Assessing The Health Of Children In Manitoba: A Population-Based Study

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THE MANITOBA CENTRE FOR HEALTH POLICY AND EVALUATION

The Manitoba Centre for Health Policy and Evaluation (MCHPE) is a unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. MCHPE is active in health services research, evaluation and policy analysis, concentrating on using the Manitoba Health data base to describe and explain patterns of care and profiles of health and illness.

Manitoba has one of the most complete, well-organized and useful health data bases in North America. The data base provides a comprehensive, longitudinal, population-based administrative record of health care use in the province.

Members of MCHPE consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards and its exceptional data base, uniquely position MCHPE to contribute to improvements in the health policy process.

MCHPE undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, MCHPE researchers secure major funding through the competitive grants process. Widely published and internationally recognized, they collaborate with a number of highly respected scientists from Canada, the United States and Europe.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

This report focuses on developing a portrait of the health and well-being of Manitoba's children, with a view to understanding differences in the health and opportunities for young Manitobans across the province. A variety of aspects of child health as well as educational achievements by children across the province and across socioeconomic groups are reviewed. Information is displayed by Regional Health Authorities (RHAs), as well as by sub-areas of Winnipeg (called Winnipeg Community Areas or WCAs). The report was developed at the request of Manitoba Health, and the selection of indicators was assisted by our advisory group.

The report compiles a vast quantity of descriptive, population-based information which is encyclopaedic in nature. It is intended as a reference document that can be used by policy makers and planners to evaluate various aspects of child health at both the regional and provincial levels in order to identify areas where new policy efforts or programs are necessary. An index and a glossary are provided at the back of the report to assist readers in navigating the various child health issues discussed. There are eight chapters (Chapters 2 to 9) dealing with specific child health issues, and at the end of each chapter, a list of key points summarizes the information discussed within the chapter. What follows is a summary of the key findings of these eight chapters.

Chapter 2 - Demographics and Conceptual Framework

- In 1998, children ages 0 to19 years comprised 28% of the Manitoba population – but the actual number of live births dropped from around 16,000 in 1994 to 14,000 in 1998, especially in Winnipeg, Brandon and the south.
- Fertility rates vary substantially by RHA and Winnipeg areas – a Manitoba woman has an average of 1.77 children during her lifetime, varying from 1.6 in Marquette to 3.2 in Burntwood RHAs, and from 1.2 in Assiniboine South to 2.3 in Point Douglas.
- Infant mortality rates 1994-1998 were 6.6/1000 live births (5.5 excluding <500 g or <20 weeks gestation), with 1.5 times the provincial rate for Burntwood RHA, and over double the rate for infants residing in the lowest income quintile area compared to the highest income quintile.
- Main causes of death for neonates were congenital anomalies and short gestational age or low birth weight, whereas main causes for post-neonatal deaths were sudden infant death syndrome (SIDS), congenital anomalies, and a combination of respiratory, infectious, and parasitic diseases.
- Child mortality rates appear stable over the 5-year period from 1994-1998.
- Children 1 to19 years old living in the north have an elevated risk of death, with double the provincial rate in children ages 1 to 9 years old. Males in the rural south area of Manitoba have a 26% to 47% greater death rate than the provincial average, depending upon their age.
- The leading cause of death for children ages 1 to 19 years old was injury, with half of the deaths for children ages 1 to 9, and three-quarters of the deaths for children ages 10 to 19 years old attributable to injury.

Chapter 3 – Being Born in Manitoba

- Winnipeg had the highest rate of preterm births compared with the south, north, and Brandon, with Downtown Winnipeg the highest rate in the province at 8.0%, compared to the provincial rate of 6.7%
- About 20% of Manitoba infants are born with "at risk" birth weights, with 5.3% low birth weight and 14.9% high birth weight. Women living in Winnipeg, and in low income areas of the province, were more likely to give birth to a low birth weight infant. Downtown Winnipeg had the highest low birth weight rate in the province. Women living in low income rural areas, the north, and south rural areas were more likely to give birth to a high birth weight infant.
- At least one-fifth of Manitoba women reported smoking during pregnancy, with elevated rates for low income women and lone parents. Middle/high income Manitoba women were more likely to consume alcohol during pregnancy, with an overall provincial rate of 12%.
- Although hospital stays are reasonably short across the province, with the provincial average of 2.7 days for vaginal and 5.3 days for Caesarean section deliveries, older mothers tend to stay longer.
- Breastfeeding initiation rates were 77% for Manitoba infants 1994-1998 according to the hospital discharge records, with Winnipeg higher at 80% and the North substantially lower at 64%. According to survey data, 36% of all Manitoba infants were breastfed for at least 6 months, but this survey data did not include women living in First Nations communities of Manitoba.
- About 4% of newborns were readmitted to hospital within 6 weeks of hospital discharge, with respiratory illness being the main reason. Babies were more likely to be readmitted for any reason if they were preterm, lived outside Winnipeg, not breastfed, born to parents who lived in the three lowest income neighbourhoods, delivered by Caesarean section, stayed less than two days post-birth, or were of low birth weight.

Chapter 4 – Reproductive Health Issues for Adolescents in Manitoba

- The 1994/95-1998/99 Manitoba teen pregnancy rate was 6.3% for females 15 to 19 years old, higher than the Canadian rate of 4% in 1994. The rate in south rural Manitoba was lower than the provincial average, whereas the rate in the north was twice the provincial and three times the national rate.
- About one-third of Manitoba 15- to 19-year-old adolescents in 1996 reported having sexual intercourse within the past year, with 9% of 15-year-olds and 70% of 19-year-olds. The rate of sexual intercourse was higher for females, adolescents in lone-parent families, those living in the urban (Winnipeg and Brandon) or north areas, and in the lower income group.
- Among sexually active females, birth control pill use was highest in the North at 61%, followed by the rural south at about 56%, and lowest in urban areas at about 36%. Condom use at last sexual intercourse was highest in the urban areas at 85%, followed by the rural south at 72%, with the lowest use in the North at 63%.

Chapter 5 – Health Status: Childhood Acute-Chronic Conditions

- Six per cent of infants (children less than 1 year old) were hospitalized for lower respiratory tract infection.
- Infants were more likely to be hospitalized for lower respiratory tract infections if they lived in the north and Parkland RHA, and in Point Douglas.
- In urban and rural areas, the prevalence of hospitalization for lower respiratory tract infection in infants increased with successive decreases in neighbourhood income level.
- Asthma was the most common childhood chronic condition: 10% of school-age children were treated for asthma, and 1% or less of adolescents were treated for cardiovascular conditions, seizure disorders or Type 1 diabetes
- Children living in Winnipeg had higher asthma treatment rates than those documented for children living in the rural south and those living in the north.
- For children 10 year of age and older, the treatment prevalence of cardiovascular disease was associated with neighbourhood income level: the lower the income level, the higher the treatment rate.

Chapter 6 – Health Status: Injury

- The 1994-1997 injury mortality rate for children residing in the north was over two times higher than the rate for those residing in the rural south, over two-and-a-half times higher than the provincial average, and over four time higher than the rate for Winnipeg children. Children living in Burntwood RHA had the highest injury mortality rate in the province, over three times higher than the provincial average.
- Children living in the Downtown area of Winnipeg had the highest injury mortality rate in Winnipeg, almost three times higher than the Winnipeg average, and almost two times higher than the provincial average.
- Motor vehicle crashes (MVCs) are the leading cause of injury death in Manitoba children, comprising over one-third of all injury deaths in this group. Other major causes of childhood injury deaths include violence to self, drowning, suffocation and choking, violence by others, and fire/flames.
- Burntwood, Norman, Parkland, North Eastman and Marquette children were more likely to be hospitalized for injuries than the average Manitoba child.
- Children living in Downtown and Point Douglas areas were more likely to be hospitalized for injuries than the average Winnipeg child.
- Falls are the main injury that sends Manitoba children to hospital, accounting for 23% of all injury hospitalizations. Other leading causes of injury hospitalizations include MVCs (12%) and violence to self (11%).
- For both rural and urban areas, and for both injury mortality and hospitalizations, children living in lower income neighbourhoods have higher injury rates than those living in higher income neighbourhoods.

Chapter 7 – Health Care Utilization

- Children from the north were over two times more likely to be hospitalized than the average Manitoba child, whereas children from Winnipeg were much less likely to be hospitalized than the average Manitoba child. Children from lower income neighbourhoods were hospitalized more frequently than children from higher income neighbourhoods.

- Physician visit rates were higher for Winnipeg children than for children living outside of Winnipeg. The lower physician visit rates for children from the north are at least partly attributable to missing data.
- Children residing in Winnipeg were over three-and-a-half times more likely to access paediatricians and other specialists than those residing outside the city.
- In terms of continuity of physician care, the proportion of visits to a usual provider rose with increasing income in urban and rural areas.
- Almost 60% of children less than 5 years old received one or more prescriptions for antibiotics.
- The receipt of multiple prescriptions for antibiotics was more common in children living in Parkland and Interlake RHAs, and the Winnipeg communities of Point Douglas and Downtown.
- Children were far more likely to receive iron supplements if they lived in northern RHAs, Parkland, North Eastman, and the Winnipeg communities of Point Douglas, Downtown and Inkster.
- Over 1% of children received prescriptions for psychostimulants (e.g., Ritalin); antidepressants, antipsychotics (e.g. for schizophrenia). Anxiolytics (e.g., for anxiety) were used in less than 1% of children.
- Female adolescents were most likely to use antidepressants and anxiolytics, and male children aged 10 to 14 years had higher use of psychostimulants.
- Rates of psychostimulant use were higher in Brandon and in the Winnipeg communities of St. James-Assiniboia and Assiniboine South, than the southern rural average. Children living in River Heights were more likely and those living in Inkster less likely to receive a prescription for an antidepressant, compared to the Winnipeg average.

Chapter 8 – Quality of Care

- Of Manitoba children born 1994-1997, 84% had a complete schedule of immunizations at one year, 72% at two years, and 83% at seven years of age – well below Canadian benchmark targets of 95%. Hospitalization due to immunizable and preventable infections was higher in northern RHAs compared to the provincial average.
- The overall 1994/95-1998/99 Manitoba section rate of 16.2% varies considerably by maternal age (increasing with increasing age) and region, with a low of 14% in Burntwood and South Eastman and a high of 23% in Nor-Man.
- the Manitoba Vaginal Birth After Caesarean (VBAC) rate of 30.9% is much lower than the benchmark of 50 to 80%, and varies considerably by region both in and outside Winnipeg, from a low of 12.5% in Norman to a high of 50% in Churchill and 45% in North Eastman
- Coincident with publication of clinical guidelines for tonsillectomy in 1996, the rates of this procedure dropped considerably across the province. Since that time, however, the rates for children living in the rural south and the north increased significantly, to pre-guideline rates. For Winnipeg children, the 1998/99 rates remained significantly lower than the pre-guideline rates.
- South Eastman and Brandon children undergo significantly more tonsillectomy/adenoidectomy procedures than the average Manitoba child, whereas Winnipeg children undergo significantly fewer procedures.

