased over time in all RHAs except Interlake-Eastern, but only Northern's wait time increase was statistically significant.
- There was no relationship between premature mortality and wait times for PCH admission from the community.

Comparisons to Previous Findings

- These results are very similar to those shown in the 2013 Atlas, which was the first to separate wait times for PCH admissions from Hospital vs those from Community settings. In this report and the 2013 report, wait times from community increased slightly over time, though with significant regional variation [1].
- The modest difference in values for 2010/11–2011/12 in this report compared to the 2013 Atlas are due to the inclusion of data from Misericordia Health Centre in this report (as noted in the introduction) [1].

Figure 9.4: Wait Times for Personal Care Home Admission from the Community by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted median number of weeks from assessment to admission into a PCH by residence prior to admission per 1,000 residents age 75+



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9.5 Level of Care on Admission to PCH

Definition: The distribution of levels of care assigned to PCH residents who were age 75 and older at the time of their admission. Level 1 represents the lowest level of need and Level 4 represents the highest, though no Level 1 residents were admitted during the study years. Levels 2 and 3 were stratified into residents whose assessment indicated a need for close supervision due to possible behavioural issues (2Y or 3Y) and residents who did not require close supervision (2N or 3N). Area of residence was assigned based on where people lived prior to PCH admission. Crude values are shown for 2010/11–2011/12 and 2015/16–2016/17. See the online supplement for further details.

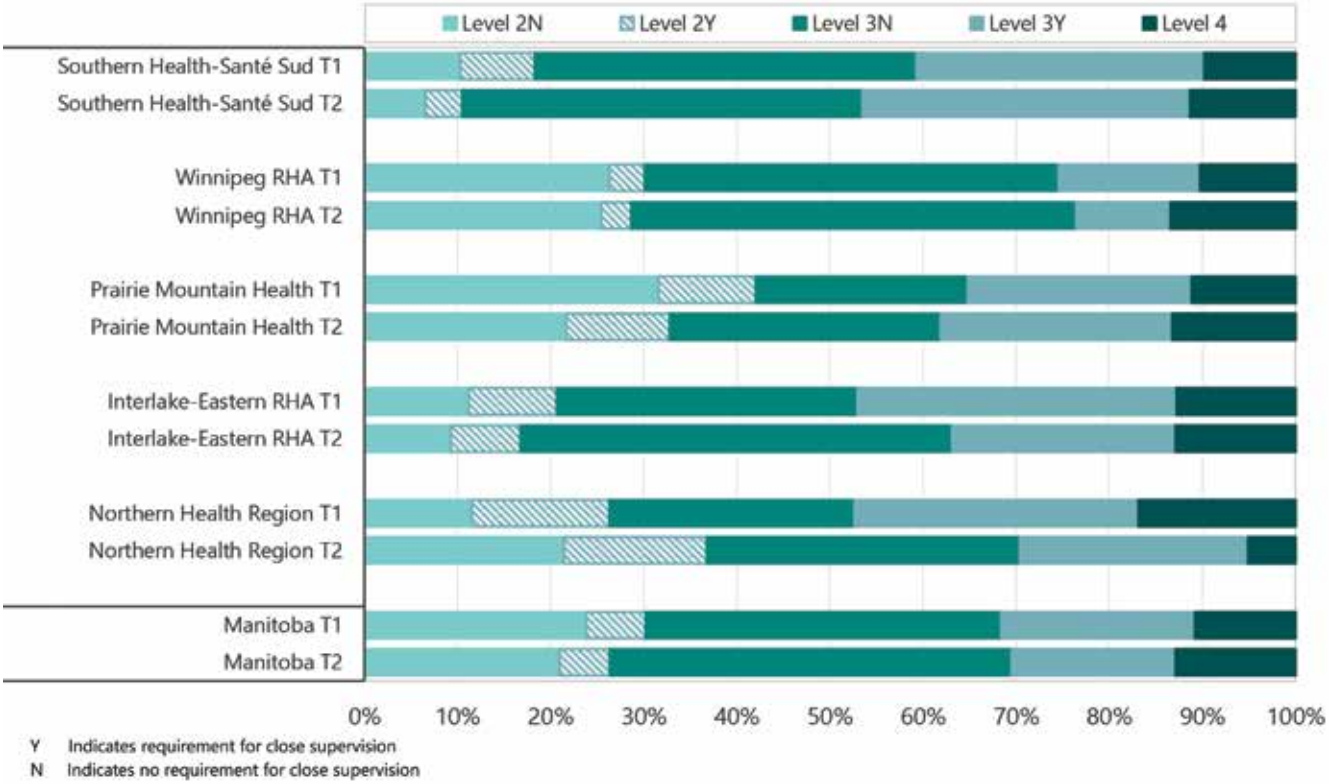
Key Findings

- Overall, there was an increase in the level of care on admission to PCHs with a reduction in Level 2 admissions and an increase in Level 3 and 4 admissions. This overall increase was reflected in all regions except Northern, though values and changes over time varied considerably by region.
  - Level 2 admissions not requiring close supervision (2N) decreased from 23.8% to 20.9%.
  - Level 2 admissions requiring close supervision (2Y) decreased from 6.39% to 5.43%
  - Level 3 admissions not requiring close supervision (3N) increased from 38.2% to 43.2%.
  - Level 3 admissions requiring close supervision (3Y) decreased from 20.8% to 17.6%.
  - Level 4 admissions increased from 10.8% to 12.9%.
- There appears to be no relationship between premature mortality and the level of care on admission to PCH at the RHA or CA level.

Comparison to Previous Findings

- These results are consistent with and extend the findings of previous Atlas reports, showing that the level of care on admission to PCHs continues to increase over time [1,2].

Figure 9.5: Level of Care on Admission to Personal Care Homes by RHA, 2010/11-2011/12 and 2015/16-2016/17
Crude average annual percent of residents age 75+ admitted to a PCH
T1 = 2010/11-2011/12 T2 = 2015/16-2016/17



9.6 Length of Stay in PCH by Level of Care on Admission

Definition: The minimum length of time (in years) that 50% of all PCH residents age 75 and older spent in PCHs before leaving the facility, according to their level of care on admission; i.e., half of PCH residents spent less than this amount of time in the PCH, and half spent longer. Level 1 represents the lowest level of need and Level 4 represents the highest. Levels 2 and 3 are stratified into residents whose assessment indicated a need for close supervision due to possible behavioural issues (2Y or 3Y) and those who did not (2N or 3N). Median values were calculated for two two-year periods: 2010/11–2011/12 and 2015/16–2016/17, and were adjusted for age, sex, RHA, and time period.

Key Findings

- Overall, the length of time Manitobans age 75 and older spent in PCHs decreased over time, consistent with the idea that people are entering PCHs later and 'sicker', which results in a shorter stay. This also implies that the acuity level of PCH residents continues to increase over time.
    - Note, however, that length of stay actually increased for those admitted at Level 1Y and 2Y. Small increases were also seen in Level 3N and Level 4, though those changes were not statistically significant.
- Changes over time varied by RHA, and by level of care within RHA, though only a few of those changes reached statistical significance.

Comparison to Previous Findings

- These results are consistent with and extend the findings of previous Atlas reports, which have shown a continual decrease in length of stay for most PCH residents [1,2].

Table 9.1: Length of Stay in Personal Care Homes by Level of Care at Admission and RHA, 2010/11-2011/12 and 2015/16-2016/17
Median number of years spent in a PCH by residents age 75+ and level of care requirement for close supervision* assessed at admission

Regional Health Authority and Time Period	Median Length of Stay (Years) by Level of Care					
	All Levels	Level 1N & 2N	Level 1Y & 2Y	Level 3N	Level 3Y	Level 4
Southern Health-Santé Sud						
2010/11-2011/12	2.31	4.61	2.72	2.14	2.10	1.46
2015/16-2016/17	2.19	4.27	3.99	2.17	1.80	1.46
Winnipeg RHA						
2010/11-2011/12	2.22 (t)	3.33 (t)	3.39	1.73	2.15	1.36 (t)
2015/16-2016/17	2.00 (t)	2.42 (t)	2.90	1.78	2.43	0.93 (t)
Prairie Mountain Health						
2010/11-2011/12	2.32	3.11	2.09	1.86	1.81	1.64
2015/16-2016/17	2.36	3.19	2.68	2.14	1.99	1.09
Interlake-Eastern RHA						
2010/11-2011/12	2.24	6.20 (t)	2.69 (t)	2.49 (t)	1.85	1.59
2015/16-2016/17	2.11	2.40 (t)	4.95 (t)	1.66 (t)	2.26	1.59
Northern Health Region						
2010/11-2011/12	2.24	2.61	2.43	1.51	2.28	1.55
2015/16-2016/17	2.35	2.86	2.91	1.41	2.05	3.34
Manitoba						
2010/11-2011/12	2.28 (t)	3.40 (t)	2.73 (t)	1.80	2.04	1.51 (t)
2015/16-2016/17	2.10 (t)	2.65 (t)	3.36 (t)	1.85	2.17	1.09 (t)

* indicates requirement (Y) or no requirement (N) for close supervision
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

Chapter 10:
Maternal and Child Health

Key Findings in Chapter 10

The results in this chapter show a mixed but overall positive picture of changes in maternal and child health indicators over time:

- The birth rate decreased slightly in Manitoba over time. In particular, the rate of births to teen mothers decreased significantly, following an even larger decrease in the rate of teen pregnancies.
- The percent of women receiving inadequate prenatal care also decreased, though only slightly.
- The rate of preterm births was stable over time.
- The percent of babies born small for gestational age increased, while those born large for gestational age decreased.
- The Caesarean section rate increased over time, and the rate of vaginal births after C-sections decreased over time, though only slightly.
- There was marked stability in the location of births in Manitoba: the vast majority occurred in a designated maternity hospital in the mother's home RHA or in Winnipeg.
- The rate of breastfeeding initiation in hospital increased significantly.
- The infant mortality rate (0-12 months) decreased significantly during the study period, and over a 20-year span.
- The child mortality rate (1-19 years) was stable over time, and injury & poisoning remained the dominant cause of child deaths.
- The rate of surgery for the extraction of multiple teeth affected by dental caries among children age 0-5 decreased significantly over time.
- The prevalence of asthma among children and youth (age 5-19) increased over time.
- For almost all indicators in this chapter, there were significant associations with health status and area-level income: those from more disadvantaged areas had significantly poorer outcomes.

Introduction

Previous RHA Atlas reports have not included a chapter on maternal and child health, because the reports have usually been accompanied by parallel reports focusing on these issues, released at about the same time. Since that is not the case for this cycle, this chapter has been added to ensure up-to-date results are available for the key indicators in the maternal and child health topic area. The choice of indicators to include was informed by decisions from the Community Health Assessment Network (CHAN) and the research team.

All indicators in this chapter were taken from previous MCHP reports, including "How are Manitoba's Children Doing?" [18] and "Perinatal Services and Outcomes in Manitoba" [19].

10.1 Birth Rate

Definition: The age-adjusted rate of births per 1,000 women was calculated for females age 15-45 for 2011/12 and 2016/17. Births were defined as live births coded in Manitoba hospital abstracts with ICD–10–CA codes Z37.0, Z37.2, Z37.3, and Z37.5. Note that home births and those occurring at the birth centre in Winnipeg are coded into the hospital abstract data system, so they were included in this analysis even if no hospital care is involved.

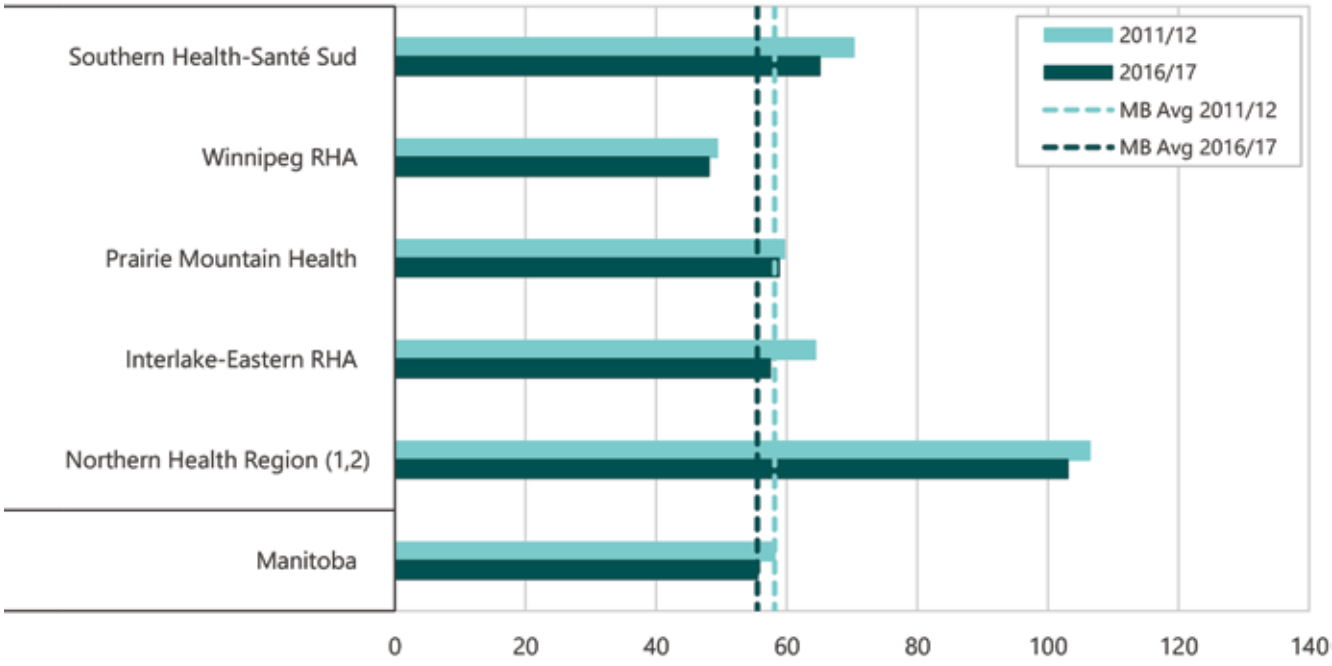
Key Findings

- Overall, the annual birth rate in Manitoba decreased slightly, but not significantly, from 58.1 to 55.5 births per 1,000 females age 15-45.
- Northern RHA was the only region with a rate statistically different from the Manitoba average (higher). The rate in Southern was slightly above average, and the rate in Winnipeg was slightly lower, but neither of these differences was significant.
- There appears to be no clear relationship between birth rate and premature mortality at the regional level, but among NCs in Winnipeg and among the districts of rural regions, birth rates were slightly higher in less healthy areas (areas with higher PMR).
- Birth rates were significantly associated with income in urban areas, and very strongly associated with income in rural areas: women in lower income areas had higher birth rates in both time periods.
- Birth rates were considerably higher for rural than urban women.