- Within Winnipeg, Transcona children undergo significantly more tonsillectomy/adenoidectomy procedures, whereas children from the Downtown area undergo significantly fewer procedures.

Chapter 9 – Social Determinants of Health

- Considerable regional variation exists in the per cent of children living in families from the lowest income neighbourhoods, ranging from less than 10% for South Eastman, Norman and Churchill to over 50% for those children residing in Parkland for the RHAs, and from less than 10% for Assiniboine South, Seven Oaks, St. James Assiniboia and Transcona to over 50% for those children living in Downtown and Point Douglas for Winnipeg areas.
- The per cent of lone-parent families tends to be higher in the north (18.5%) and Winnipeg (16.3%) than in the rural south (9.1%), with regional variations evident.
- Unemployment for 25- to 44-year-olds ranges from less than 3% in South Westman to almost 20% in Churchill and from less than 4% in Assiniboine South, St. Vital and Transcona to over 14% in Point Douglas.
- The per cent of those not finishing high school is lower in Winnipeg than the other RHAs, but within Winnipeg the per cents range from 11% in Fort Garry to over 40% in Point Douglas.
- Grade 3 mean scores on math standards tests ranged from less than 43 in the Downtown and Point Douglas areas, to 64 in Fort Garry. Across RHAs where some regions have a high percentage of children who attend band schools (who are not required to write exams) scores varied from 45 in Burntwood to 56 in North Eastman.
- Manitoba has 105 licensed child day care spaces per 1000 children aged 0 to 12 years. Information on unlicensed home day cares shows an additional 131 children per 1000 are in unregulated care.
- Manitoba children are less likely to participate in sports if they are from low-income families that live in urban areas, and if their mothers do not have any post-secondary education.
- Almost 29% of Manitoba children are obese or at risk for obesity.
- For many of the indicators of child health examined throughout this report we found a relationship between child health and the overall health of the population of the region in which a child lives. That is, in regions where the health of the entire population tends to be poorer and the need for health care services greater, the child population also tends to be in poorer health.
- Many of the indicators of child health examined in this report are related to the socioeconomic circumstances in which the child lives. For many of these indicators, the higher the child's neighbourhood income level, the better performance on the child health indicators.

CHAPTER 1: INTRODUCTION

1.0 Background

Recent years have seen a surge of interest in child health and development, coinciding with the formal recognition of the inherent worth of children and the right of children to enjoy exemplary health (Centre for Human Rights, United Nations 1989). Research in this area has revealed a powerful relationship between child health and health in adulthood (Power et al. 1990; Starfield 1991), and compelling arguments have been made regarding the importance of early childhood experiences and development on later health and well-being (Cyander 1994; Hertzman 1998; Hertzman and Wiens 1996). Socioeconomic status, which includes factors such as family income level, parental education and employment, and living conditions, has been shown to have a particularly strong relationship to both child health (Aber et al. 1997; Gissler et al. 1998; Nelson 1992; Roberts and Power 1996) and to long-term health outcomes (Lundberg 1993; Marmot 1997; Rahkonen et al. 1997; Davey Smith et al. 1998; van de Mheen et al. 1997). Lower socioeconomic status is associated with poorer health outcomes, and there is a graded effect of this relationship such that with each increase in level of socioeconomic status there is an increase in health status (Hertzman 1999). This relationship between socioeconomic status and health is referred to as the socioeconomic gradient in health status.

There is a distinction between absolute and relative poverty, with the former based on the lack of basic needs (e.g., poor housing, diet, etc.), while the latter emphasizes the lack of basic needs as well as psychosocial needs. Poverty statistics used in this chapter are based on Statistics Canada's relative definition of the Low Income Cut-Off, which defines a family in poverty as in "straitened circumstances" due to the need to spend significantly more of its income on basics (food, shelter, clothing) than does the average family (Statistics Canada, http://www.statcan.ca). The gradient effect observed in health across socioeconomic strata provides support for the relative poverty perspective: it is not just those from the lowest income neighbourhoods that have the poorest outcomes, but those from middle-income neighbourhoods do less well than those from the higher income neighbourhoods. (Sarlo 1996).

Children living in poverty are most at risk for poor health outcomes. Given that the child poverty rate in Canada has increased over the past several years from 14.9% in 1981 to 19.9% in 1997 (Ross et al. 2000), with the Manitoba child poverty rate at 22.1% in 1997 (Social Planning Council of Winnipeg 1999), there is growing concern about the impact of poverty on child health and well-being.

The Manitoba child poverty rate is higher than the national average. Manitoba had the highest child poverty rate in the country five years out of nine, between 1989 and 1997, having the third highest child poverty rate in the other four years. The child poverty rate in Manitoba ranged from a low of 22% to a high of 27% over the nine-year period. Further information on Manitoba's child poverty rate can be obtained on the Social Planning Council of Winnipeg website http://www.spcw.mb.ca/.

A number of provincial and national initiatives (e.g., Children First Policy, National Children's Agenda, Understanding the Early Years) have called for child health strategies to attempt to minimize the effects of child poverty as well as optimize the current well-being and future health of all children. The

Accurate measurements of child health status can be used:

- *To identify vulnerable populations of*

development and evaluation of policies and programs designed to enhance child health and well-being require accurate measurements of child health status as well as the social conditions in which children live. The measurement of child health status is also useful for identifying vulnerable populations of children.

children

- *As a proxy for the health of the community*
- *To set targets for programs designed to enhance child health and well-being*
- *To evaluate the effectiveness of programs designed to enhance child health and well-being*

(adapted from Szilagyi and Schor 1998).

1.1 Purpose of this report

The purpose of this report is to provide planners and those involved in improving child health and well-being with a rich source of descriptive, population-based information on the health of children in Manitoba. The report is encyclopaedic in nature, and not necessarily intended to be read cover-to-cover. As a compilation of information on child health status in Manitoba, it is intended as a reference document. Our hope is that policy makers can use this document to critically evaluate various aspects of child health status at both the regional and provincial level and identify areas where new policy efforts are necessary. Most figures and tables in this report show child health indicators by Regional Health Authority (RHA) and by Winnipeg Community Area (WCA). Figure 1.1 shows the location of the RHAs within Manitoba and Figure 1.2 shows the location of the WCAs within Winnipeg. For RHA and WCA analyses overall rates are given for Manitoba, the North (Burntwood, Norman and Churchill), South Rural (South Eastman, Central, South Westman, Marquette, North Eastman, Interlake and Parkland), and non-Winnipeg (all RHAs except Winnipeg).

To make the information in this report as accessible and easy to use as possible we have made the report available on our website at http://www.umanitoba.ca/centres/mchpe/reports.htm. *Listed below are hyperlinks to each of the chapters described in the left-hand column.*

1.2 What's included in this report

As one flips through this report it becomes apparent that all graphs maintain a consistent ordering of regions throughout. This ordering is based on the Premature Mortality Ratio (PMR) which is the rate of deaths before 75 years of age. Many of the projects undertaken by the Manitoba Centre for Health Policy and Evaluation have presented data using this ordering, based on the belief that PMR is the best single measure to reflect the healthiness of a group of people and their need for health care services (Carstairs and Morris 1991; Eyles et al. 1991; Eyles

Chapter 2: Demographics and Conceptual Framework

Figure 1.1: Manitoba's Regional Health Authorities

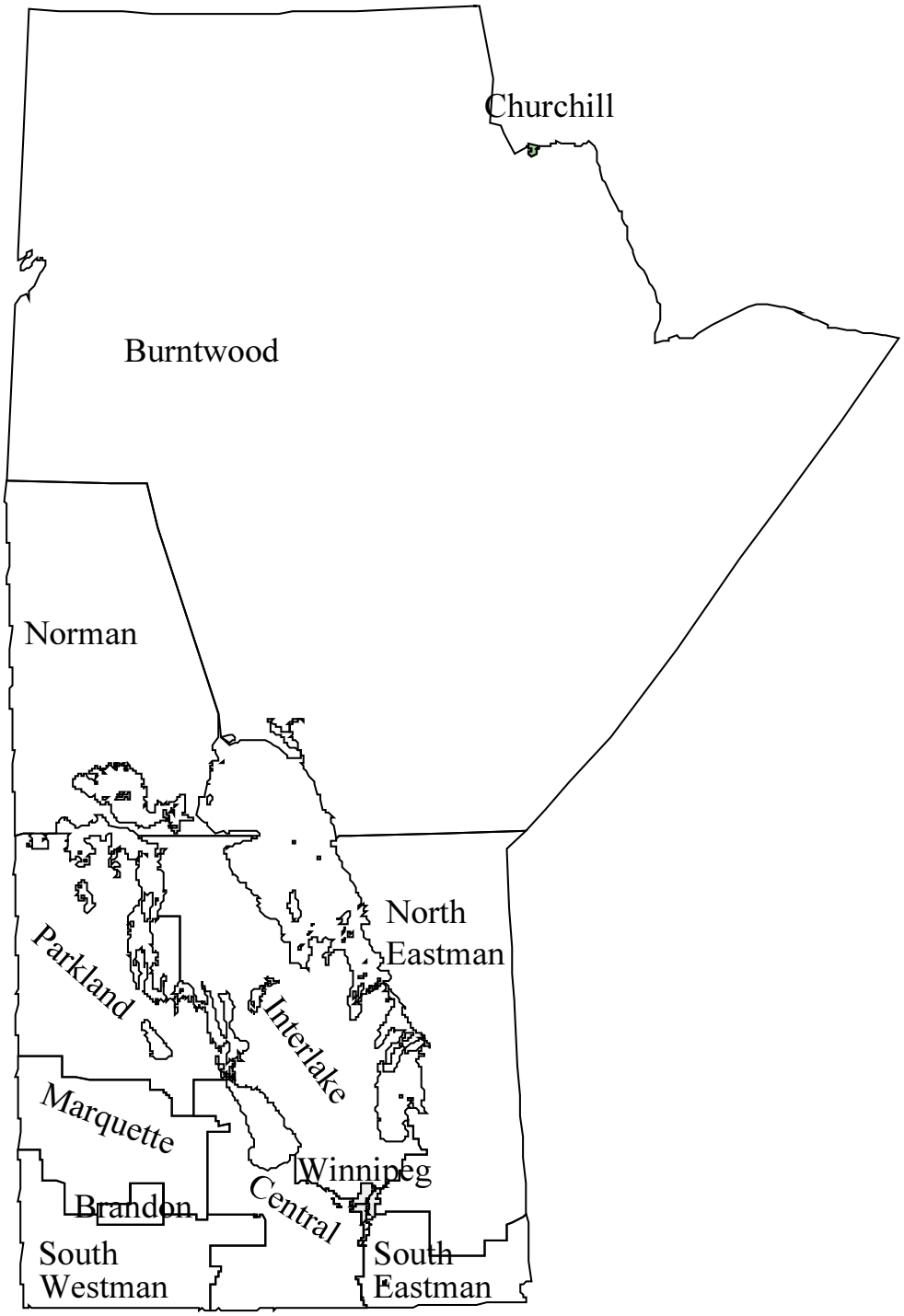
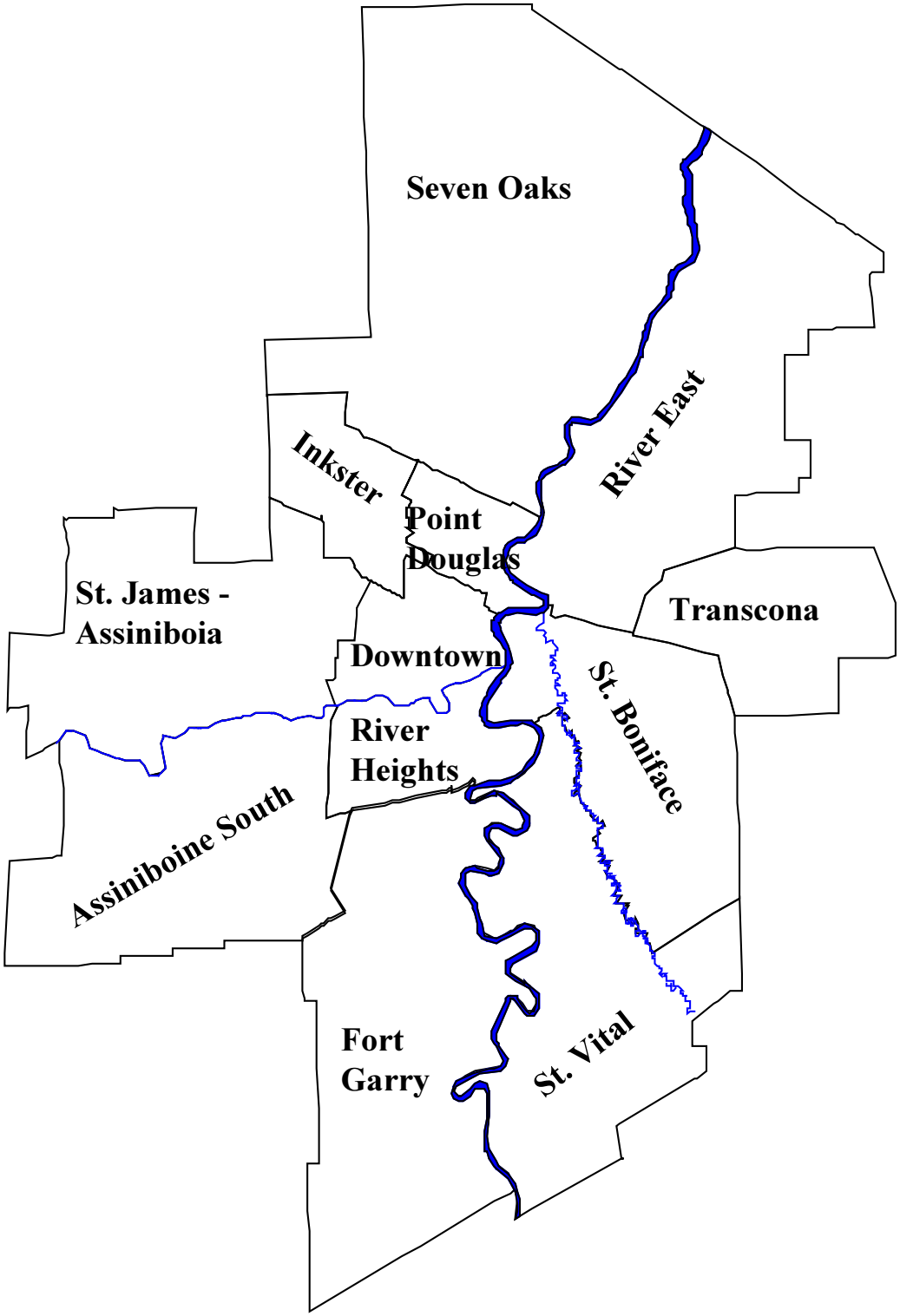


Figure 1.2: Winnipeg Community Areas



and Birch 1993). Those regions at the top of the graphs (lower PMR) tend to have more educated, more affluent residents who also tend to be healthier, whereas those at the bottom of the graphs (higher PMR) tend to have the opposite characteristics. Although it is legitimate to question whether a health measure based on the population up to 74 years of age should be used in a report on children, there is no single child health indicator available that reflects overall child health and need for health care. The ordering by PMR provides insight into which child health status measures are associated with the overall health of the populations within the regions. The concepts of the healthiness of populations within regions as well as indicators of socioeconomic risk are described in Chapter 2, Demographics and Conceptual Framework. Also included in this chapter is demographic information important to health care planners, and well-established indicators of child health based on infant and childhood mortality.

Chapter 3: Being Born in Manitoba: A Look at Perinatal Health Issues

Many factors influence the health and well-being of children throughout their youth and later into adult life, and many of those factors begin during pregnancy, birth, and in the first year of life. Chapter 3, Being Born in Manitoba, includes some of the indicators for the health and well-being of our youngest members of society – issues surrounding pre-term birth, "at risk" birth weights (low and high), breastfeeding rates, and hospital readmission rates. As well, the maternal indicators of healthy pregnancy and birthing are crucial to the well-being of the baby, so we have also included information on maternal prenatal care, prenatal risk factors, and birthing experiences (including type of delivery, and maternal length of stay).

Chapter 4: Reproductive Health Issues for Adolescents in Manitoba

Chapter 4 on adolescent reproductive health addresses the problem of "kids having kids", knowing that teen pregnancy is associated with adverse outcomes of infant health and well-being, as well as socioeconomic impact upon the adolescent. Because the Manitoba teen pregnancy rate is substantially higher than the Canadian rate, this report includes information on risk factors and risk behaviours that may help planners develop or monitor programs

designed to decrease pregnancy rates. This includes information on the age at menarche, dating behaviour, onset of sexual intercourse, and contraceptive use. Different areas of Manitoba may need to consider different strategies to decrease teen pregnancy rates, based on the geographic-specific variations.

Chapter 5: Health Status: Childhood Acute and Chronic Conditions

The assessment of health status plays an important role in the planning, delivery and evaluation of the effectiveness of health care systems. Included in this report are two chapters on child health status. The first, Chapter 5, Childhood Acute and Chronic Conditions, focuses on three sets of conditions that impose a considerable morbidity burden in terms of limitations in function and dependency on medications and technology: 1) lower respiratory tract infections; 2) chronic conditions, and; 3) physical disabilities. The second health status chapter, Chapter 6, Injuries, is devoted entirely to an examination of injuries in Manitoba children. Injuries are the number one reason for deaths of children, and account for about one in every six hospitalizations. This chapter includes information on age and gender differences in injuries, as well as regional variations in injury mortality and hospitalization rates, and causes of injuries.

Chapter 6: Health Status: Injuries

Chapter 7: Health Service Utilization

Knowledge of patterns of health services utilization in children can provide useful information for the planning of health service delivery. Chapter 7, Health Services Utilization, examines hospitalization rates, physician visit rates, and rates of prescription drug use. Information is provided regarding where children use health services in relation to where they live, and what kind of practitioner provides these services. Data on prescription drug utilization provides an indication of trends in physician prescribing as well as the distribution of disease. Among others, antibiotics, psychostimulants and antidepressants have been chosen as medications of interest because of concerns over their increased use in children in the past decade.

Chapter 8: Quality of Care

The quality of care children receive is also an important focus. Poor quality of care can involve "too little care" in some cases and "too much care" in

others. Chapter 8 looks at examples of both aspects of quality of care. "Too little care" as a potential threat to quality is explored by examining immunization rates and avoidable hospitalizations due to immunizable and preventable infections. "Too much care" as a potential threat to quality is explored by examining Caesarean section rates for women, Vaginal Birth After Caesarean section (VBAC) rates for women, and tonsillectomy/adenoidectomy rates for children.

Chapter 9: Social Determinants of Health

Medical care is only one of myriad factors that have an impact on child health. An assessment of the social conditions in which children live is an essential component of understanding the environmental factors that have an impact on child health and well-being. Chapter 9 focuses on social determinants of child health, examining regional differences in socioeconomic status measures, the relationship between education and health, and community resources and family characteristics that may have an impact on child development. In each section of the report information on the impact of neighbourhood income levels on child health is explored, and Chapter 9 provides a summary of these findings. A summary of the discussions regarding the relationship between child health indicators and the healthiness of the populations within regions is also provided in this chapter.

Chapter 10: Methods

Glossary

This report also contains a chapter on methods and a Glossary. The Methods chapter (Chapter 10) describes general concepts and the sources of data used in this report. The Glossary contains more detailed information about the specific measures and calculations used in this report. The entries in the Glossary are in alphabetical order.

1.3 How to use this report

Index

To make it easier to find and use information pertinent to the different RHAs and WCAs, we have included an index of child health measures at the end of this report. The Index is alphabetized so that the reader can look up a topic and then flip to the pages where this topic is discussed. This Index is also

available on the report website http://www.umanitoba.ca/centres/mchpe/reports.htm and topics can be accessed by clicking on the appropriate index listing.

Each of the graphs and tables presented in the report and data from which they were derived are also available on the report website. The data are in Microsoft Excel format allowing users to modify tables and graphs to their own specifications. The website provides further details on how to use the Excel data.

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Patricia J. Martens

CHAPTER 2: DEMOGRAPHICS AND CONCEPTUAL FRAMEWORK

2.0 Introduction

In a recent collaborative report by the Canadian Institute for Health Information (CIHI) and the Federal/Provincial/Territorial Advisory Committee on Population Health and Health Services, Health Canada, and Statistics Canada, participants identified key core indicators for health researchers, policy-makers and planners (CIHI 1999). These indicators relate to four areas:

- health status of the population, and how this compares both over time and by region
- non-medical determinants of health by region
- health services – both availability and utilization
- community characteristics useful for contextual analysis

This chapter includes information on ***the health status*** of the Manitoba population. The healthiness of the populations in regions and sub-regions becomes the underlying concept of the report. However, patterns of health and disease must be understood in the context of the community and region, taking into consideration the "size, structure and growth of the population" (Young 1998). So this chapter also includes ***demographic*** information with a regional focus on children ages 0-19 years old, including answers to:

- what is the proportion of children in each region?
- what is the birth (fertility) rate?
- what is the death (mortality) rate and causes?