Comparison to Previous Findings

- MCHP has not reported results for this indicator before, so direct comparisons are not available. However, MCHP's perinatal report analyzed birth rates in a number of separate categories [19].

Figure 10.1: Birth Rate by RHA, 2011/12 and 2016/17
Age-adjusted rate of live births per 1,000 females age 15-45



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.2 Inadequate Prenatal Care

Definition: The average annual maternal age-adjusted percent of singleton live births whose mothers received inadequate or no prenatal care was calculated for two five-year time periods: 2007/08–2011/12 and 2012/13–2016/17. Mothers with no or inadequate prenatal care were determined as those with a low score on the R–GINDEX (Revised–Graduated Prenatal Care Utilization Index) [20]. The denominator includes all singleton live births in Manitoba hospitals (ICD–10–CA codes Z38.0, Z38.1, Z38.2) where the mother was covered by MHSAL for the entire gestation period. Stillbirths and records with gestational age missing, less than 20 weeks, or greater than 45 weeks were excluded.

The ICD–9–CM tariffs used to identify a prenatal care visit were 8400 and 8401. If a diagnosis of pregnancy was also recorded on the medical claim then ICD–9–CM tariffs, 8501, 8507, 8509, 8529, 8540, and 8550 were also used. The ICD–9–CM diagnosis codes used to identify a prenatal care visit were 640–669, V22, and V23.

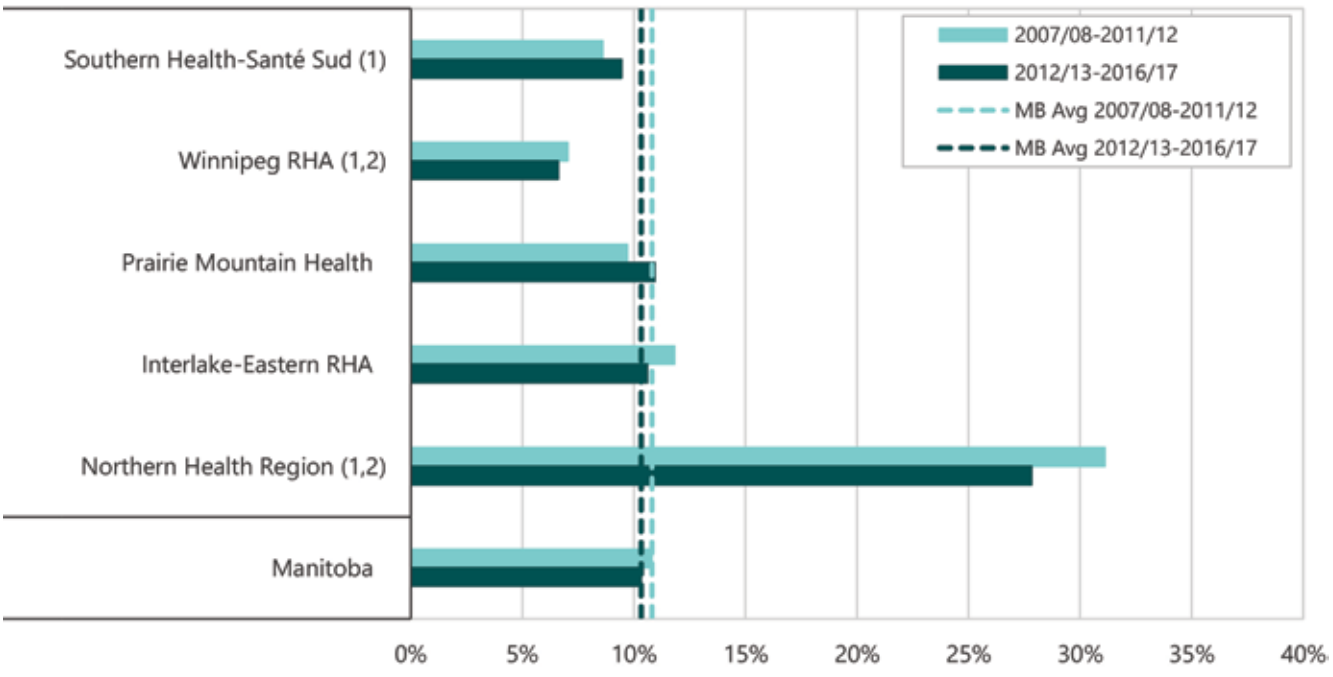
Key Findings

- Overall, the rate of inadequate prenatal care decreased slightly, but not significantly, from 10.8% to 10.3%. Rates and changes over time varied by region, but none of the regional changes were statistically significant.
- Rates in Winnipeg and Southern (in the first time period) were significantly lower than the provincial average, while those in Northern were significantly higher.
- There appears to be no clear relationship between prenatal care and premature mortality at the regional level, but among NCs in Winnipeg and among the districts of rural regions, inadequate prenatal care rates were higher in less healthy areas (higher PMR).
- Inadequate prenatal care rates were significantly associated with income in urban and rural areas in both time periods, with women in lower income areas having rates that were 2-3 times higher than women in higher income areas.
- Inadequate prenatal care rates were considerably higher for rural than urban women.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed rates rose slightly from about 11% in 2001/02, to about 12.5% in 2008/09. This report shows rates have decreased in more recent years.

Figure 10.2: Inadequate Prenatal Care Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Maternal age-adjusted average annual percent of singleton live in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.3 Preterm Birth Rate

Definition: The maternal age-adjusted rate of preterm births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The preterm birth rate is expressed as the percent of live births with a gestational age of less than 37 completed weeks out of all live births in Manitoba hospitals (ICD–10–CA code Z38). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks were excluded.

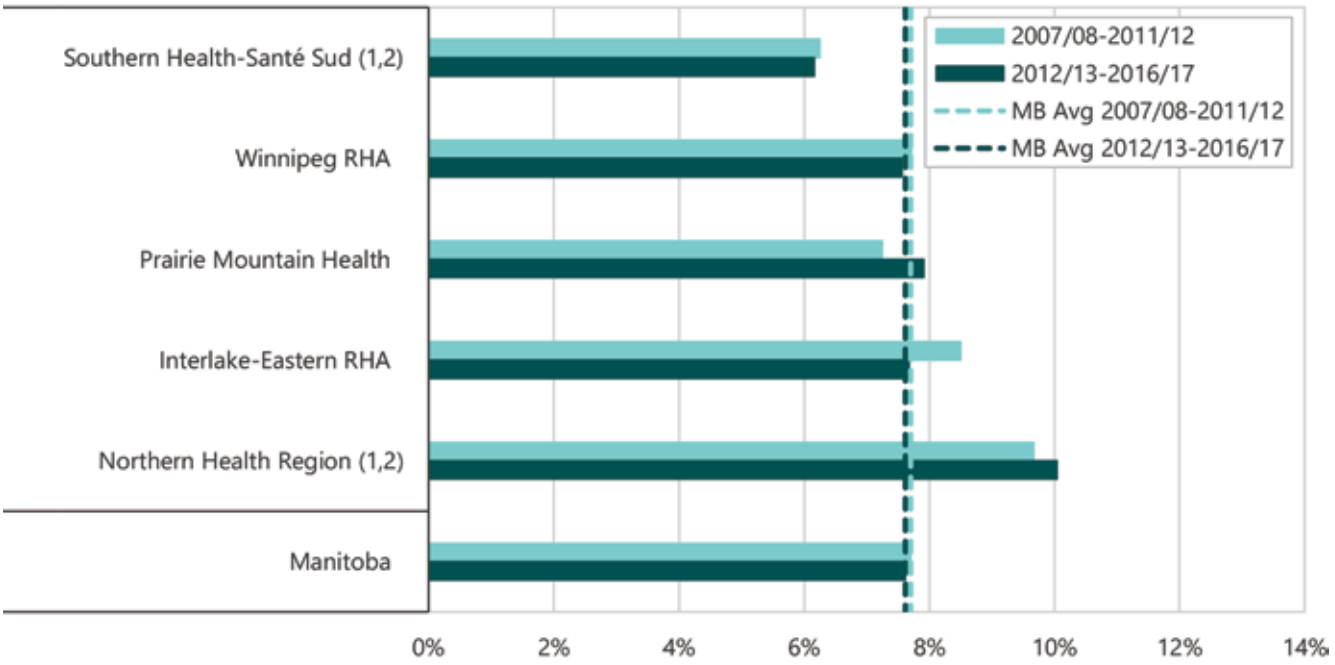
Key Findings

- Overall, the rate of preterm birth (before 37 weeks) was stable in Manitoba at 7.6%. Changes over time varied by RHA, but none were statistically significant.
- Rates in Southern were significantly lower than the provincial average, while those in Northern were significantly higher.
- There appears to be a relationship between preterm birth rates and premature mortality at the regional level, with higher rates in less healthy areas; the relationship was less clear among rural districts and within Winnipeg NCs.
- Preterm birth rates were significantly associated with income in urban and rural areas in both time periods, with women in lower income areas having higher rates.
- Preterm birth rates were similar for rural and urban women.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed preterm birth rates were relatively stable over time – varying from about 7.5-8.0% from year to year. This report suggests continued stability in rates since then, though the results here show five-year periods, not single-year rates.

Figure 10.3: Preterm Birth Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Maternal age-adjusted average annual percent of live in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.4 Small for Gestational Age (SGA) Births

Definition: The maternal age-adjusted rate of small for gestational age (SGA) births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The SGA birth rate was expressed as the percent of SGA live births out of all live births in Manitoba hospitals (ICD–10–CA code Z37.0, Z37.2, Z37.3, Z37.5). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks or birth weight missing, less than 200g or greater than 8kg were excluded.

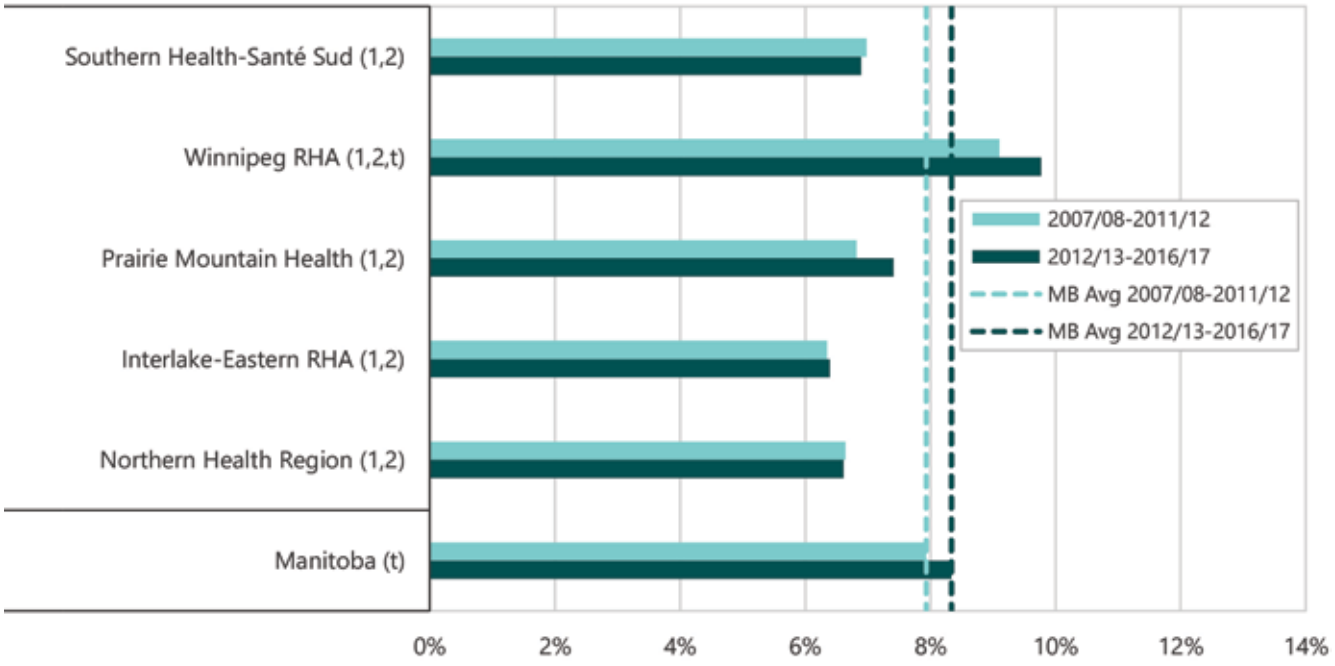
Key Findings

- Overall, the percent of infants born SGA increased over time from 7.93% to 8.34% of all live births. This increase was driven by the increase in Winnipeg, as no other regions had significant changes over time (though Prairie Mountain had a slight increase).
- Rates in Winnipeg were significantly higher than the provincial average, while those in all other regions were significantly lower.
- There appears to be no clear relationship between SGA and PMR at the regional, district or Winnipeg NC levels.
- SGA birth rates were significantly associated with income in urban but not rural areas in both time periods. Lower income urban residents had higher rates of SGA births.
- SGA birth rates were lower for rural than urban women.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed that SGA birth rates were relatively stable over time – varying from about 6.5-7.5% from year to year. This report shows that rates have increased in recent years, though the results here show five-year periods, not single-year rates.

Figure 10.4: Small for Gestational Age Birth Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Maternal age-adjusted average annual percent of live in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.5 Large for Gestational Age (LGA) Births

Definition: The maternal age-adjusted rate of large for gestational age (LGA) births was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. The LGA birth rate was expressed as the percent of LGA live births out of all live births in Manitoba hospitals (ICD–10–CA code Z37.0, Z37.2, Z37.3, Z37.5). Records with gestational age missing, less than 20 weeks, or greater than 45 weeks, or birth weight missing, less than 200g or greater than 8kg were excluded.

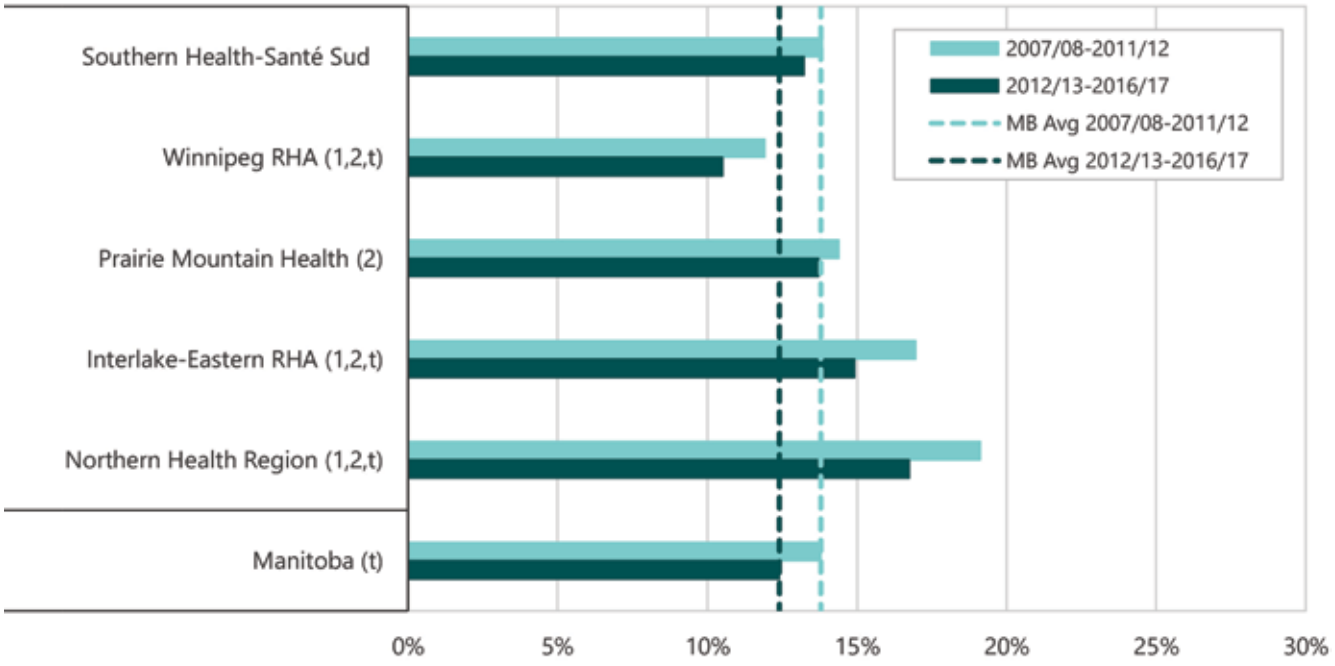
Key Findings

- Overall, the rate of LGA births decreased over time from 13.8% to 12.4%. Rates decreased in all regions, though the decreases in Southern and Prairie Mountain were not statistically significant.
- Rates in Winnipeg were significantly lower than the provincial average, while those in Northern, Interlake-Eastern, and Prairie Mountain (in the second time period) were significantly higher than average.
- There appears to be a relationship between LGA births and premature mortality at the regional level, with higher rates in areas with higher PMR, but the trends were less clear among RHA districts and Winnipeg NCs.
- LGA birth rates were significantly associated with income in rural areas in both time periods, and in the second time period in urban areas, with women in lower income areas having higher LGA rates.
- LGA birth rates were higher for rural than urban women.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed LGA rates were relatively stable around 15% in the 2000s. This report shows that rates have decreased in recent years, though the results here show five-year periods, not single-year rates.

Figure 10.5: Large for Gestational Age Birth Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Maternal age-adjusted average annual percent of live in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.6 Caesarean Section Rate

Definition: The maternal age-adjusted rate of Caesarean sections was calculated for fiscal years 2010/11–2011/12 and 2015/16–2016/17. Caesarean delivery was defined by a hospitalization in a Manitoba hospital with CCI code 5.MD.60. The denominator included all births (live and still) in Manitoba hospitals (ICD–10–CA codes Z37).

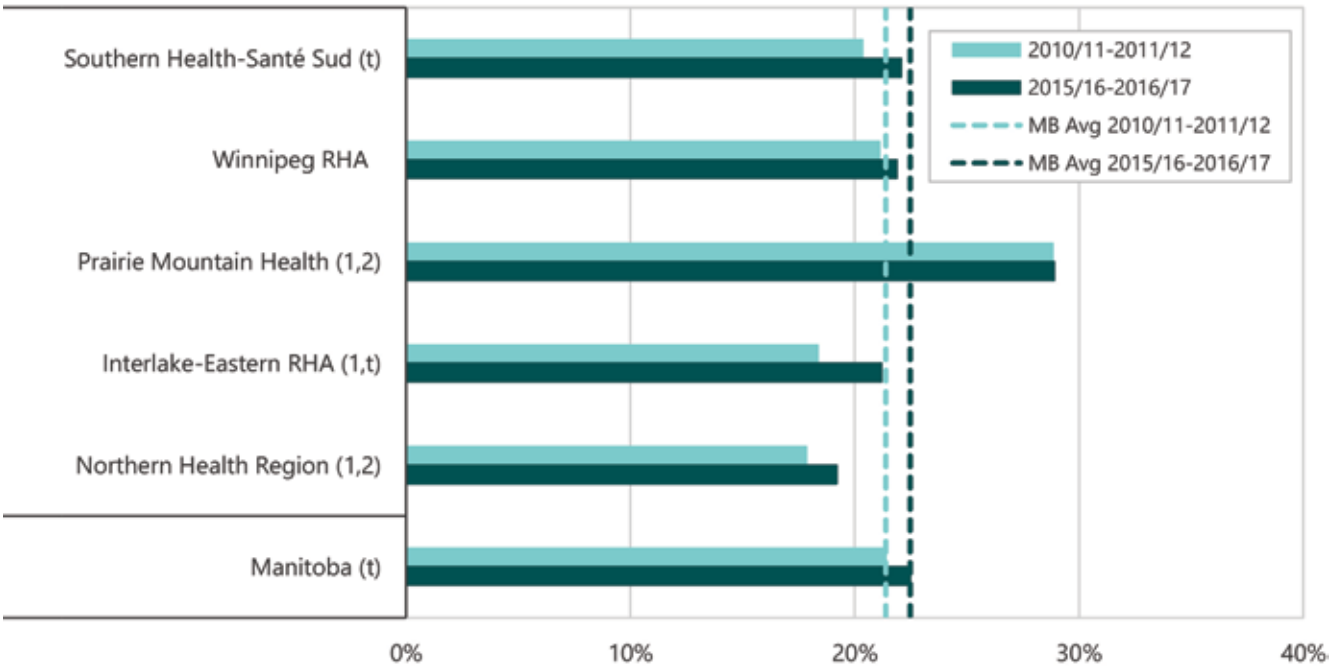
Key Findings

- Overall, the rate of C-sections increased over time from 21.4% to 22.5%. Rates increased in all regions, but only the increases in Southern and Interlake-Eastern were statistically significant.
- Rates were above average in Prairie Mountain, and below average in Northern and Interlake-Eastern (in the first time period).
- There appears to be no clear relationship between C-section rates and premature mortality at the regional, district, or Winnipeg NC levels.
- There was no relationship between C-section rates and income in urban or rural areas in either time period.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed C-section rates increased from 18% in 2001/02 to about 19.9% in 2008/09. This report shows that rates have continued to increase in more recent years.

Figure 10.6: Caesarean Section Rate by RHA, 2010/11-2011/12 and 2015/16-2016/17
Maternal age-adjusted average annual percent of in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
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10.7 Vaginal Birth after Caesarean Section (VBAC)

Definition: The maternal age-adjusted rate of VBACs was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. VBACs were defined as:

- a hospitalization with a diagnosis of vaginal birth (ICD–10–CA code Z37) in the absence of a C-section (CCI code 5.MD.60) and with a previous hospitalization for a C-section (ICD–10–CA O34.20 or ICD–9–CM procedure codes 74.0, 74.1, 74.2, 74.4, 74.9 or CCI code 5.MD.60)
- a hospitalization for vaginal birth after C-section (ICD–10–CA code O75.7).

The denominator includes all females who ever had a previous C-section delivery and had a subsequent delivery during the five-year period in Manitoba hospitals. This included live births and stillbirths in Manitoba hospitals (ICD–10–CA codes Z37). If women had more than one delivery, one is randomly chosen to only count women once per time period.

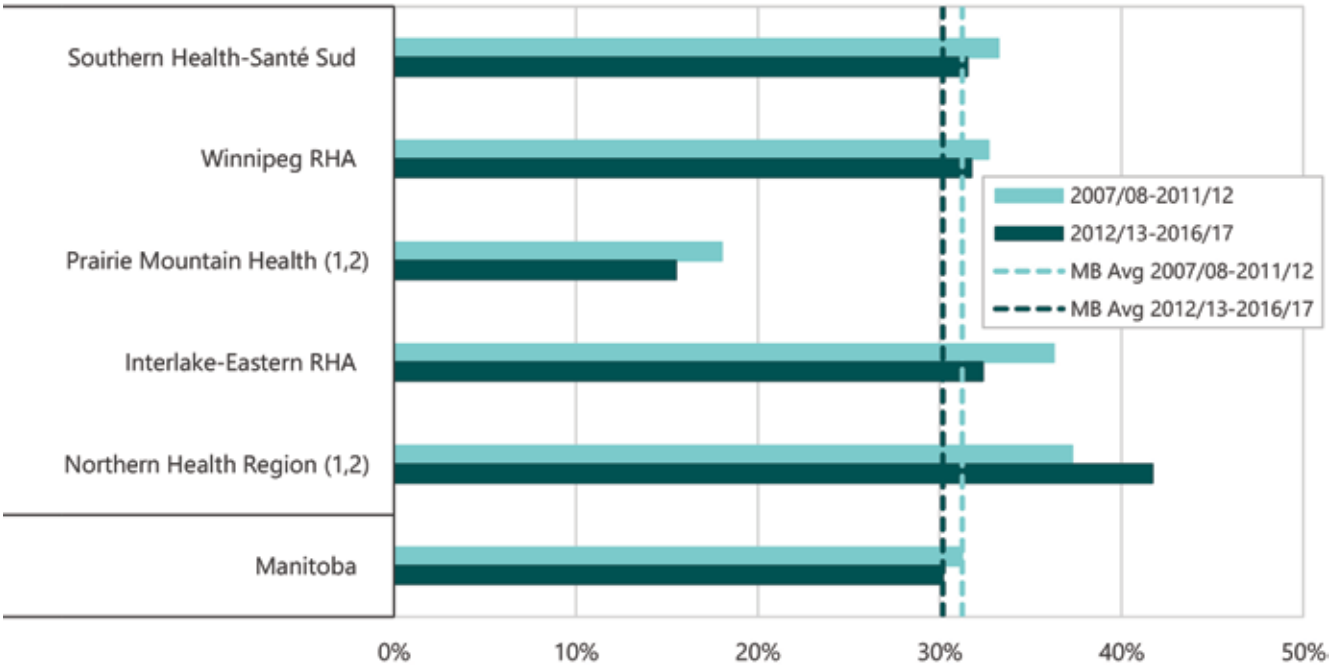
Key Findings

- Overall, the rate of VBACs decreased slightly, but not significantly from 31.3% to 30.2%. Most regions had decreasing rates, though Northern had an increase over time; none of the regional changes were statistically significant.
- Rates in Prairie Mountain were significantly lower than the provincial average, while those in Northern were significantly higher.
    - The low VBAC rates in Prairie Mountain, combined with their high C-section rates, suggest that further investigation may be worthwhile.
- There appears to be no relationship between VBAC rates and premature mortality at the regional level, district or Winnipeg NC levels.
- VBAC rates were not significantly associated with income in rural areas. Among women in urban areas, VBAC rates were somewhat higher among those from lower income areas, though this relationship was only significant in the first time period.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed that VBAC rates decreased from 32.5% in 2001/02, to 29.3% in 2008/09. The current report shows that rates increased slightly and then decreased slightly since that time.

Figure 10.7: Rate of Vaginal Birth After Prior Caesarean Section by RHA, 2007/08-2011/12 and 2012/13-2016/17
Maternal age-adjusted percent of births among females (all ages) with previous Caesarean section



1 indicates area's rate was statistically different from Manitoba average in first time period
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t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.8 Traveling to Give Birth

Definition: Information regarding where women went to give birth by the following categories: (1) percent delivered at their expected maternity hospital, (2) percent delivered at a maternity hospital in other RHA, (3) percent delivered in a Winnipeg maternity hospital, and (4) percent delivered in a non-maternity hospital. The location of deliveries was calculated for fiscal years 2010/11–2011/12 and 2015/16–2016/17. This indicator included live births and stillbirths in Manitoba hospitals (ICD–10–CA codes Z37).

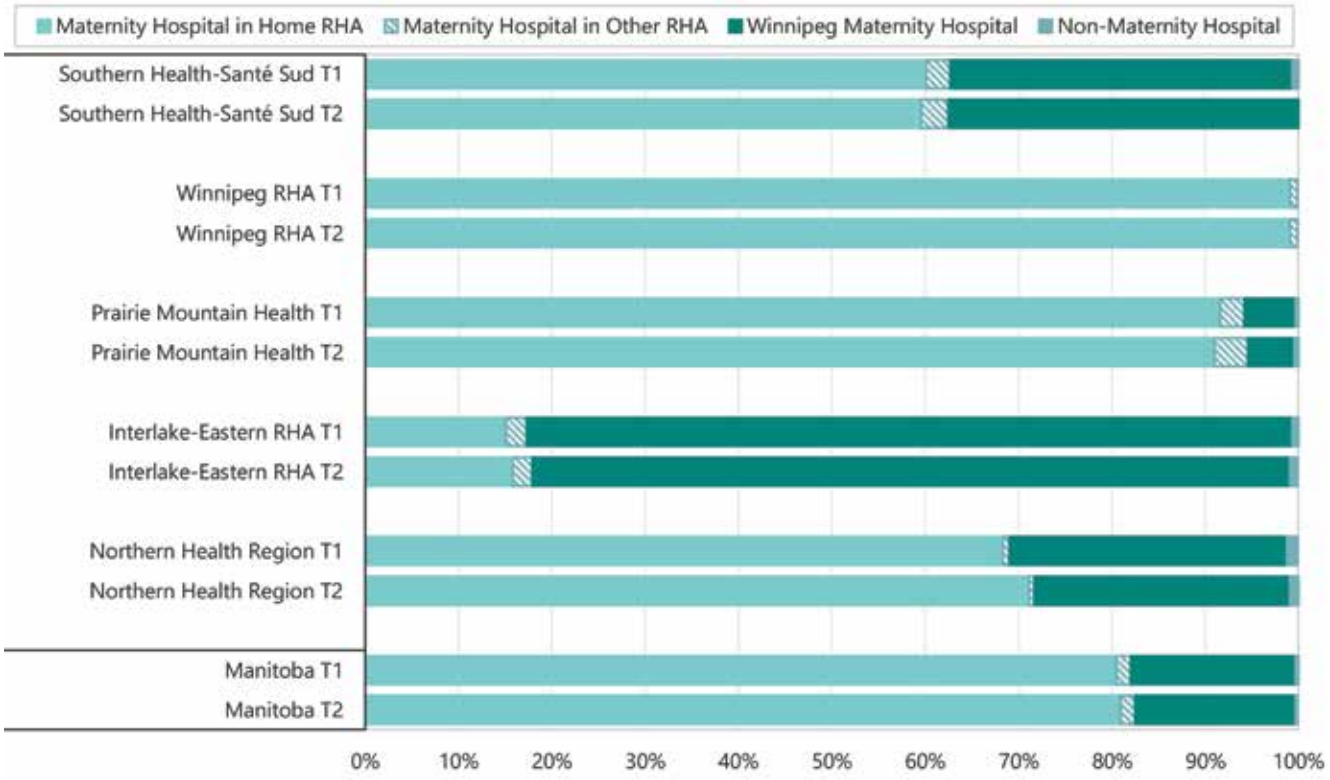
Key Findings

- For Manitoba overall and within each RHA, the distribution of locations of birth was very stable over time.
- Results varied markedly across RHAs, related mostly to the percent of births happening in Winnipeg. Those rates were highest for Interlake-Eastern (over 80%), but also substantial for Southern and Northern (27-37%).
- Very few births occurred in 'non-maternity' hospitals in Manitoba (0.20%)

Comparison to Previous Findings

- Previous MCHP reports have reported on this issue, but using slightly different methods than that used in this report, so results cannot be directly compared. That said, the overall patterns and trends are similar to those shown in MCHP's perinatal report [19].