Comparative analyses help Manitobans look at their own data both within-region and between regions. This report includes information for Regional Health Authorities (RHAs), sub-regions of Winnipeg RHA (Community Areas), and overall rates such as the Manitoba rate, the North (Norman, Burntwood and Churchill RHAs), South Rural (which exclude Winnipeg and Brandon), and "Non-Winnipeg" (which

Population pyramids

A succinct way of presenting information about a population's age and sex structure is called a "population pyramid." This diagram (Figure 2.1) shows the percentage of population, by five-year age groups and by sex. Many developed countries' graphs approximate rectangles, whereas developing countries often exhibit a pyramidal shape with a large percent of the population being young. Knowledge of this structure has implications for planning the health care services of a region.

Population pyramids for each region are available in the MCHPE project entitled, "Comparative Indicators of Population Health and Health Care Use for Manitoba's Regional Health Authorities: A POPULIS Project", which is available in hard copy from MCHPE or on-line at http://www.umanitoba.ca/centres/mchpe

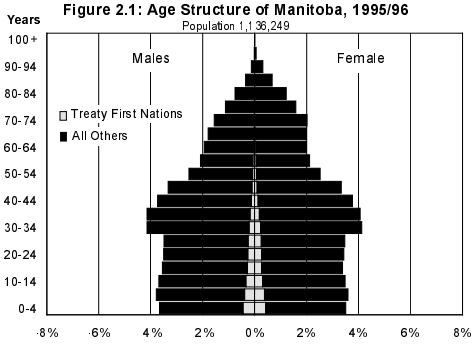


Figure 2.1: Age Structure of Manitoba, 1995/96
Population 1,136,249

includes Brandon and all other RHAs except Winnipeg). This gives a better understanding of the effects of context, non-medical determinants of health, as well as differing program structures. Our hope is that this report will encourage discussion so that groups will learn from each other, facilitating "best practice" models for maternal, child and adolescent health issues.

2.1 Healthiness indicators: Premature Mortality Rate (PMR), and Socioeconomic Factor Index (SEFI)

Premature mortality rate, or "PMR", measures the rate of premature deaths, that is, death before the age of 75 years. This rate is age and gender "adjusted", that is, standardized to reflect the age and gender structure of the overall Manitoba population, to make comparisons between regions more valid. PMR is considered the *best single measure to reflect the healthiness of a group of people, and their need for health care services* (Carstairs and Morris 1991; Eyles et al. 1991; Eyles and Birch 1993). Populations which have a high PMR are more likely to report poor health, greater number of symptoms, and more illness – both at the subjective self-reported level and the objective illness level. All graphs within this report are ordered by PMR, both at the RHA level and the sub-regional level. The lower the PMR, the healthier the population of the region. In this report, PMR is based upon a five-year average from 1994/95 to 1998/99, to ensure stability of the measure. See Figures 2.2 and 2.3 for the PMR by regions and sub-regions.

Healthiness of a region's population

The comparative healthiness of populations within regions is highlighted by two measures – the "premature mortality rate" (PMR), and the "socioeconomic factor index" (SEFI). All graphs in this report are ordered by PMR (which is highly correlated to SEFI). Regions with the least risk, that is, regions with the healthiest populations, are displayed at the top of the graph, with increasing risk down the left side.

Ordering the regions by PMR gives additional insight into the child health measures. Those regions listed at the top of each graph have the lowest PMR (South Eastman, Central, Brandon RHAs), indicating a relatively healthy regional population. Those regions listed at the bottom left side have the highest PMR (Burntwood, Norman, and Churchill RHAs), reflecting a less healthy population and a greater need for health care services. As you look at each graph, ask yourself such questions as:

- Which indicators of child health follow an

Figure 2.2: Premature Mortality Rates By RHA, 1994/95-1998/99

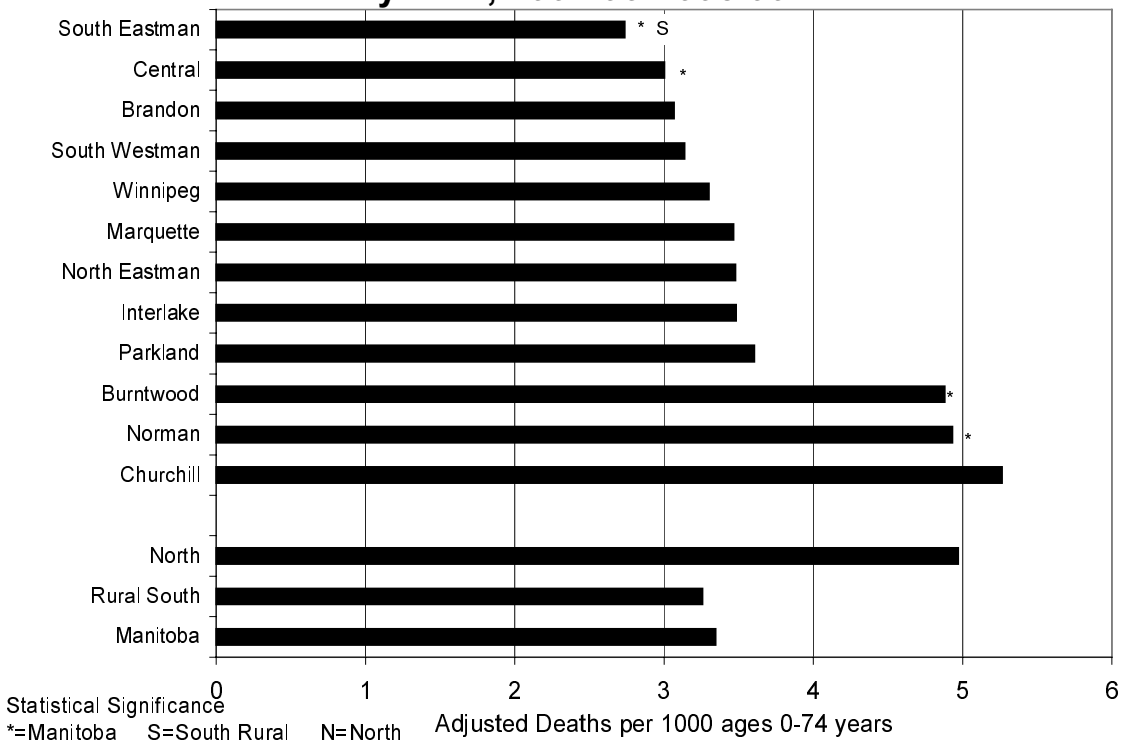
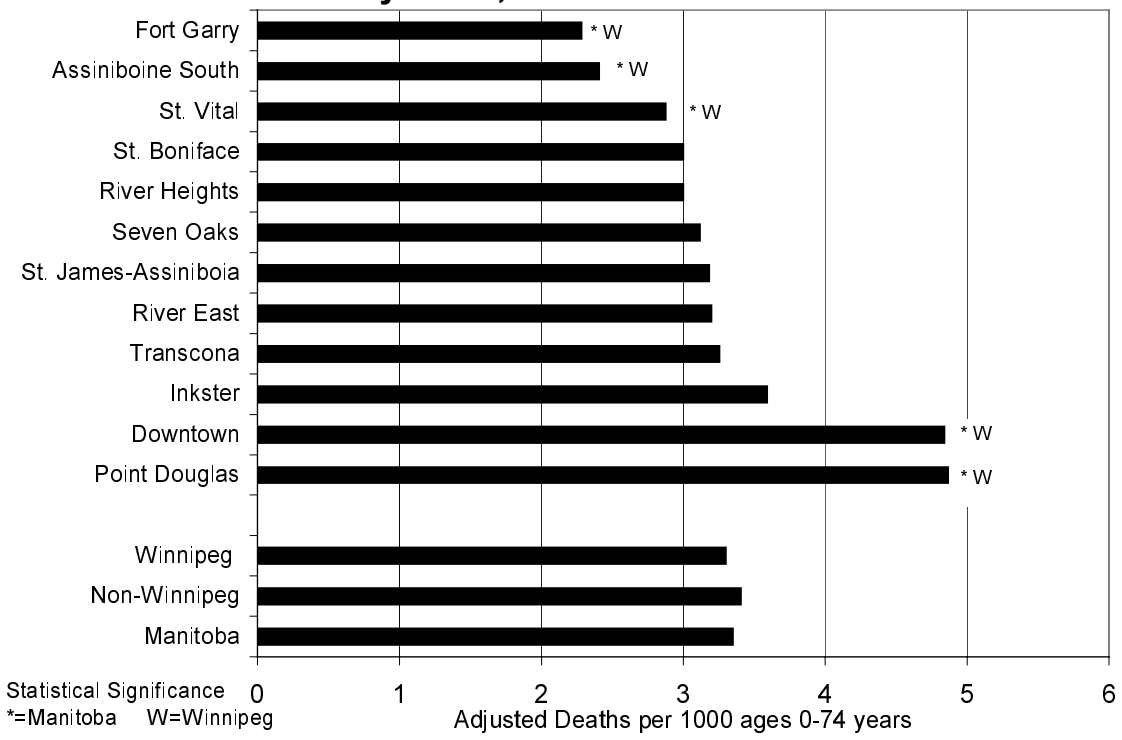


Figure 2.3: Premature Mortality Rates By WCA, 1994/95-1998/99



"expected" pattern of increase or decrease with the healthiness measure of the region?

- Does this ordering give insight into those indicators most closely associated with the general health of a region's population?

A second underlying determinant of health, also used extensively in other MCHPE reports, is a socioeconomic risk indicator (Frohlich and Mustard 1994; Mustard and Frohlich 1995). This has recently been modified to produce the SEFI (socioeconomic factor index). The overall Manitoba score is set to "0". So a negative SEFI score indicates *less* risk (more favourable socioeconomic conditions), and a positive score indicates *higher* risk compared to the Manitoba average. See the Glossary section for further details.

Socioeconomic Factor Index – the non-medical determinants of health and the need for health care

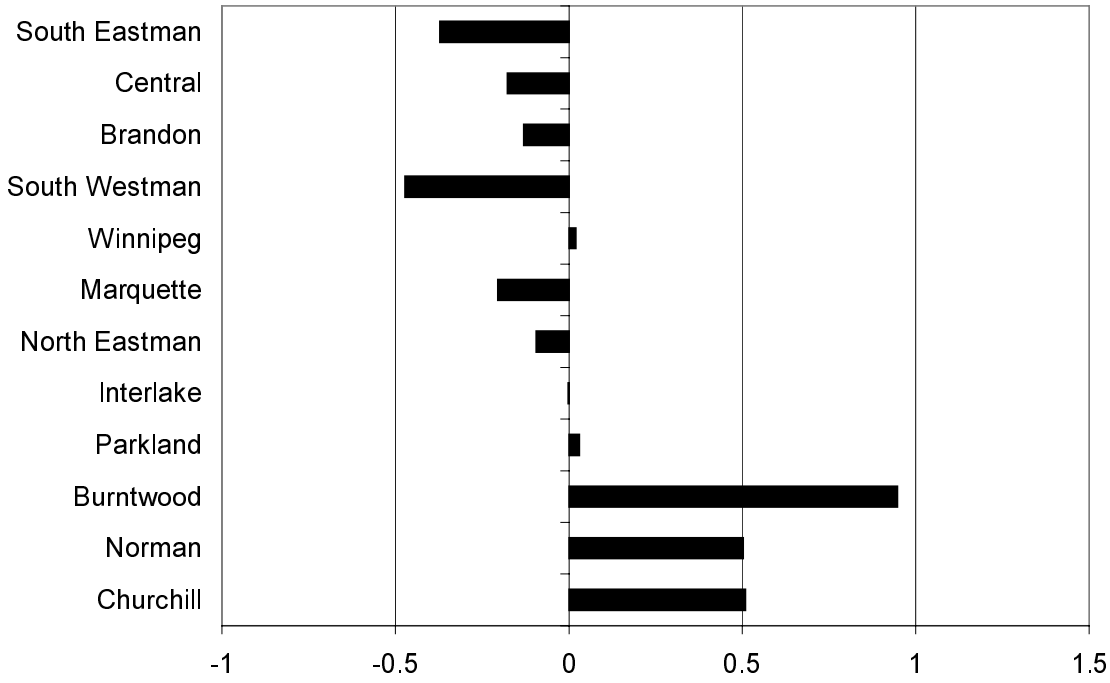
SEFI is based upon census measures of environmental, household and individual conditions associated with poor health, and hence a greater need for health care (see the Glossary for further explanation). Greater detail as to specific socioeconomic risk factors by region is given in Chapter 9.

Regional SEFI scores are provided in Figures 2.4 and 2.5. Knowing that socioeconomic factors are essential in the understanding of the healthiness of regions, the SEFI is one way to indicate the non-medical determinants of health and to estimate where needs for health care are likely to be higher (where there are less favourable socioeconomic conditions). Parallel trends are evident for most of the RHAs and the Winnipeg sub-regions when comparing Premature Mortality Rate and the SEFI score, so our ordering, with increasing PMR down the left side of the graphs, is also a reflection of increasing socioeconomic risk.

2.2 Describing the population and growth: Demographics and birth rate

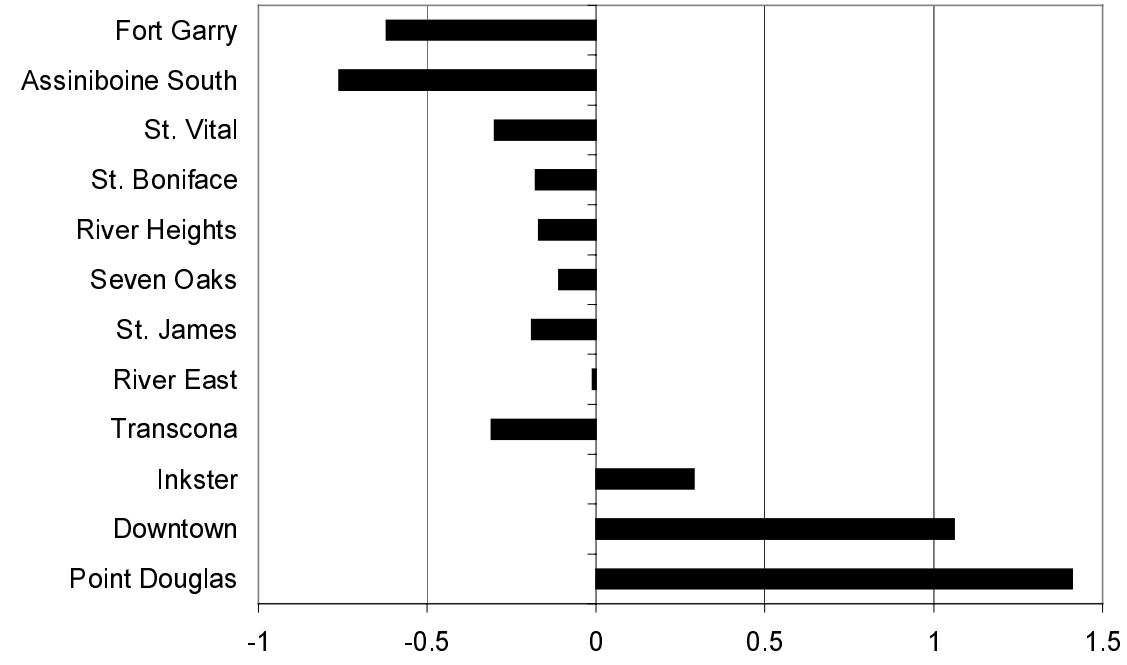
Knowledge of the age structure has implications for planning the health care services of a region. Focussing on children, Figures 2.6 and 2.7 show RHA and Winnipeg sub-region percentages of children in each age bracket of 0 to 4, 5 to 9, 10 to 14, and 15 to 19 years old (see also the Glossary, under "population by RHA" and "population by WCA" for sex and age specific numbers in 1998). For Canada in 1998, 33% of the population was composed of children and youth (CCSD 1999), but this included persons up to the age of 24 years. Manitoba 1998 data indicate that children

Figure 2.4: Socioeconomic Risk (SEFI - Socioeconomic Factor Index) by RHA, 1996



Note: this is standardized to the Manitoba average, with the Manitoba average being "0"

Figure 2.5: Socioeconomic Risk (SEFI - Socioeconomic Factor Index) by WCA, 1996



Note: this is standardized to the Manitoba average, with the Manitoba average being "0"

Figure 2.6: Population Distribution by Age and RHA, 1998

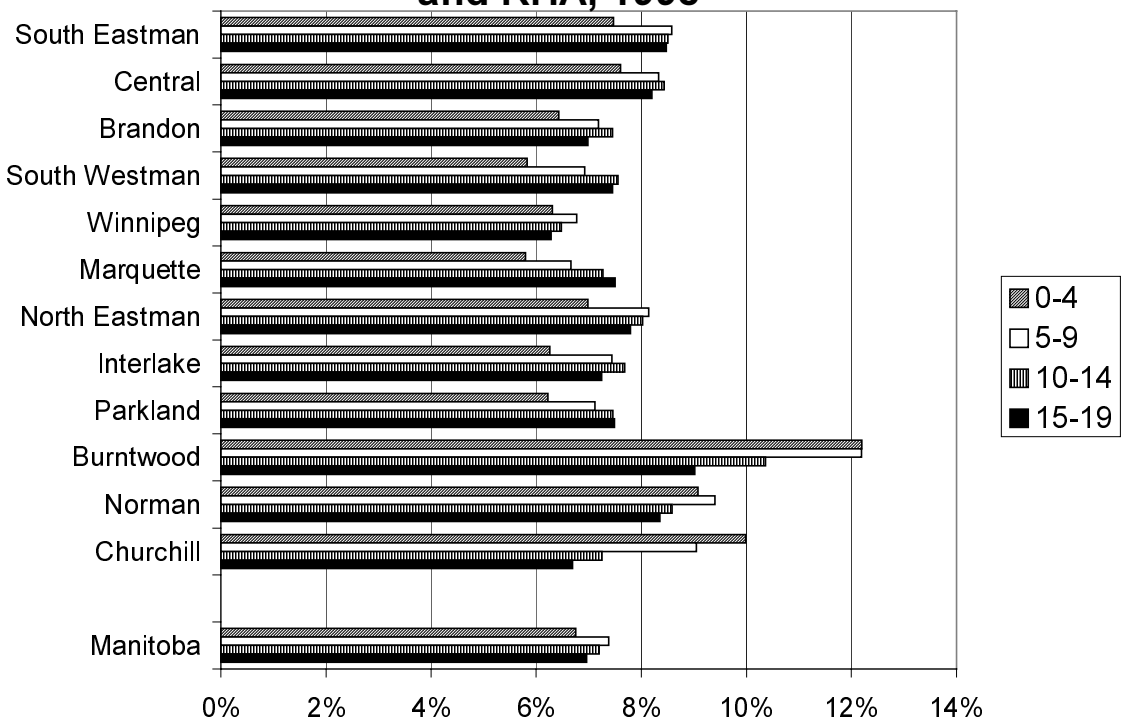
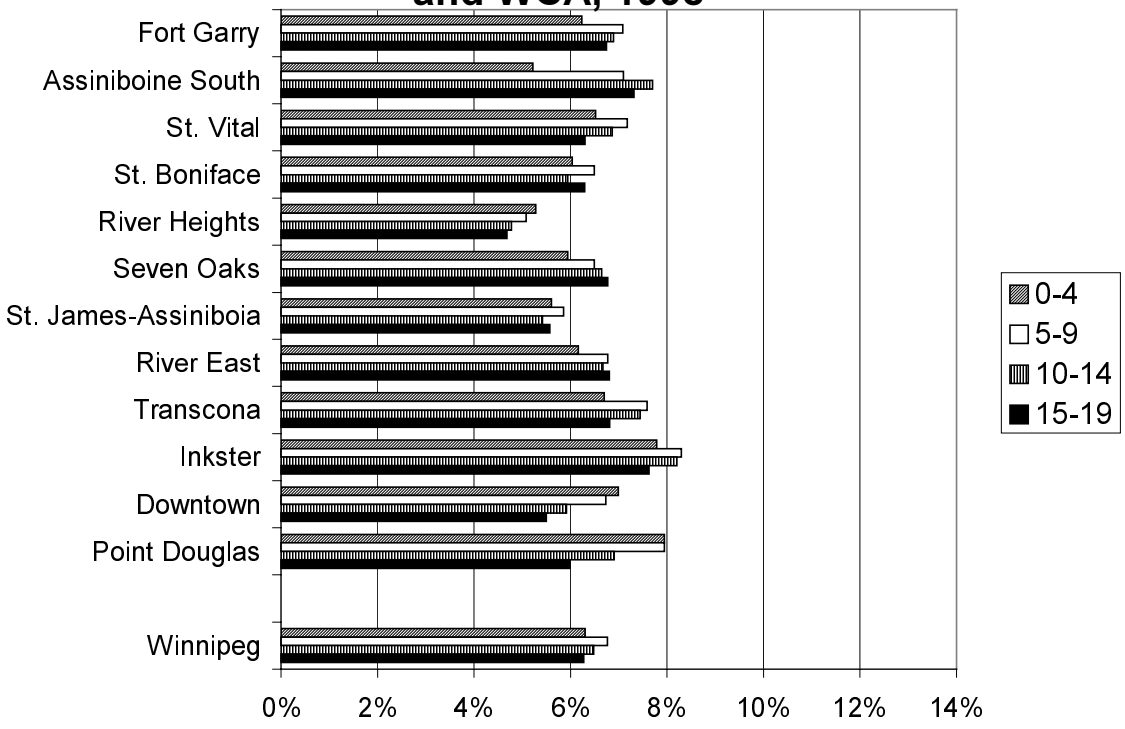


Figure 2.7: Population Distribution by Age and WCA, 1998



0-19 years old constituted 28% of the population, and 26% of Winnipeg residents.