Figure 10.8: Location of Births by RHA, 2010/11-2011/12 and 2015/16-2016/17
Percent of in-hospital births, T1 = 2010/11-2011/12 T2 = 2015/16-2016/17



10.9 Breastfeeding Initiation

Definition: The maternal age-adjusted breastfeeding initiation rate was calculated for fiscal years 2011/12 and 2016/17. Breastfeeding initiation was defined as exclusive or partial breastfeeding at hospital discharge. The denominator included all live births in Manitoba hospitals (ICD–10–CA code Z38). Stillborn births and records with missing breastfeeding initiation were excluded.

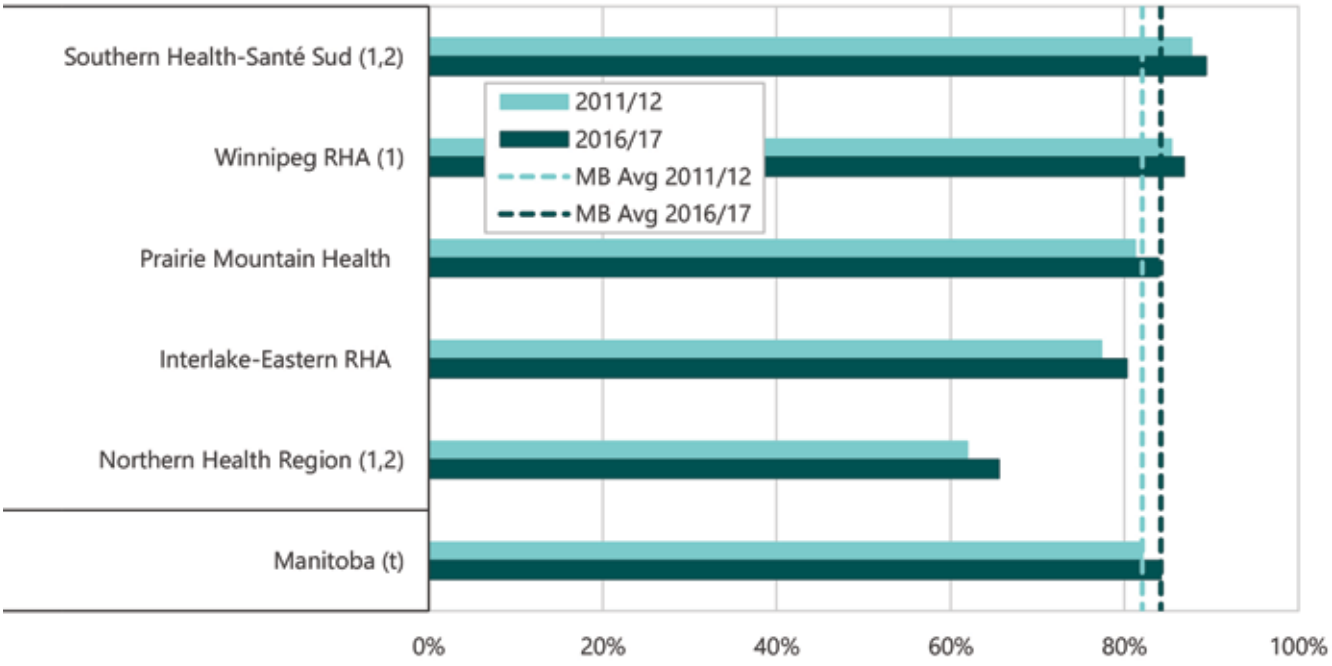
Key Findings

- Overall, the rate of breastfeeding initiation in hospital increased over time from 82.1% to 84.2%. Rates increased in every region, though none of the regional increases were statistically significant.
- Rates in Southern and Winnipeg (in the first time period) were significantly higher than the provincial average, while those in Northern were significantly lower.
- There was a strong inverse relationship between breastfeeding initiation and premature mortality at the RHA level with lower initiation rates among residents of less healthy areas (higher PMR). This trend was also evident, but not as strong, among RHA districts and Winnipeg NCs.
- Breastfeeding initiation rates were significantly associated with income in urban and rural areas in both time periods, with women in lower income areas having lower rates of initiation.

Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report, though the time trend has reversed [19]. That report showed that breastfeeding initiation rates decreased slightly from 80.9% in 2001/02 to 79.2% in 2008/09. This report shows that rates have increased significantly in more recent years.

Figure 10.9: Breastfeeding Initiation Rate by RHA, 2011/12 and 2016/17
Maternal age-adjusted percent of live in-hospital births



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.10 Infant Mortality

Definition: The average annual rate of deaths per 1,000 infants (age 0-364 days) was calculated for two five-year time periods: 2007–2011 and 2012–2016. Values for the second time period were maternal age-adjusted to the Manitoba population in the first time period. Infant mortality rates were also calculated for 20 years (1997–2016).

Key Findings

- Infant mortality is a relatively rare outcome, so results are only shown for RHAs, Winnipeg CAs, and income quintiles.
- The infant mortality rate in Manitoba decreased significantly from 6.2 to 5.2 per 1,000 live births. Rates decreased in all regions except Northern, though the magnitude of the decreases varied widely; only the decrease in Winnipeg reached statistical significance.
- Rates in Northern were significantly higher than the provincial average.
- There appears to be a relationship between infant mortality and premature mortality at the regional and CA levels, with higher mortality rates in less healthy areas (higher PMR).
- Infant mortality rates were significantly associated with income in urban and rural areas in both time periods, with higher mortality rates in lower income areas.

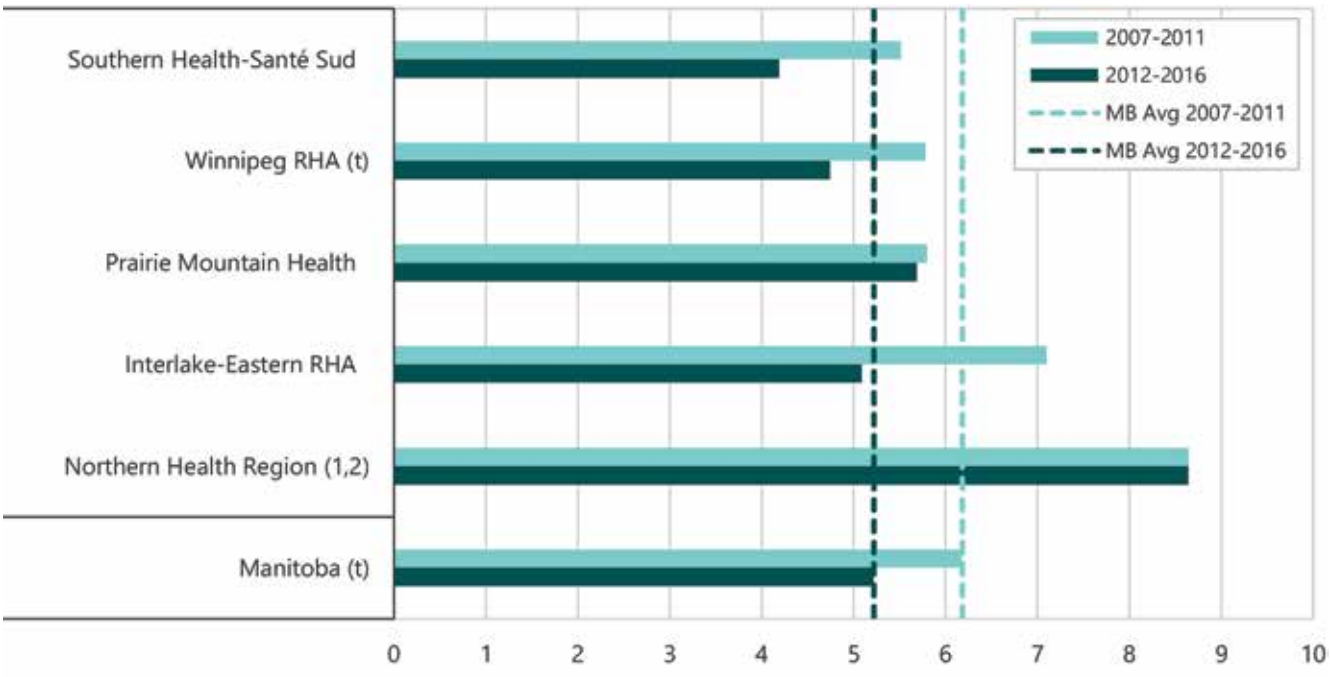
Comparison to Previous Findings

- The values shown here are comparable to those shown in MCHP's perinatal report [19]. That report showed that the infant mortality rate was 5.2%, for the 8–year period 2001/02–2008/09. The current report suggests that since then, rates increased and then decreased again over time.

20-Year Trend Analysis

- Overall, the provincial infant mortality rate decreased significantly from 6.52 to 4.87 deaths per 1,000 live births (see online supplement).
- Rates for all regions showed wide variation from year to year, reflecting that infant mortality is a relatively rare outcome (Figure 10.11). (In some years, rates for Prairie Mountain and Interlake-Eastern were suppressed due to low numbers).
- Only the decreases in Winnipeg and Southern reached statistical significance.

Figure 10.10: Infant Mortality Rate by RHA, 2007-2011 and 2012-2016
Maternal age-adjusted average annual rate of death in first 364 days per 1,000 live births



1 indicates area's rate was statistically different from Manitoba average in first time period
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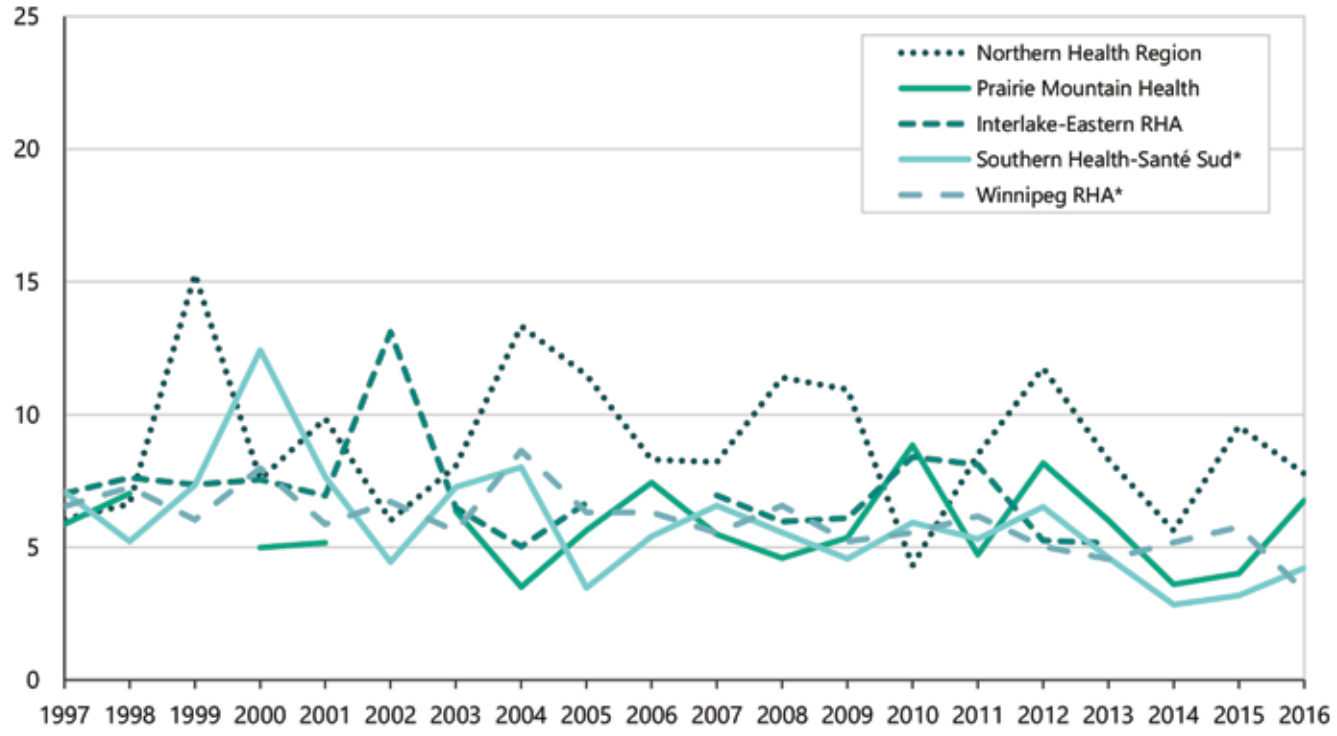
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

Figure 10.11: Infant Mortality Rate by RHA, 1997-2016
Maternal age-adjusted rate of death in first 364 days per 1,000 live births



* this area's rate has a statistically significant change over time
Note: Data suppressed due to small numbers are not shown

10.11 Child Mortality

Definition: The average annual age- and sex-adjusted rate of deaths per 1,000 residents age 1-19 was calculated for two five-year time periods: 2007–2011 and 2012–2016. The denominator includes all Manitoba residents as of December 31 of each year (2007–2016). Infant mortality rates were examined separately.