It is interesting to note patterns in Figures 2.6 and 2.7 showing declining or increasing percentages of children by age bracket. For example, Marquette RHA has a declining percentage of young children, whereas Churchill RHA has an increasing percentage. In Winnipeg, Assiniboine South has a declining percentage of young children, but Point Douglas an increasing percentage.

To give planners a picture of birth rate, the "general fertility rate" calculates the number of births per 1000 women age 15 to 44 years old. Figures 2.8 and 2.9 show the fertility rate by region. The urban areas of Winnipeg and Brandon have lower fertility rates (54/1000) than the Manitoba average (59/1000), but the North has much higher rates (94/1000). Within Winnipeg sub-regions, Assiniboine South has a significantly lower general fertility rate (41/1000) than Winnipeg or Manitoba, and Point Douglas significantly higher (76/1000), at 1½ times the Winnipeg and Manitoba average.

Another useful measure for comparison is the "total fertility rate" (Young 1998: 30), interpreted as "the number of children who would be born to an average woman who experiences each of the age-specific fertility rates of a population in a given year as she progresses through her reproductive lifetime." For Manitoba, the total fertility rate from 1994-1998 was 1.77 children per woman, which was lower than that of the United States in the 1990s at 2.06. Canadian total fertility rate for 1997 was 1.5 children per woman (CCSD 1999: 10, 65).

Trends over time from 1994 to 1998 indicate a significant decline in fertility rate in Manitoba ($p<0.001$), but this mainly reflects the patterns in urban areas and in South Rural Manitoba ($p<0.001$). North Manitoba fertility rates have stayed relatively stable ($p=0.09$, NS). The annual number of live births in Manitoba has dropped by 2,000 over the short time period of 1994 to 1998, from 16,164 in 1994 to

Who is giving birth? National and provincial maternal age in 1997

According to the Canadian Council on Social Development (1999:10), the percent of births in 1997 to Canadian women in various age brackets was as follows:

- *11% to women less than 20 years old;*
- *58% to women ages 20-29 years old;*
- *31% to women age 30 and older.*

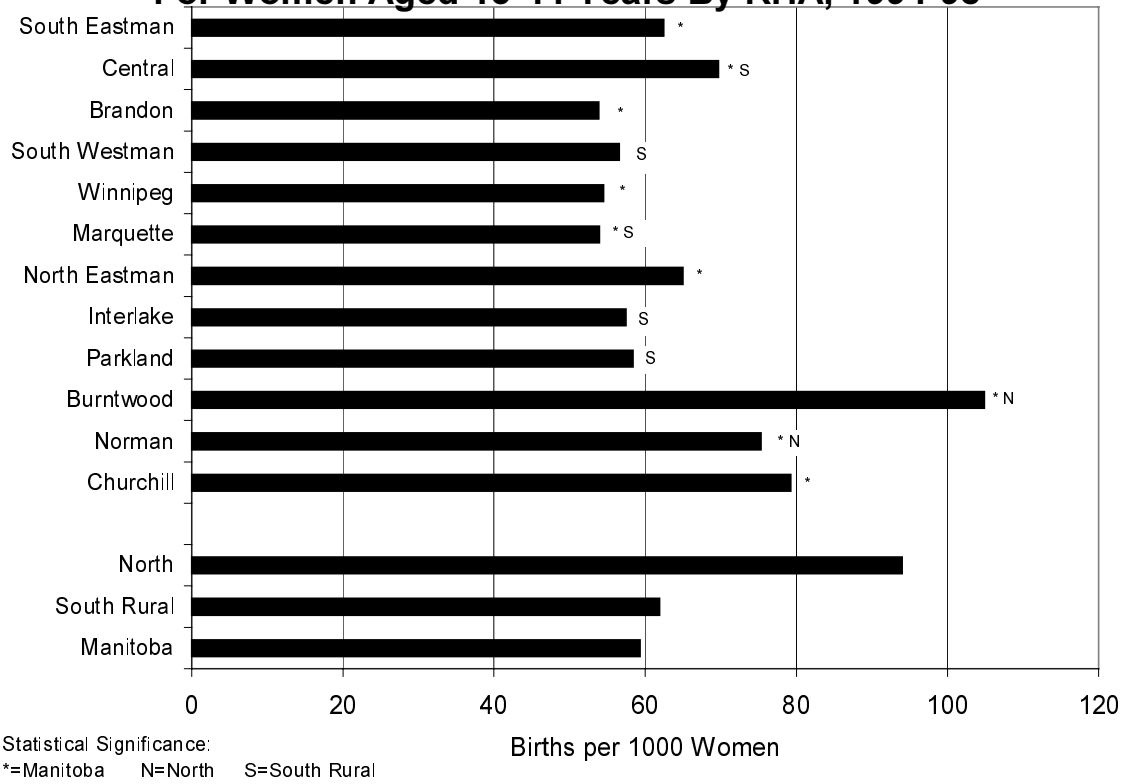
In contrast, there were more babies in Manitoba during 1997 being born to younger women:

- *18% to women less than 20 years old;*
- *55% to women 20 to 29 years old; and*
- *27% to women 30 years old or more.*

Total fertility rate

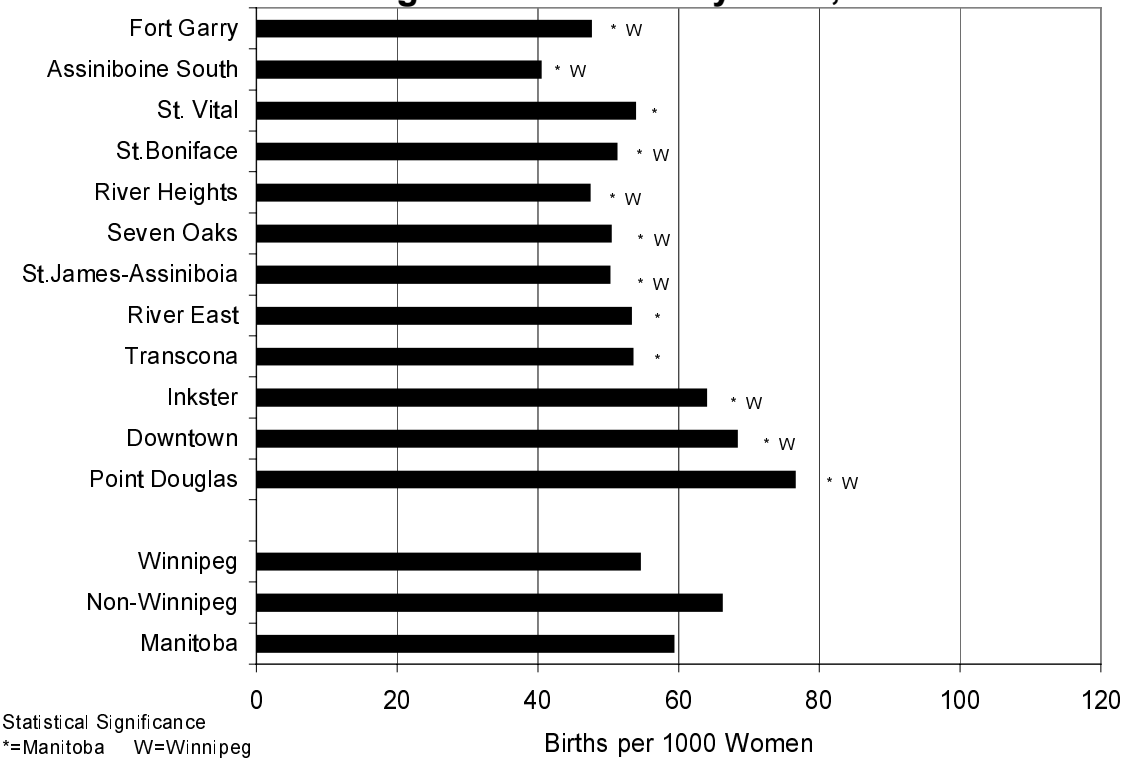
The total fertility rate (reflecting the children born to the "average woman" in her lifetime) varies tremendously at the RHA level, with Burntwood as the highest at 3.15 children per woman, and Marquette the lowest at 1.62. Within Winnipeg, Point Douglas is the highest (2.30), Assiniboine South the lowest (1.21).

Figure 2.8: General Fertility Rate For Women Aged 15-44 Years By RHA, 1994-98



Statistical Significance:
*=Manitoba N=North S=South Rural

Figure 2.9: General Fertility Rate For Women Aged 15-44 Years by WCA, 1994-98



Statistical Significance
*=Manitoba W=Winnipeg

14,143 in 1998. This also reflects the Canadian experience overall, where there was a reported 5% drop in the number of births reported from 1996 to 1997 (CCSD 1999: 10, 65), similar to the Manitoba drop from 1996-1997 of 5.3%. Interestingly, this was the largest drop in successive years from 1994-1998.

Manitoba actual number of live births 1994-1998, and trends

Actual numbers of live births within Manitoba for the years 1994 to 1998 were: 16,164; 15,833; 15,161; 14,361; and 14,143 respectively. General fertility rates (births/women aged 15 to 44 years) are declining in Manitoba, but not in northern RHAs. Drops in numbers of births from the previous year were: 2.1% (1994 to 1995), 4.2% (1995 to 1996), 5.3% (1996 to 1997) and 1.5% (1997 to 1998).

2.3 Mortality rates of children

This section will describe child mortality rates in Manitoba, including infant mortality (death before the age of 1 year), and mortality for children ages 1 to 19 years by four age groupings.