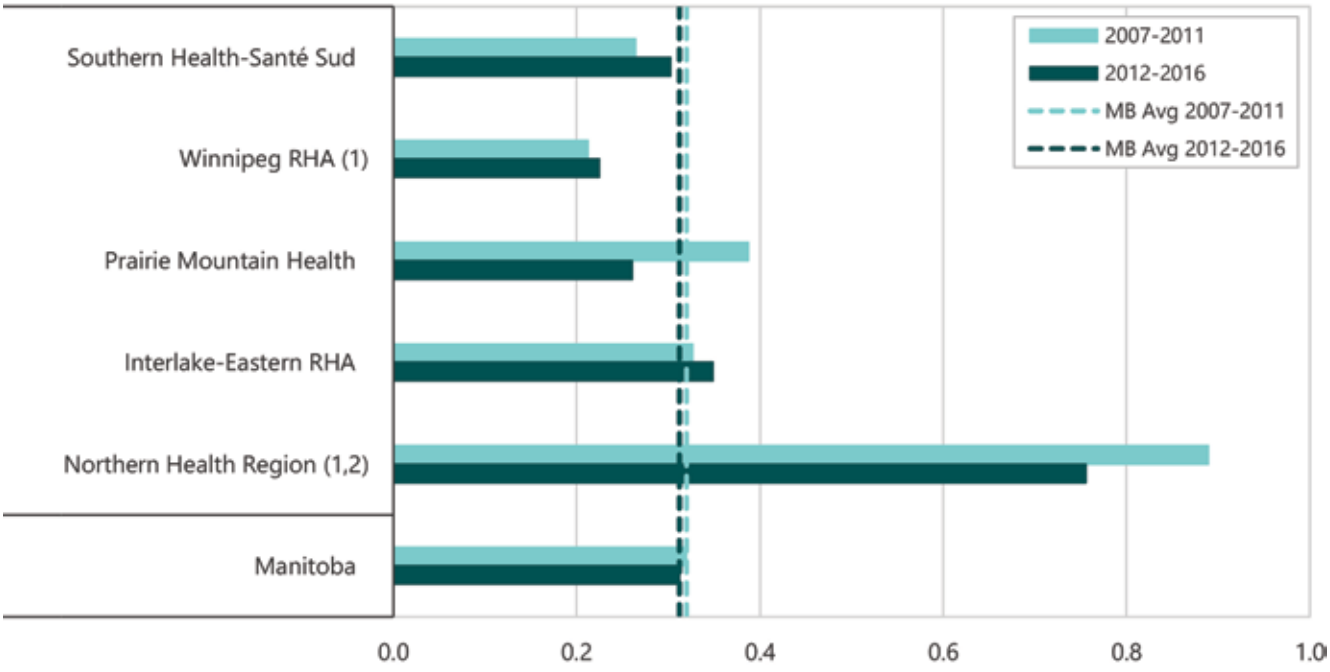
Key Findings

- For Manitoba overall, the child mortality rate was basically stable over time (0.32 in the first time period and 0.31 in the second). Rates and changes over time varied markedly by region, but none of the regional changes were statistically significant.
- Rates in Northern were significantly higher than the provincial average, while those in Winnipeg were lower, though the difference in the second time period did not reach statistical significance.
- There appears to be a relationship between child mortality and premature mortality at the regional and Winnipeg CA levels: rates were higher in less healthy areas (higher PMR).
- Child mortality rates were strongly associated with income in urban and rural areas in both time periods, with children in lower income areas having higher mortality rates.
- Mortality rates were considerably higher for rural than urban children.

Comparisons to Previous Findings

- The values shown here are consistent with and extend those shown in MCHP's report "How are Manitoba's Children Doing?" [18]. That report also showed child mortality rates were stable through the 2000s, though also with a very slight decrease over time (from 0.34 to 0.33).
- Taken together, these results suggest a slow but continuing reduction in child mortality over time in Manitoba.

Figure 10.12: Child Mortality Rate by RHA, 2007-2011 and 2012-2016
Age- and sex-adjusted average annual rate of death per 1,000 residents age 1-19



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
t indicates change over time was statistically significant for that area
s indicates data suppressed due to small numbers

10.12 Causes of Child Mortality

Definition: The most common causes of death for Manitobans age 1-19 in two five-year time periods (2007–2011 and 2012–2016). Causes of death from the Vital Statistics death records were grouped by ICD–10 chapter, and the most common causes were shown for each RHA and the province overall (shown as average annual crude/unadjusted percent).

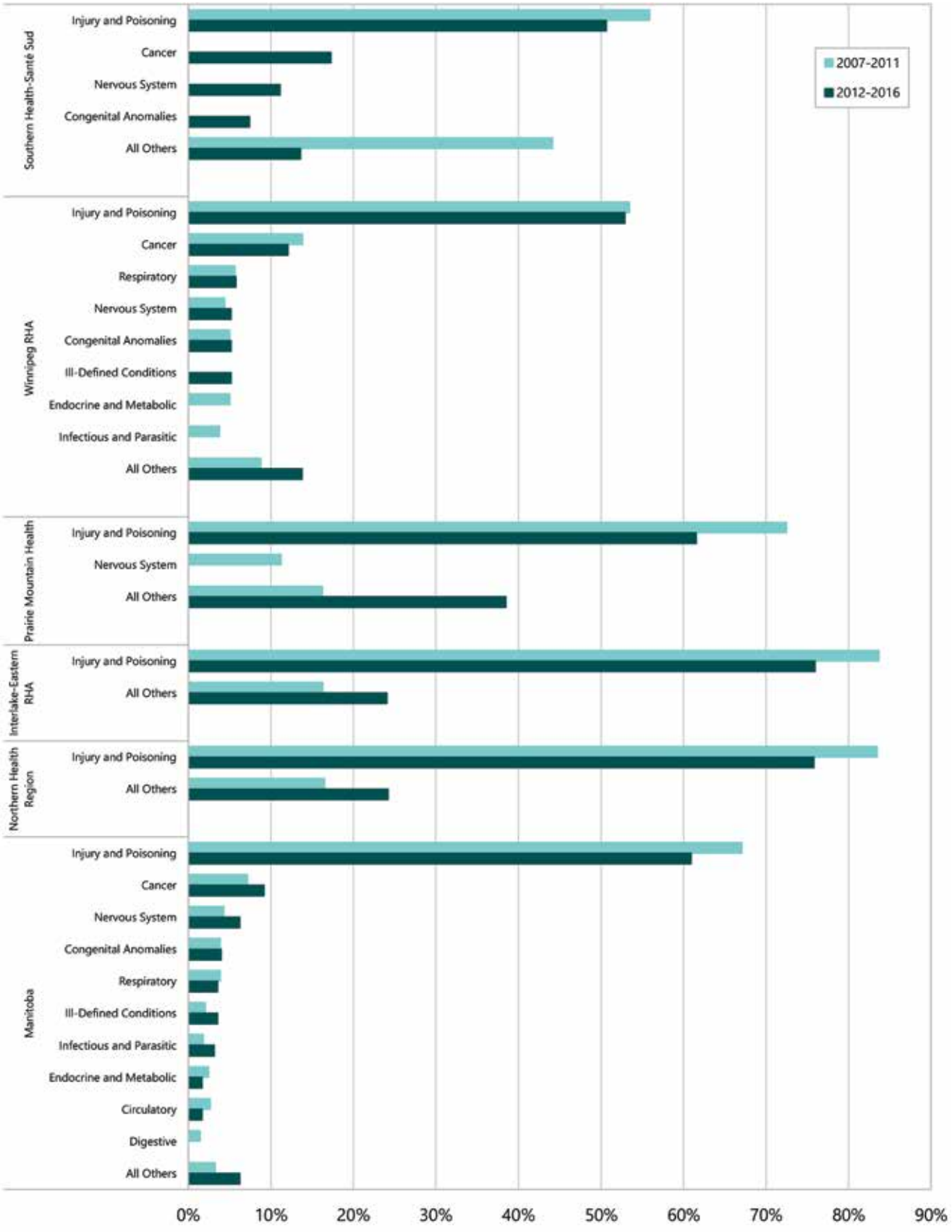
Key findings

- Child mortality is a relatively rare outcome, so values for specific causes were suppressed for many regions in both time periods. The values for Manitoba give the most meaningful indication of the distribution of causes of child mortality and they show only small changes over time.
- For Manitoba overall and for every region, injury & poisoning was by far the most common cause of mortality for children (over 60%). Cancer was a distant second, followed by nervous system disorders, respiratory disorders and congenital anomalies.

Comparison to Previous Findings

- The values shown here are very similar to those shown in MCHP's report "How Are Manitoba's Children Doing?" [18]. That report showed that injury & poisoning was the dominant cause of child death, at 61%, followed by cancer, nervous system disorders, and congenital anomalies. This report shows that injuries remain the dominant cause, followed by cancer, nervous system, congenital anomalies, and respiratory diseases.

Figure 10.13: Most Common Causes of Child Mortality by RHA, 2007-2011 and 2012-2016
Average annual crude percent of deaths among residents age 1-19



10.13 Dental Extraction Surgery Among Children

Definition: The annual average crude rate of dental extraction surgery per 1,000 residents age 0-5 years for two five-year periods (2007/08–2011/12 and 2012/13–2016/17). Dental extractions were defined by a hospitalization with an ICD–9–CM procedure code of 23.01, 23.09, 23.11, 23.19 or CCI code of 1.FE.57, 1.FE.89 ATC N05BA, N05CD, N05CF, N03AE01. We did not have data for pediatric dental extractions performed outside of hospitals (e.g., in dentists' offices) and so the rates reported here may underestimate the extent of severe early childhood tooth decay.

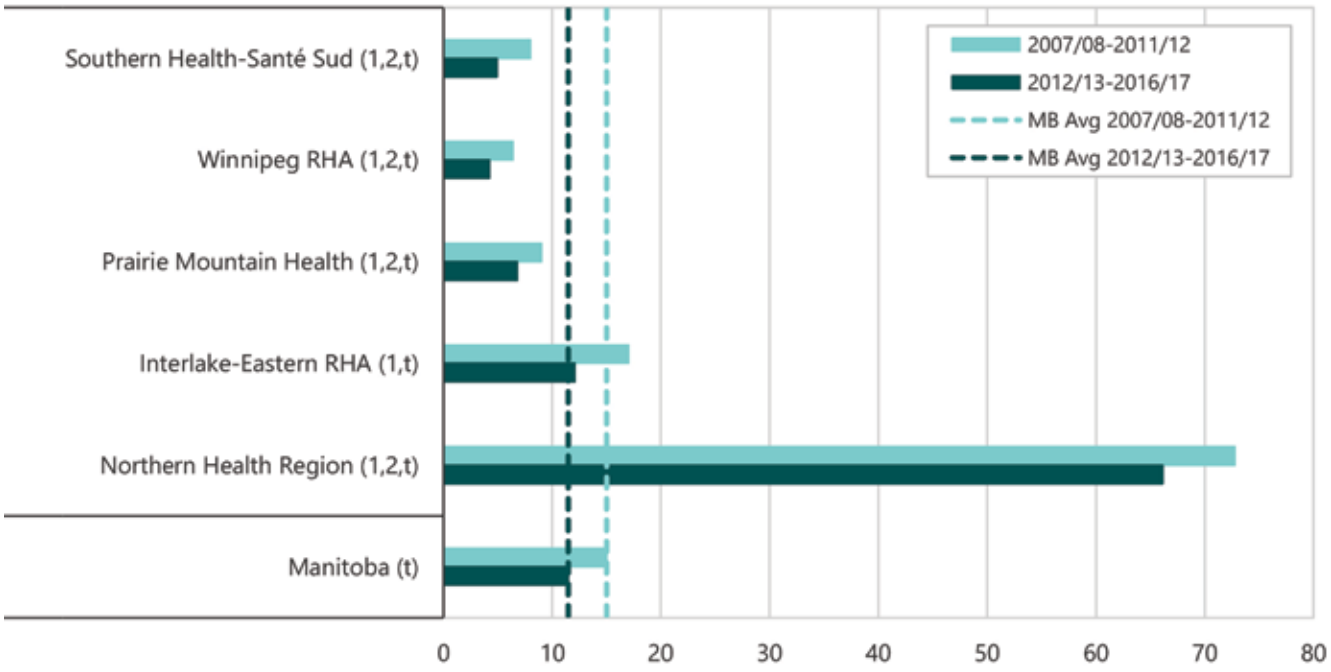
Key Findings

- Overall, the rate of surgery for dental caries decreased significantly from 15.0 to 11.5 per 1,000 children under age 6. Rates decreased significantly in all regions over time.
- Rates in Northern were above the provincial average, while those in Southern, Winnipeg, and Prairie Mountain were below average. Interlake-Eastern rates were above average in the first time period, but right at the average in the second time period.
- There appears to be a relationship between dental surgery rates and premature mortality at the regional, district and Winnipeg NC levels, with higher surgery rates for those in less healthy areas (higher PMR).
- Dental surgery rates were strongly associated with income in urban and rural areas in both time periods with children in lower income areas having higher rates of surgery.
- Rates for rural children were much higher than rates for urban children.

Comparison to Previous Findings

- The results shown here are consistent with and extend the findings of the 2013 Atlas, which also showed a decrease in dental extractions [1].

Figure 10.14: Dental Extraction Surgery Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Crude average annual rate per 1,000 residents age 0-5



1 indicates area's rate was statistically different from Manitoba average in first time period
2 indicates area's rate was statistically different from Manitoba average in second time period
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10.14 Asthma Prevalence

Definition: The percent of residents age 5-19 diagnosed with asthma in a two-year period, as defined by any of the following:

- one or more hospitalizations with a diagnosis of asthma (ICD–9–CM codes 493; ICD–10–CA codes J45)
- one or more physician visits with a diagnosis of asthma (ICD–9–CM codes as above)
- one or more dispensations of medications to treat asthma (see online supplement)

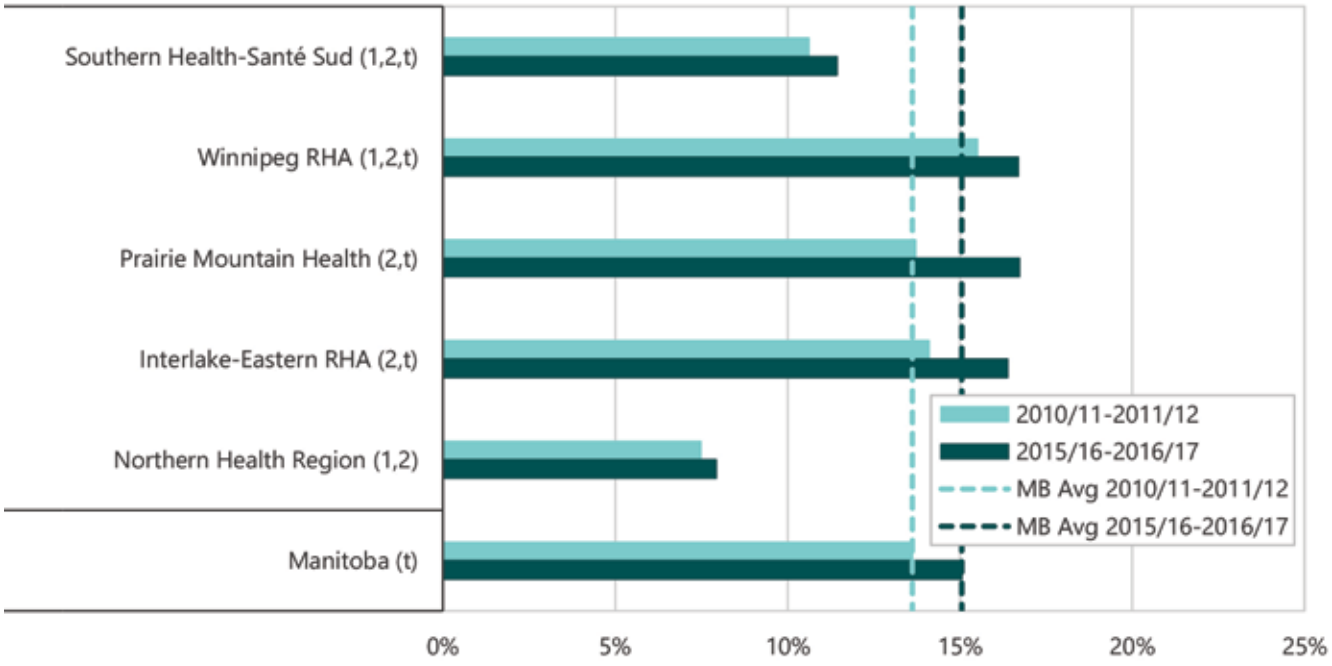
Key Findings

- Overall, the prevalence of asthma among children and youth increased over time from 13.6% to 15.1%. Rates increased in all regions, though the increase in Northern did not reach statistical significance.
- Rates in Northern and Southern were significantly lower than the provincial average, while those in Winnipeg were significantly higher. Rates in Prairie Mountain and Interlake-Eastern were above average in the second time period, but not in the first time period.
    - Recall that rates for Northern may be underestimated because primary care provided by nurses in nursing stations are not included in the medical claims data system.
- There appears to be no clear relationship between asthma prevalence in children and youth and premature mortality at the regional, district or Winnipeg NC levels.
- The prevalence of asthma in children and youth was significantly associated with income in rural areas, but less so in urban areas.
- Perhaps more interestingly, the trends were in opposite directions: in rural areas, those in higher income areas had higher rates, whereas in urban areas, those in higher income areas had lower rates (though the trend was only significant in the first time period).
- Asthma prevalence was somewhat higher for urban than rural children and youth, though this may be partly attributable to the higher rate of visits to physicians and nurse practitioners among those in urban areas.

Comparison to Previous Findings

- The values shown here are very similar to those shown in MCHP's report "How Are Manitoba's Children Doing?" [18]. That report showed that asthma prevalence increased slightly from 13.8% in 2000/01–2001/02 to 14.3% in 2008/09–2009/10. This report shows that asthma prevalence has increased more rapidly since then.

Figure 10.15: Prevalence of Asthma by RHA, 2010/11-2011/12 and 2015/16-2016/17
Age- and sex-adjusted average annual percent of residents age 5-19



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10.15 Teen Pregnancy Rate

Definition: The average annual age-adjusted teen pregnancy rate per 1,000 females age 15-19 was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. This included live births, still births, ectopic pregnancies, abortions and miscarriages, and was defined by a hospitalization in Manitoba with ICD–10–CA codes Z37, O00, O02.1, O03, O04, O05, O07, O08, O36.4 or CCI codes 5.CA.xx, 5.MD.5, 5.MD.60. The denominator included all Manitoba female residents age 15-19 as of December 31, 2007-2016. Note that abortions performed in private clinics were not included in the count of teen pregnancies.

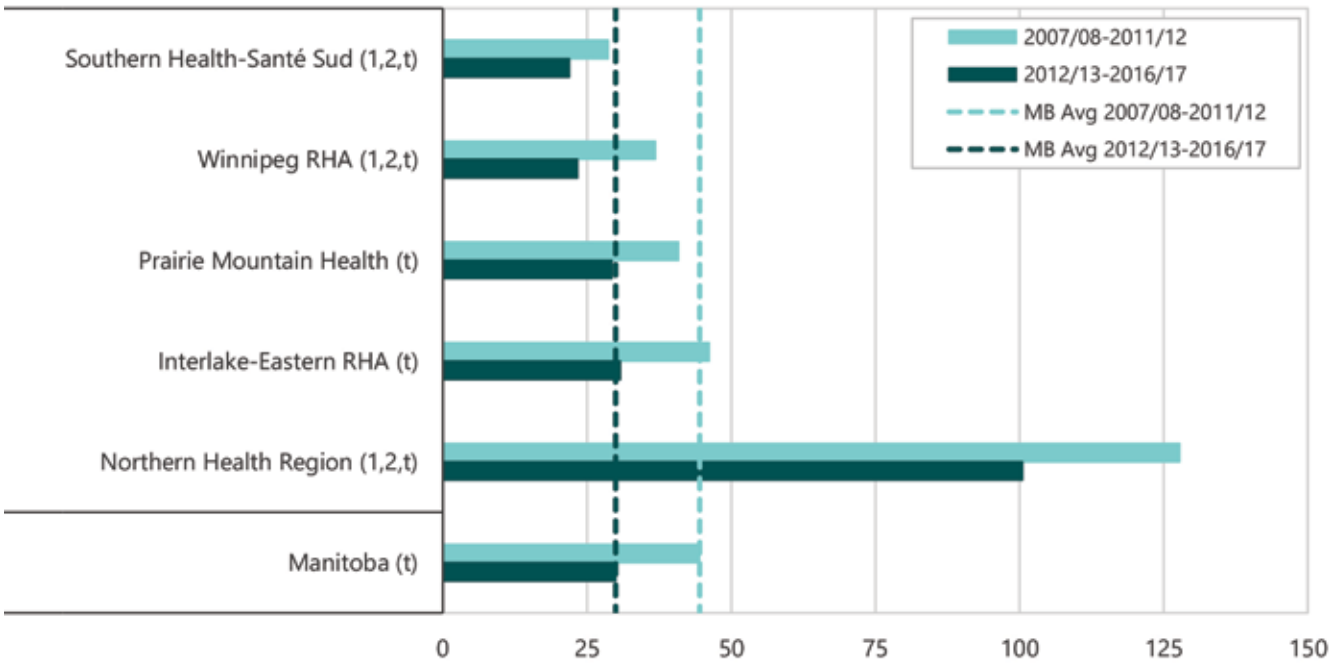
Key Findings

- The teen pregnancy rate decreased dramatically from 44.5 to 30 pregnancies per 1,000 females age 15-19. Rates decreased significantly in every region.
- In both time periods, rates in Winnipeg and Southern were significantly lower than the provincial average, while those in Northern were significantly higher.
- There appears to be a relationship between teen pregnancy rates and premature mortality at the regional, district and Winnipeg NC levels, with higher rates in less healthy areas (higher PMR).
- Teen pregnancy rates were very strongly associated with income in urban and rural areas in both time periods, with higher rates among residents of lower income areas. Rates in rural areas were considerably higher than in urban areas.

Comparison to Previous Findings

- These results are consistent with those shown in MCHP's report "How are Manitoba's Children Doing?" [18], but indicate a much larger decrease in teen pregnancy rates in more recent years. Rates decreased from 52.2 per 1,000 in the early 2000s to 46.9 in the late 2000s, but dropped dramatically to 30 per 1,000 in the mid-2010s.

Figure 10.16: Teen Pregnancy Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age-adjusted annual average rate per 1,000 females age 15-19



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10.16 Teen Birth Rate

Definition: The average annual age-adjusted teen birth rate per 1,000 females age 15-19 was calculated for fiscal years 2007/08–2011/12 and 2012/13–2016/17. Births were defined as live births in Manitoba hospitals with ICD–10–CA codes Z37.0, Z37.2, Z37.3, Z37.5. The denominator included all Manitoba female residents age 15-19 as of December 31, 2007–2016.

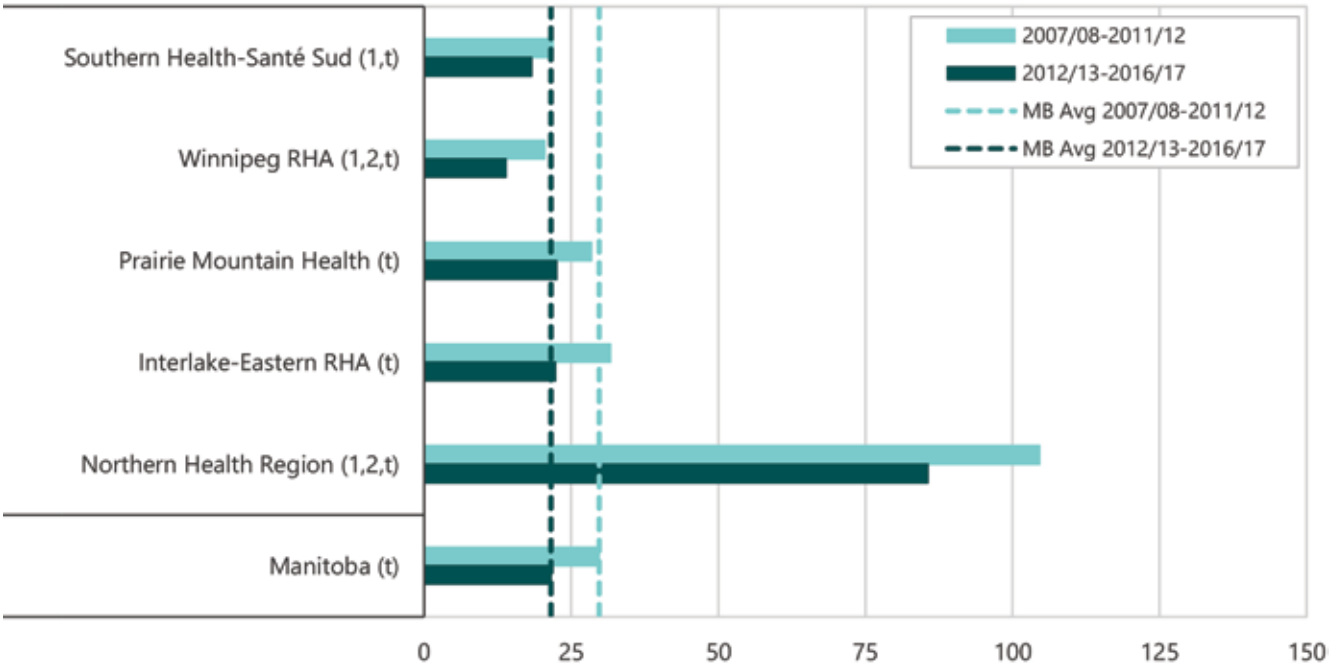
Key Findings

- The teen birth rate decreased dramatically from 29.7 to 21.5 births per 1,000 females age 15-19. Rates decreased significantly in every region.
- Rates in Winnipeg and Southern (in the first time period) were significantly lower than the provincial average, while those in Northern were significantly higher.
- There appears to be a relationship between teen birth rates and premature mortality at the regional, district and Winnipeg NC levels, with higher rates in less healthy areas (higher PMR).
- Teen birth rates were very strongly associated with income in urban and rural areas in both time periods, with higher rates among residents of lower income areas.
- Teen birth rates were higher among rural than urban residents.

Comparison to Previous Findings

- The values shown in this report show a decreasing trend that is similar to that shown in MCHP's perinatal report [19]. The indicator used in that report showed teen births as a percent of all births, and values ranged from about 9.5% in 2001/02 to 9.0% in 2008/09. The indicator here is a rate of births per 1,000 females age 15-19, so the actual values cannot be directly compared.

Figure 10.17: Teen Birth Rate by RHA, 2007/08-2011/12 and 2012/13-2016/17
Age-adjusted average annual rate per 1,000 females age 15-19



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Appendix 1: Administrative Area Boundaries

Districts and Zones Within Each Health Region

Southern Health–Santé Sud

Zone 1

- Seven Regions
- MacGregor
- Rural Portage
- Cartier/St. Francis Xavier
- Portage la Prairie

Zone 2

- Grey/St Claude
- Carman
- MacDonald
- Morris
- St. Pierre/DeSalaberry
- Red River South

Zone 3

- Lorne/Louise/Pembina
- Stanley
- Altona
- Morden
- Winkler
- Roland/Thompson

Zone 4

- Niverville/Ritchot
- Taché
- Ste Anne/LaBroquerie
- Steinbach
- Hanover
- Rural East

Interlake-Eastern RHA

Selkirk Zone

- Selkirk

East Zone

- Beausejour
- Pinawa/Lac Du Bonnet
- Whiteshell

North Zone

- Powerview/Pine Falls
- Fisher River Cree Nation/ Peguis First Nation
- Eriksdale/Ashern

South Zone

- Stonewall/Teulon
- Winnipeg Beach/St. Andrews
- St. Clements
- Springfield

West Zone

- Gimli
- Arborg/Riverton
- St. Laurent

Northern Remote Zone

- Northern Remote

Prairie Mountain Health

North Zone

- Duck Mountain
- Porcupine Mountain
- Riding Mountain
- Agassiz Mountain
- Dauphin
- Swan River

Brandon Zone

- Brandon West End
- Brandon North Hill
- Brandon Downtown
- Brandon South End
- Brandon East End

South Zone

- South Asessippi
- Little Saskatchewan
- Turtle Mountain
- Souris River
- Whitemud
- Spruce Woods

Northern Health Region

Zone 1

- The Pas/OCN, Kels (The Pas, Opaskwayak Cree Nation, RM of Kelsey with the exclusion of Cranberry Portage)
- Flin, Snow, Cran, Sher (Flin Flon, Snow Lake, Cranberry Portage, Sherridon/Cold Lake)
- LL/MC, LR, O-P(SIL), PN(GVL) (Lynn Lake, Marcel Colomb First Nation, Leaf Rapids, O-Pipon-Na-Piwin (South Indian Lake) Cree Nation, Granville Lake
- Thompson, Myst Lake (Thompson and the LGD of Mystery Lake)
- Thicket Portage, Pikwitonei, Wabowden, Ilford, War Lake First Nation, Cormorant
- Gillam, Fox Lake Cree Nation

Zone 2

- GR/Mis, ML/Mos, Eas/Che (Grand Rapids, Misipawistik Cree Nation, Moose Lake, Mosakahiken Cree Nation, Easterville, Chemawawin Cree Nation, Unorganized Territory)
- Puk/Mat Col CN (Pukatawagan, Mathias Colomb Cree Nation)
- SayD(TL), Bro/BL, NoL(Lac) (Churchill/Sayisi Dene (Tadoule Lake) First Nation, Brochet/Barren Lands First Nation, Northlands (Lac Brochet) First Nation)
- Nelson House/NCN (Nisichawayasihk (Nelson House) Cree Nation, Incorporated Community of Nelson House)
- Sham, York First Nation, Tat(SPL) (Shamattawa First Nation, York Factory First Nation, Tataskweyak (Split Lake) Cree Nation)
- Bu(OH), MS(GR), GLN/GLFN (Bunibonibee (Oxford House) Cree Nation, Manto Sipi (God's River) Cree Nation, God's Lake Narrows, God's Lake First Nation)
- Cross Lake/Cross Lake FN (Incorporated Community of Cross Lake, Cross Lake First Nation)

Zone3

- Island Lake/Garden Hill First Nation, Red Sucker Lake/Red Sucker Lake First Nation, St. Theresa Point First Nation, Wasagamack First Nation

Neighbourhood Clusters and Community Areas Within Winnipeg RHA

The lists below indicate which of the 228 Winnipeg community areas fall within each of the 25 neighbourhood clusters.