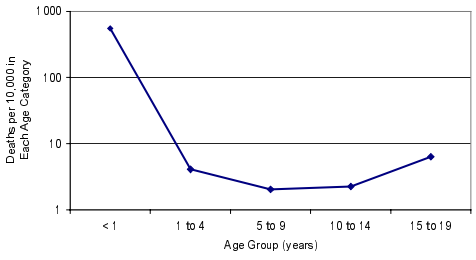
2.3.1 Infant mortality

Infant mortality rate (number of infant deaths under one year old per 1000 live births per year) is considered a useful indicator of the level of health within a community (Last 1988). This is further separated into neonatal (28 days and under) and post-neonatal (29 days to less than 1 year), the former being more sensitive to medical care and the latter to socioeconomic conditions as well as ongoing medical care (Starfield 1985). According to the Canadian Perinatal Surveillance System (Health Canada 1999), Sudden Infant Death Syndrome or "SIDS" was the leading cause of *post-neonatal* deaths at 26%, followed by birth defects at 23%, in 1996. The Manitoba data for 1994-1997 indicates that the leading causes of death for neonates was congenital anomalies (26%), followed by short gestational age/low birth weight (18%). For post-neonates, SIDS was the leading cause of death at 29%, followed by congenital anomalies at 14%. Respiratory, infectious, and parasitic diseases made up a total of 19% of the causes of death for post-neonates. See Figures 2.11 and 2.12 for pie chart diagrams showing causes of death.

Trends in infant and child mortality by age

When mortality rates are diagrammed by age group, the most common pattern to emerge in developed countries is a J-shaped graph (Young 1998: 32). This graph (Figure 2.10) shows just the bottom part of the "J", including only Manitoba infant and child mortality rates from 0-19 years. It uses a logarithmic scale due to the magnitude of infant mortality in relationship to the other age brackets.

Figure 2.10: Manitoba Child Mortality Including Infant Mortality, 1994-98



Over the past 35 years, Canada experienced the most dramatic decline in infant mortality for any of the developed countries, with the exception of Japan (Health Canada 1998). In 1995 Canada had the seventh lowest rate in the world, following Finland, Sweden, Japan, France, Switzerland and Denmark.

Figure 2.11: Causes of Mortality for Neonates (28 days or less) in Manitoba, 1994-97

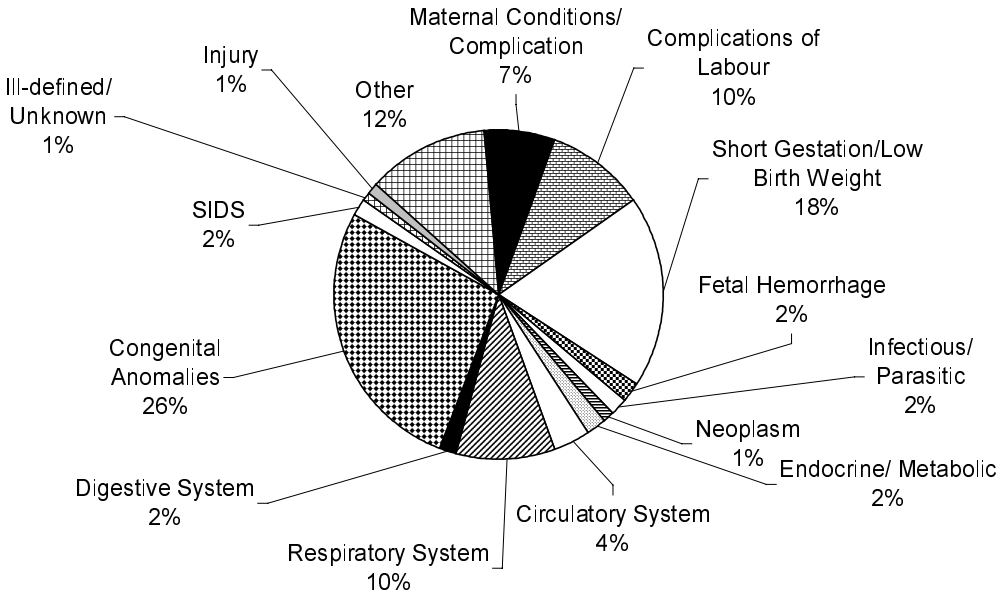
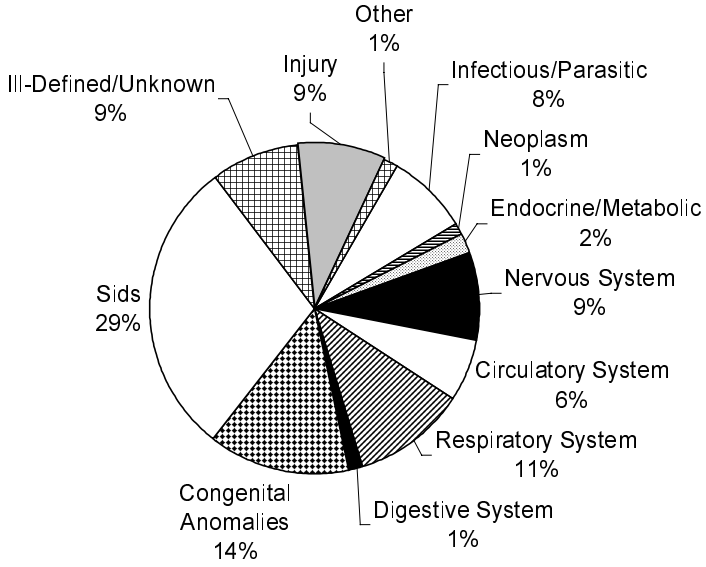


Figure 2.12: Causes of Mortality for Post-Neonates (29 days to less than 1 year) In Manitoba, 1994-97



Male infants world-wide exhibit a constant elevated infant mortality rate of about 1.3 times the female rate, despite declines for both genders.

In Figures 2.13 and 2.14, there are two infant mortality rates reported: (a) all infant deaths, and (b) rates including only infant deaths of babies weighing 500 g or more, or of 20 weeks or more gestational age. It is essential to take into consideration the bias introduced by inclusion of the <500g babies if one does not "adjust" the rate accordingly, since different regions, provinces, as well as countries may have very different proportions of <500g infants (Joseph and Kramer 1996). The Canadian Perinatal Surveillance System committee also recommends adjustment for birth weight, although it is sometimes difficult to obtain necessary data (Health Canada 1998). Using a crude rate, Manitoba had the 4th highest infant mortality rate in 1994, with Newfoundland, Saskatchewan and Alberta having higher rates. But excluding <500g infants, Manitoba ranked 7th highest, with Saskatchewan, Newfoundland, Prince Edward Island, Alberta, British Columbia, and Ontario all being higher.

Provincial infant mortality reports

Extensive reports of feto-infant mortality are produced by the Manitoba Health Epidemiology Unit Perinatal Project Team. These reports include a classification of mortality by weight and age at death, relating this to program areas of maternal health, maternal care, newborn care and infant care. Information from the Manitoba Perinatal Surveillance Report includes 1985-1996 data (March, 1999 report), and up to 1998 data in the most recent publication (2000).

For the years 1994-1998, the Manitoba infant mortality rate was 6.6/1000 (or 5.5/1000 excluding <500g birth weight infants), but rates varied by region from a low of 4.5/1000 (4.2/1000) in Brandon RHA to a high of 10.2/1000 (9.8/1000) in Burntwood. Since infant mortality is a relatively rare event, one would expect these rates to fluctuate widely. Figures 2.13 and 2.14 indicate that the only region with rates that are "statistically" different from the Manitoba rate is Burntwood. In comparison, the infant mortality rate for Canada in 1994 was 6.3/1000 live births, but excluding live-born infants less than 500g birth weight, the rate was 5.66/1000 (Joseph and Kramer 1996; Statistics Canada 1994, 1995 and 1997). Including all infant deaths, Canadian infant mortality rates experienced a drop in 1997 to around 5.5 (5.3/1000 in a report from Saskatchewan Health 2000; and 5.6/1000 in the report from CCSD 1999). This is substantially lower than the USA 1997 infant mortality rate of 7.2/1000 live births (Hoyert 1999).

Figure 2.13: Infant Mortality Rates for Children Aged < 1 Year at December 31 by RHA, 1994-98