Assiniboine South

- Betsworth
- Edgeland
- Elmhurst
- Eric Coy
- Marlton
- Old Tuxedo
- Ridgedale
- Ridgewood South
- River West Park
- Roblin Park
- South Tuxedo
- Southboine
- Tuxedo
- Tuxedo Industrial
- Varsity View
- Vialoux
- West Perimeter South
- Westdale
- Wilkes South

Downtown East

- Armstrong Point
- Broadway–Assiniboine
- Centennial
- Central Park
- China Town
- Civic Centre
- Colony
- Exchange District
- Legislature
- Logan–CPR
- Portage–Ellice
- Portage and Main
- South Portage
- Spence
- The Forks
- West Alexander
- West Broadway

Downtown West

- Daniel McIntyre
- Minto
- Polo Park
- Sargent Park
- St. Matthews
- West Wolseley
- Wolseley

Fort Garry North

- Beaumont
- Brockville
- Buffalo
- Chevrier
- Crescent Park
- Linden Ridge
- Linden Woods
- Maybank
- Parker
- Pembina Strip
- Point Road
- West Fort Garry Industrial
- Whyte Ridge
- Wildwood

Fort Garry South

- Agassiz
- Bridgwater Forest
- Cloutier Drive
- Fairfield Park
- Fort Richmond
- La Barriere
- Montcalm
- Parc La Salle
- Perrault
- Richmond Lakes
- Richmond West
- South Pointe
- St. Norbert
- Trappistes
- Turnbull Drive
- University
- Waverley Heights
- Waverley West B
- Waverley West D
- Waverley West E
- Waverley West F
- Waverley West Town Centre

Inkster East

- Brooklands
- Burrows–Keewatin
- Inkster Industrial Park
- Pacific Industrial
- Shaughnessy Park
- Weston
- Weston Shops

Inkster West

- Inkster Gardens
- North Inkster Industrial
- Oak Point Highway
- Tyndall Park
- Weston
- Weston Shops

Point Douglas North

- Burrows Central
- Inkster–Faraday
- Luxton
- Mynarski
- Robertson
- St. John's
- St. John's Park

Point Douglas South

- Dufferin
- Dufferin Industrial
- Lord Selkirk Park
- North Point Douglas
- South Point Douglas
- William Whyte

River East

- Eaglemere
- Grassie
- Kil–Cona Park
- Kildonan Crossing
- McLeod Industrial
- Munroe East
- North Transcona Yards
- Springfield North
- Springfield South
- Valley Gardens

River East West

- Kildonan Drive
- Munroe West
- River East
- Rossmere–A
- Rossmere–B
- Valhalla
- Norwood West

River East North

- East St. Paul RM

River East South

- Chalmers
- East Elmwood
- Glenelm
- Talbot–Grey
- Tyne–Tees

River Heights East

- Lord Roberts
- McMillan
- River–Osborne
- Riverview
- Roslyn

River Heights West

- Central River Heights
- Crescentwood
- Earl Grey
- Ebby–Wentworth
- Grant Park
- J. B. Mitchell
- Mathers
- North River Heights
- Rockwood
- Sir John Franklin
- South River Heights
- Wellington Crescent

Seven Oaks East

- Garden City
- Jefferson
- Kildonan Park
- Leila–McPhilips Triangle
- Leila North
- Margaret Park
- Riverbend
- Rivergrove
- Seven Oaks
- Templeton–Sinclair
- West Kildonan Industrial

Seven Oaks West

- Amber Trails
- Mandalay West
- Rosser–Old Kildonan
- The Maples

Seven Oaks North

- West St. Paul RM

St. Boniface East

- Archwood
- Dugald
- Dufresne
- Holden
- Island Lakes
- Maginot
- Mission Industrial
- Niakwa Park
- Niakwa Place
- Royalwood
- Sage Creek
- Southdale
- Southland Park
- St. Boniface Industrial Park
- Stock Yards
- Symington Yards
- The Mint
- Tissot
- Windsor Park

St. Boniface West

- Central St. Boniface
- North St. Boniface
- Norwood East

St. James–Assiniboia West

- Assiniboia Downs
- Buchanan
- Crestview
- Glendale
- Heritage Park
- Kirkview
- Saskatchewan North
- Sturgeon Creek
- Westwood

St. James–Assiniboia East

- Airport
- Booth
- Birchwood
- Bruce Park
- Deer Lodge
- Jameswood
- Kensington
- King Edward
- Murray Industrial Park
- Omand's Creek Industrial
- Silver Heights
- St. James Industrial
- Woodhaven

St. Vital North

- Alpine Place
- Elm Park
- Glenwood
- Kingston Crescent
- Lavalee
- Norberry
- Pulberry
- St. George
- Varennes
- Victoria Crescent
- Worthington

St. Vital South

- Dakota Crescent
- Maple Grove Park
- Meadowood
- Minnetonka
- Normand Park
- River Park South
- St Vital Centre
- St Vital Perimeter South
- Vista

Transcona

- Canterbury Park
- Griffin
- Kern Park
- Kildare–Redonda
- Meadows
- Melrose
- Mission Gardens
- Peguis
- Radisson
- Regent
- Transcona North
- Transcona South
- Transcona Yards
- Victoria West

Appendix 2: 20-Year Time Trend Analysis of Prevalence of Mood and Anxiety Disorders

As part of the work for this Atlas report, the Community Health Assessment Network (CHAN) requested 20-year time trend analyses on a number of key indicators from past Atlas reports. One of those was the prevalence of mood and anxiety disorders, which is not included in this report, because a separate MCHP deliverable has recently reported similar data (see Mental Illness among Adult Manitobans)[8]. However, that report did not provide results over a long time span, so we present them below.

The age- and sex-adjusted prevalence of mood and anxiety disorders was calculated for residents age 10 and older in four five-year time periods: 1997/98-2001/02 to 2012/13-2016/17. Mood and anxiety disorders were defined by one of the following conditions:

- one or more hospitalizations with a diagnosis of depression, episodic mood disorders (i.e., bipolar disorder, manic episode), or anxiety (i.e., anxiety disorders, phobic disorders, obsessive–compulsive disorders): ICD–9–CM codes 296.1–296.8, 300.0, 300.2–300.4, 300.7, 309, 311; ICD–10–CA codes F31, F32, F33, F34.1, F38.0, F38.1, F40, F41.0–F41.3, F41.8, F41.9, F42, F43.1, F43.2, F43.8, F45.2, F53.0, F93.0
- one or more physician visits with a diagnosis of depression or episodic mood disorders: ICD–9–CM codes 296 and 311.
- one or more hospitalizations or physician visits with a diagnosis of anxiety, dissociative, and somatoform disorders: ICD–9–CM code 300; ICD–10–CA codes F32, F34.1, F40, F41, F42, F44, F45.0, F45.1, F48, F68.0, F99 and one or more dispensations of an antidepressant (i.e., fluoxetine, citalopram, desipramine, venlafaxine), benzodiazepine derivatives anxiolytics (i.e., diazepam), or lithium (an antipsychotic): ATC codes N05AN01, N05BA, N06A
- three or more physician visits with a diagnosis of anxiety, dissociative, and somatoform disorders or adjustment reaction, ICD–9–CM codes 300 and 309

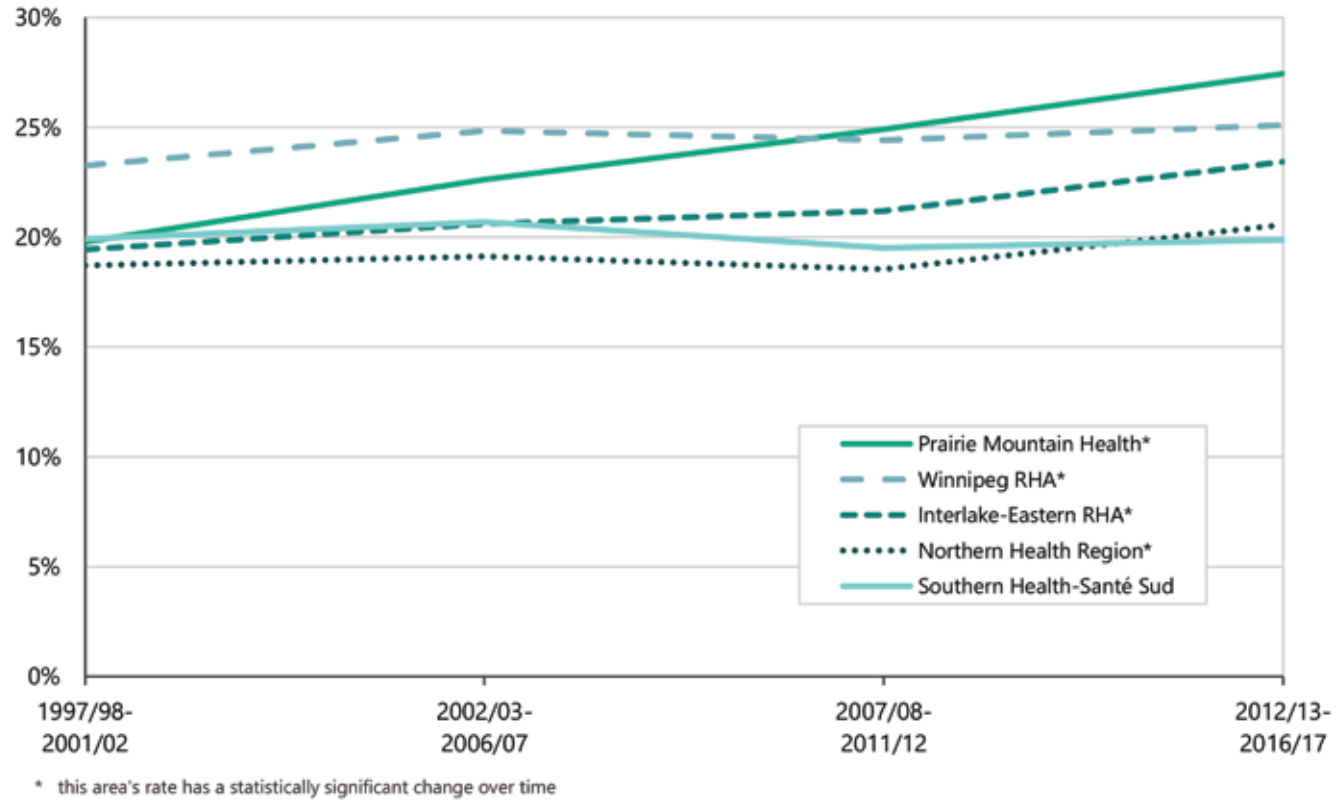
The denominator includes all Manitoba residents age 10 and older as of December 31, 1999, 2004, 2009, and 2014.

8 See the MCHP website: http://mchp-appserv.cpe.umanitoba.ca/deliverablesList.html

Key findings

- For Manitoba overall, the prevalence of mood and anxiety disorders increased significantly over time from 21.7% in the late 1990s to 24.4% in the mid-2010s (see online supplement).
- Prevalence in Southern was stable over time, whereas rates in all other regions increased over time, though the changes in Winnipeg and Northern were not statistically significant.
- Prevalence in Winnipeg was consistently above the provincial average, while that in Southern, Interlake-Eastern and Northern were below average.

Appendix Figure 2.1: Prevalence of Mood and Anxiety Disorders by RHA, 1997/98-2001/02 and 2012/13-2016/17
Age- and sex-adjusted percent of residents, age 10+ diagnosed with disorder



* this area's rate has a statistically significant change over time

Appendix 3: Disaggregation of Income Quintile 1 in Winnipeg

This project was done in partnership between MCHP and WRHA Population and Public Health, under the auspices of this Atlas report, but completed by a separate research team.

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Introduction

The objective of this analysis was to explore the health gradient within the lowest income quintile (called quintile 1) in the Winnipeg population to describe and project potential theoretical health gains associated with low income intervention measures. While theoretical only and fraught with ecological assumptions, the intention was to inform policy dialogue about whether increasing income at the lowest end of the income spectrum within income quintile 1 could have potential positive health impacts.

Nearly all potential policy measures to narrow the income gap at the very low end of the income spectrum affect income quintile 1 (i.e., household incomes below about $50,000 annual income). Even a two-parent family working full-time on minimum wage would fall within income quintile 1. Considerations of a basic guaranteed income, increase to Employment Income Assistance (EIA) basic living allowances, or increased minimum wage all affect the economic situation and associated health status of people in income quintile 1. Additionally, income quintile 1 spans a large income range that is double that of income quintiles 2, 3 or 4. And yet, an exploration of the relationship between income and health status within income quintile 1 had not been undertaken.

Methods

Selected socioeconomically sensitive hospitalization indicators from the 2013 and 2019 RHA Atlases were analyzed for fiscal years 2010/11–2015/16. Counts, crude rates, age- and sex-adjusted rates, and rate ratios were calculated by income quintile, and also by five sub-quintiles created by dividing income quintile 1 into 5 equal categories based on Census Dissemination Area (DA)-level average household income. Income quintiles were generated specifically for Winnipeg using income levels derived from the 2011 Census and 2016 population counts derived from the Manitoba Health population file (see methodological considerations section for more detail). The statistical significance of the linear trend of crude and age- and sex-adjusted rates by income quintile were calculated for each indicator.

The indicators reported in this study are:

Adult Population Indicators

1. Hospitalizations for Ambulatory Care Sensitive Conditions (ACS): The number of inpatient hospitalization days for ambulatory care sensitive (ACS) conditions among residents age 0-74 per 100 residents age 0 to 74 in a given year. ACS conditions are a group of 17 diseases and diagnoses, including asthma, angina, gastroenteritis, and congestive heart failure. These were created by Billings and colleagues [16,17]. Low rates of hospitalizations for ACS conditions can be used as indicators of access to good quality primary care. For all ACS conditions except congenital syphilis, the condition must be coded as the most responsible diagnosis (see online supplement for more details).
2. Hospital Days for Acute Care: Days of hospital care provided to patients who are acutely ill and require medical care or surgery for treatment of a disease or severe illness. Acute care patients are typically hospitalized for a short period of time, and discharged or transferred to a secondary care setting. An acute care patient may have part of their hospital stay designated as alternate level of care (see online supplement for more details).
3. Hospital Days for Alternate Level of Care: Days of hospital care provided to patients who were designated as alternate level of care (ALC). A patient may be designated as ALC if he or she is occupying an acute care hospital bed but is no longer acutely ill and does not require the intensity of resources and services provided in an acute care

setting. The number of ALC days patients spent in hospital may include the entire length of stay, or only a portion of the hospital stay (see online supplement for more details).

Childhood Population Indicators

4. Hospital Episodes: The number of episodes of hospital care for children age 0-19 (excluding newborns; see online supplement for more details).
5. Dental Extraction Surgeries: The number of dental extraction surgeries among children age 0-5 (see online supplement for more details).
6. Hospital Episodes for Injury: The number of episodes of injury related hospitalization among children age 0-19 (excluding newborns; see online supplement for more details).

Methodological Considerations

Analysis Using Income Quintiles

Identifying the relationship between income inequality and health gradients is challenging in Manitoba since income is not routinely collected on the health record. To overcome this limitation, MCHP has developed a methodology to attribute individual health records with an area-level household income estimate. Using the average household income of dissemination area (DA) of residence, residents are classified into one of five income quintiles (1 is the lowest income group, 5 is the highest income group). Dissemination areas (DA) are the smallest geographic unit used by Statistics Canada to disseminate detailed income data. DAs range in size from 400 to 1,000 residents and in Winnipeg there are 1,150 DAs.

Income quintiles are constructed by ranking dissemination areas from low to high by the 2011 average household income of the DA, and then dividing these into five income groups so that approximately 20% of the population is included in each group.

Appendix Table 3.1 below shows the income ranges (derived from 2011 Census) of the income quintiles used in this study and the Winnipeg 2016 population count in each quintile.

Appendix Table 3.1: Income Quintile Groups in Winnipeg Health Region, 2016

Income Quintile	Number of People	Income Range (Dissemination Areas)
Income Quintile 1 (Lowest)		
Sub-Quintile 1a (Lowest)	31,599	$14,772 - $34,058
Sub-Quintile 1b	30,366	$34,112 -$ 38,564
Sub-Quintile 1c	30,699	$38,647 - $ 43,203
Sub-Quintile 1d	31,978	$43,234 - $46,187
Sub-Quintile 1e (Highest)	31,171	$46,400 - $50,143
Income Quintile 2	151,923	$50,149 - $63,907
Income Quintile 3	143,237	$63,986 - $81,086
Income Quintile 4	156,386	$81,159 - $98,985
Income Quintile 5 (Highest)	155,966	$99,008 - $343,154

MCHP normally creates separate income quintile classifications for rural and urban Manitoba, with Winnipeg and Brandon included in the urban component. For this study, however, only Winnipeg was included in the construction of the income quintiles.

Strengths and Limitations of Income Quintile Analyses

In the absence of a direct collection of income on the individual health record, the use of area-level household income quintiles provides a very efficient method of classifying residents by income level. Individuals can be easily and inexpensively classified to the dissemination area they reside in using their 6 digit postal code from the Manitoba Health Insurance Registry and then attributed to the income quintile of that dissemination area.

Although the use of area-level household income quintiles is efficient and inexpensive to implement, the limitation of this method is that it classifies all individuals within a dissemination area with the same income ranking (based on the average household income of the DA). In a DA where there is a high degree of homogeneity (similarity) in income levels this is not a large problem as the DA level income ranking correctly classifies all individuals. However, in the majority of DAs where there is a wide range of household incomes, low income and high income individuals are all given the same income rank, with the result that many individuals are misclassified in terms of their income.

Using area-level household income quintile estimates instead of directly measured income at the individual level most likely leads to an underestimation of the strength of the relationship between income and health outcomes as a result of distortion introduced by individual level income misclassification (described above). This means that when relationships are identified between income and health outcomes using income quintiles, these relationships are likely stronger in reality.

Area-level household income quintile estimates can also make it challenging to project theoretical health gains associated with low income intervention measures. Since the actual income level of residents is not known (only the average household income of the DA of residence is known), it is difficult to parameterize a model that would project the improved health outcomes potentially associated with an increase in the minimum or living wage. Even breaking income quintile 1 into 5 sub–quintiles as was undertaken in this study does not resolve this issue since income quintile 1a (the lowest income category) contains a wide range of household incomes, and there remain a large number of individuals with very low income living in higher income quintile categories.

The limitations of area-level household income quintile/sub–quintile analysis noted here holds true for all income quintile analyses commonly conducted in Manitoba, such at the RHA Atlases.

Results

Shown in the tables that follow, crude and adjusted rates and associated rate ratios are reported for both income quintile classifications 1 to 5, as well as for income quintile sub–classifications 1a to 1e (income quintile 1 divided into 5 sub-categories) for each of the six indicators examined.

Using ACS as an example (Appendix Tables 3.3 and 3.5), one can see that there is a significant gradient (linear trend) in these hospitalizations by both broad income quintile (rate ratio of 2.27) and by quintile 1 sub–quintile (rate ratio of 1.49).

With the exception of Hospital Episodes (Appendix Tables 3.15 and 3.17) and Dental Extraction Surgreries (Appendix Tables 3.19 and 3.21), the significant linear trend observed at the broad income quintile level also persisted at the sub–quintile level. In these cases, however, the rate ratios of category 1a vs. 1e were greater than 1, indicating higher rates in lower income populations.

Key Findings

- In all of the 6 indicators explored, a gradient was found within income quintile 1 (between sub–quintiles) in addition to differences between quintiles.
- This confirms that the association between lower income and lower health status persists even in the lowest income part of the income gradient.
- The gradient is less prominent within income quintile 1 than between the quintiles as would be expected given the population size of the groups being compared.
- For all of the 6 indicators, the linear trend across the income quintile 1 sub–quintiles achieved significance for the crude rates.
- For two indicators the adjusted sub–quintile rates linear trend did not reach statistical significance (Hospital Episodes for children and Dental Extraction Surgeries for children).

Conclusion

The association between income (as a proxy for social and economic status) and health status persists within income quintile 1 showing a similar pattern within income quintile 1 as is evident across the income quintiles.

Hospitalizations for Ambulatory Care Sensitive Conditions among Adults

Appendix Table 3.2: Crude Rate of Hospitalizations for Ambulatory Care Sensitive Conditions by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-74

Income Quintile	Number Observed per Year	Crude Percent	Crude Rate Ratio*
1 (Lowest)	10,332	1.16%	Reference
2	6,634	0.77%	1.51
3	5,281	0.64%	1.80
4	4,211	0.47%	2.45
5 (Highest)	3,678	0.41%	2.80

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.3: Adjusted Rate of Hospitalizations for Ambulatory Care Sensitive Conditions by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-74

Income Quintile	Adjusted Percent	Adjusted Rate Ratio*
1 (Lowest)	1.60%	Reference
2	1.08%	1.49
3	0.97%	1.66
4	0.73%	2.20
5 (Highest)	0.71%	2.27

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.4: Crude Rate of Hospitalizations for Ambulatory Care Sensitive Conditions by Income Sub-Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-74

Income Sub-Quintile	Number Observed per Year	Crude Percent	Crude Rate Ratio*
1a (Lowest)	2,585	1.46%	Reference
1b	2,203	1.24%	1.18
1c	2,044	1.14%	1.28
1d	1,946	1.09%	1.34
1e (Highest)	1,554	0.88%	1.66

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Appendix Table 3.5: Adjusted Rate of Hospitalizations for Ambulatory Care Sensitive Conditions by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-74

Income Sub-Quintile	Adjusted Percent	Adjusted Rate Ratio*
1a (Lowest)	1.94%	Reference
1b	1.59%	1.22
1c	1.49%	1.31
1d	1.24%	1.57
1e (Highest)	1.31%	1.49

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Hospital Days for Acute Care among Adults

Appendix Table 3.6: Crude Days of Acute Care in Hospital by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 18+

Income Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1 (Lowest)	620,670	696.88	Reference
2	449,616	519.98	1.34
3	355,454	433.92	1.61
4	325,467	366.03	1.90
5 (Highest)	278,202	312.87	2.23

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.7: Adjusted Days of Acute Care in Hospital by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 18+

Income Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1 (Lowest)	838.27	Reference
2	627.15	1.34
3	531.94	1.58
4	493.15	1.70
5 (Highest)	420.79	1.99

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.8: Crude Days of Acute Care in Hospital by Income Sub-Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 18+

Income Sub-Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1a (Lowest)	153,509	865.54	Reference
1b	131,459	737.23	1.17
1c	121,406	677.84	1.28
1d	121,209	676.24	1.28
1e (Highest)	93,087	527.04	1.64

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Appendix Table 3.9: Adjusted Days of Acute Care in Hospital by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 18+

Income Sub-Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1a (Lowest)	1,046.22	Reference
1b	881.63	1.19
1c	807.05	1.30
1d	724.59	1.44
1e (Highest)	720.95	1.45

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Hospital Days for Alternate Level of Care among Adults

Appendix Table 3.10: Crude Days of Alternate Levels of Care in Hospital by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 18+

Income Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1 (Lowest)	79,812	89.61	Reference
2	73,581	85.10	1.05
3	50,059	61.11	1.47
4	45,112	50.73	1.77
5 (Highest)	39,684	44.63	2.01

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.11: Adjusted Days of Alternate Levels of Care in Hospital by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 18+

Income Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1 (Lowest)	105.35	Reference
2	62.99	1.67
3	43.39	2.43
4	45.26	2.33
5 (Highest)	32.62	3.23

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.12: Crude Days of Alternate Levels of Care by Income Sub-Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 18+

Income Sub-Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1a (Lowest)	16,733	94.35	Reference
1b	16,441	92.20	1.02
1c	17,737	99.03	0.95
1d	17,679	98.63	0.96
1e (Highest)	11,222	63.54	1.48

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Appendix Table 3.13: Adjusted Days of Alternate Levels of Care by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 18+

Income Sub-Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1a (Lowest)	98.68	Reference
1b	69.55	1.42
1c	178.81	0.55
1d	70.97	1.39
1e (Highest)	62.27	1.58

* Statistically significant linear trend across income sub-quintiles (p<0.04).

Hospital Episodes among Children

Appendix Table 3.14: Crude Rate of Hospital Episodes for Children by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-19

Income Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1 (Lowest)	5,573	25.70	Reference
2	3,616	19.37	1.33
3	3,372	18.15	1.42
4	2,895	14.08	1.83
5 (Highest)	2,925	13.79	1.86

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.15: Adjusted Rate of Hospital Episodes for Children by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-19

Income Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1 (Lowest)	24.90	Reference
2	18.96	1.31
3	17.93	1.39
4	13.97	1.78
5 (Highest)	14.13	1.76

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.16: Crude Rate of Hospital Episodes for Children by Income Sub-Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-19

Income Sub-Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1a (Lowest)	1,271	28.75	Reference
1b	1,153	26.47	1.09
1c	1,126	25.66	1.12
1d	820	22.67	1.27
1e (Highest)	1,203	24.56	1.17

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Appendix Table 3.17: Adjusted Rate of Hospital Episodes for Children by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-19

Income Sub-Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio†
1a (Lowest)	27.63	Reference
1b	25.81	1.07
1c	24.69	1.12
1d	21.82	1.27
1e (Highest)	24.30	1.14

† No statistically significant linear trend across income sub-quintiles.

Dental Extraction Surgeries among Children

Appendix Table 3.18: Crude Dental Extraction Surgery Rate for Children by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-5

Income Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1 (Lowest)	803	10.91	Reference
2	280	4.87	2.24
3	193	3.57	3.06
4	103	1.81	6.04
5 (Highest)	51	1.00	10.95

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.19: Adjusted Dental Extraction Surgery Rate for Children by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-5

Income Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1 (Lowest)	8.77	Reference
2	4.01	2.19
3	3.02	2.91
4	1.57	5.60
5 (Highest)	0.77	11.42

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.20: Crude Dental Extraction Surgery Rate for Children by Income Sub-Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-5

Income Sub-Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1a (Lowest)	238	14.38	Reference
1b	163	10.70	1.34
1c	153	10.13	1.42
1d	100	8.50	1.69
1e (Highest)	149	9.97	1.44

* Statistically significant linear trend across income sub-quintiles (p<0.0001).

Appendix Table 3.21: Adjusted Dental Extraction Surgery Rate for Children by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-5

Income Sub-Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio†
1a (Lowest)	11.49	Reference
1b	8.82	1.30
1c	8.56	1.34
1d	7.07	1.63
1e (Highest)	8.15	1.41

† No statistically significant linear trend across income sub-quintiles.

Hospital Episodes for Injury among Children

Appendix Table 3.22: Crude Rate of Hospital Episodes for Injury for Children by Income Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-19

Income Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1 (Lowest)	803	3.70	Reference
2	429	2.30	1.61
3	373	2.01	1.84
4	369	1.79	2.06
5 (Highest)	327	1.54	2.40

* Statistically significant linear trend across income quintiles (p<0.0001).

Appendix Table 3.23: Adjusted Rate of Hospital Episodes for Injury for Children by Income Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-19

Income Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1 (Lowest)	3.44	Reference
2	2.07	1.66
3	1.78	1.93
4	1.57	2.19
5 (Highest)	1.35	2.54

* Statistically significant linear trend across income quintiles (p <0.0001).

Appendix Table 3.24: Crude Rate of Hospital Episodes for Injury for Children by Income Sub- Quintile, 2010/11-2015/16
Crude average annual rate and rate ratio, age 0-19

Income Sub-Quintile	Number Observed per Year	Crude Rate per 1,000	Crude Rate Ratio*
1a (Lowest)	202	4.57	Reference
1b	155	3.56	1.28
1c	168	3.83	1.19
1d	104	2.87	1.59
1e (Highest)	174	3.55	1.29

* Statistically significant linear trend across income sub-quintiles (p<0.003)

Appendix Table 3.25: Adjusted Rate of Hospital Episodes for Injury for Children by Income Sub-Quintile, 2010/11-2015/16
Age- and sex-adjusted, average annual rate and rate ratio, age 0-19

Income Sub-Quintile	Adjusted Rate per 1,000	Adjusted Rate Ratio*
1a (Lowest)	4.44	Reference
1b	3.30	1.35
1c	3.54	1.26
1d	2.66	1.67
1e (Highest)	3.20	1.39

* Statistically significant linear trend across income sub-quintiles (p<0.001).

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