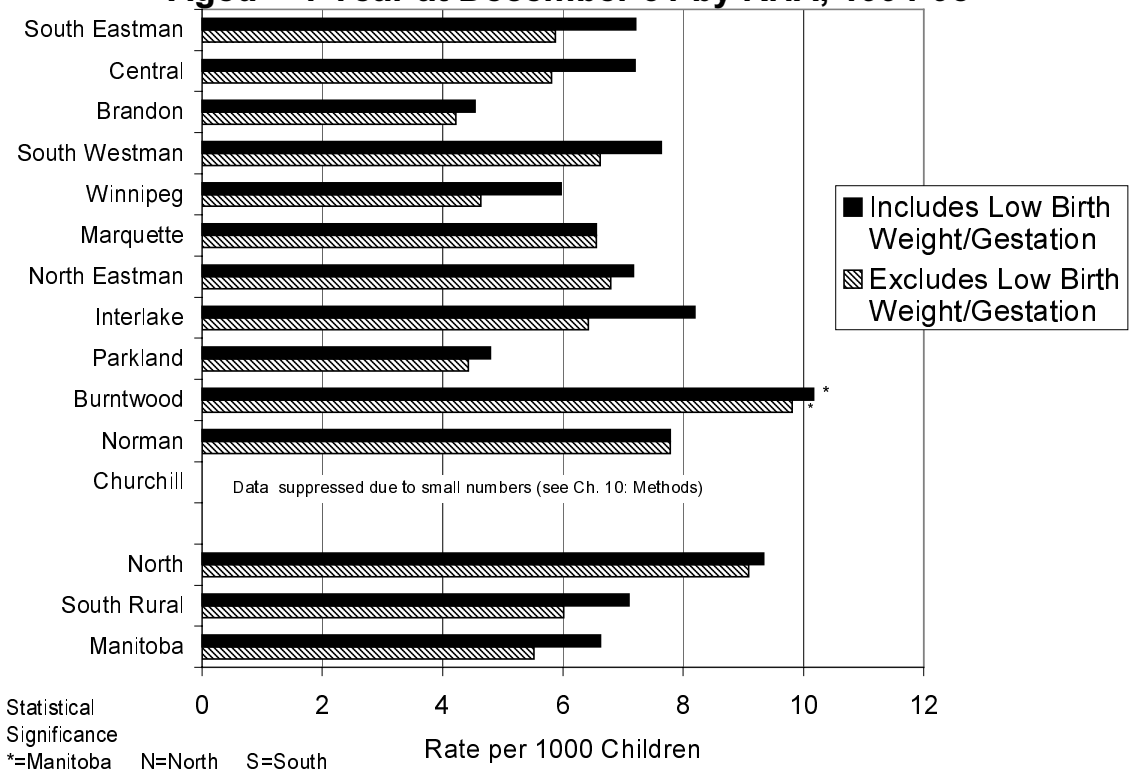
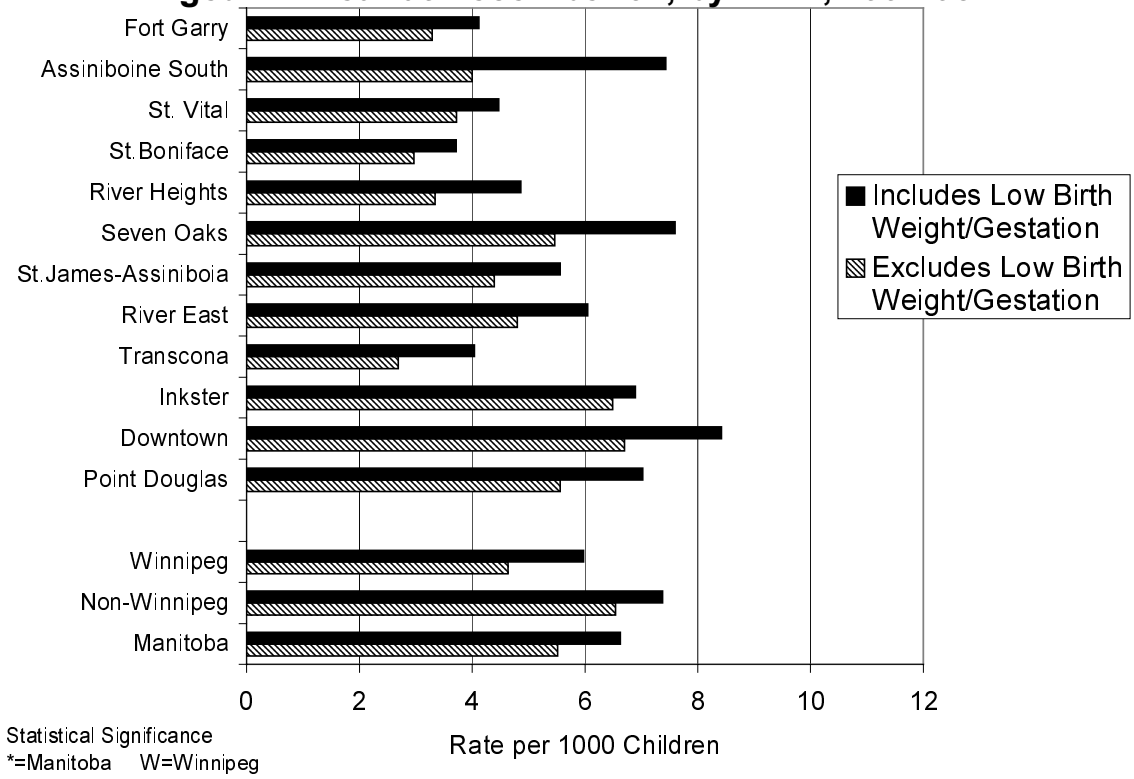


Figure 2.14: Infant Mortality Rates for Children Aged < 1 Year at December 31, by WCA, 1994-98



Over the past few decades, the key reasons for decreased infant mortality rates in developed countries have been (a) the improved rate of survival of low birth weight and preterm babies due to better resuscitation and care, and (b) an increase in genetic counselling and congenital anomalies screening. But recently introduced assisted reproductive technologies may actually have the effect of increasing infant mortality rates in the future, since multiple births increase the risk of premature or low birth weight infants (MMWR 1999).

Manitoba data from 1994-1998 demonstrates a strong gradient in infant mortality by income quintile, as seen in Figures 2.15 and 2.16 ($p<0.001$). There was *double* the infant mortality when comparing the lowest income quintile to the highest, both in urban (8.12/1000 vs. 4.15/1000 for all children – ratio 1.96, or 6.24/1000 vs. 2.72/1000 excluding <500g) and rural settings (10.18/1000 vs. 4.75/1000 – ratio 2.14, or 8.83 vs. 4.05). This is similar to Canada-wide urban area data, where a 1.7 ratio by income quintile was observed (Health Canada 1998). An article in Maclean's magazine (Nichols May 15, 2000: 52) states that the infant mortality rate in Canada's poorest neighbourhoods was 6.5/1000, compared to 3.9/1000 in more affluent neighbourhoods – these rates are similar to the Manitoba urban data, but are not reflecting the rural data. Data from the United States indicates steep gradients both by ethnicity and by maternal education, with "white" infants born to mothers with fewer than 12 years of education 2.4 times as likely to die as those born to mothers with 16 or more years of education (National Center for Health Statistics 1998).

Infant mortality by income quintile
Manitoba infant mortality for the lowest income quintile was double that in the highest income quintile, both in urban and rural regions. This income differential has also been observed for Canada-wide data (Health Canada 1998; Statistics Canada 1999), where urban infant mortality rates were 1.7 times higher in the lowest quintile compared to the highest quintile (7.5/1000 vs. 4.5/1000 for 1986-1991; and 6.5/1000 vs. 3.9/1000 for the year 1996).

Figure 2.15: Infant Mortality By Rural Income Quintile, 1994-98

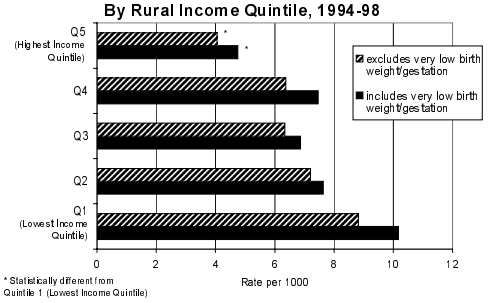
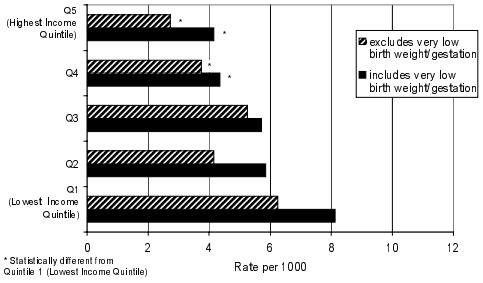


Figure 2.16: Infant Mortality By Urban Income Quintile, 1994-98



2.3.2 Child mortality

This section will examine child mortality rates for the four age groups of 1-4, 5-9, 10-14, and 15-19 year olds. One world-wide measure of mortality is the "under five" or "child death rate", which is the number of deaths for children aged 1 to 4 years in a given year per 1000 children in this age group. This "under five" mortality rate is considered a useful measure of the

Information on Manitoba stillbirth rates
For information on stillbirth rates, please refer to the Manitoba Perinatal Surveillance Report (1999, 2000) produced by the Manitoba Health Epidemiology Unit Perinatal Project Team.

"burden of preventable communicable diseases in the child population" (Last 1988).

Age-specific mortality for 1-19 year olds is presented in Figures 2.17 and 2.18 by age category, gender, and geographical location. Because child death is a rare event, child mortality rates for 1994-1998 are presented by larger geographical regions – North, South Rural, Winnipeg and Manitoba. The graphs indicate that in general Winnipeg has lower child mortality rates than the Manitoba average, especially for male children ages 5 to 19 years. A more extensive discussion of death rates to due injury is included in Chapter 6.

In contrast, northern Manitoba shows an elevated pattern of mortality for nearly all age categories, especially for children ages 1-9 years. Females living in northern Manitoba have double the Manitoba female mortality rate at age 5-9 years, almost triple the rate at ages 1-4 and 15-19 years, but about the same rate in the middle years of 10-14 years old. Northern Manitoba males have almost triple the Manitoba male mortality rate at ages 1-9, double the rate at ages 10-14, and 1.6 times the rate at ages 15-19 years old.

Northern Manitoba child mortality
Children living in the North region of Manitoba (Norman, Burntwood and Churchill RHAs) have elevated death rates compared to the Manitoba average. Comparison of children living in northern RHAs to the Manitoba average mortality rate for that age group:
Age <1 year: 1.7 times higher
Ages 1-4 years: 2.3 times higher
Ages 5-9 years: 2.2 times higher
Ages 10-14 years: 1.5 times higher
Ages 15-19 years: 1.9 times higher

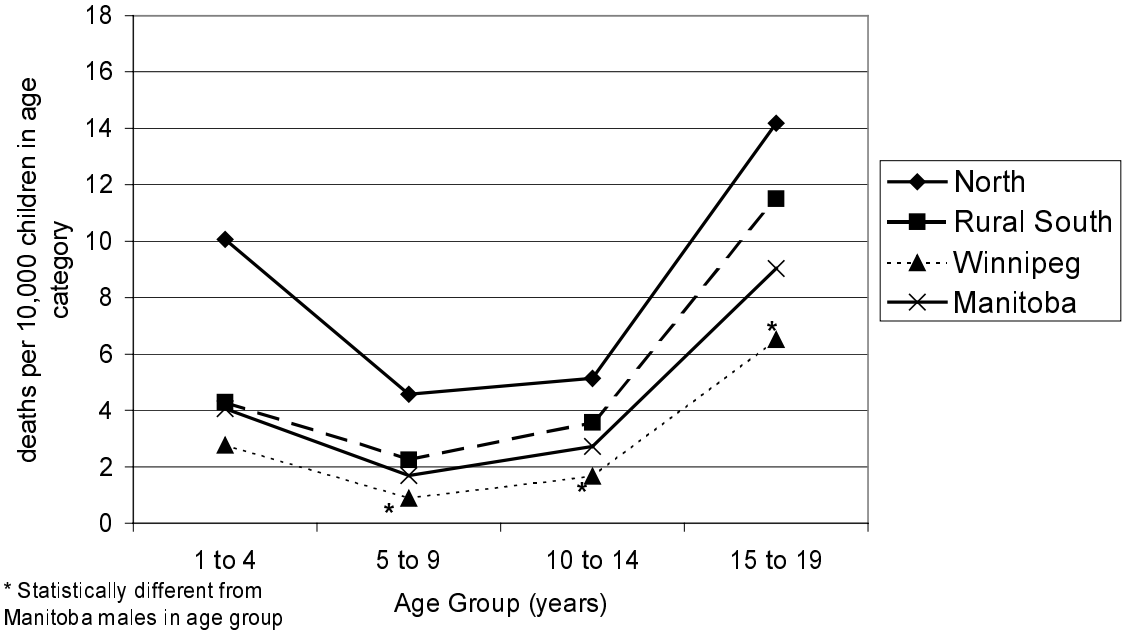
Children living in rural southern Manitoba tend to have slightly elevated mortality rates. For males ages 5-19 years old living in south rural areas, the rates are 26% to 47% higher than the average Manitoba male.

An article in The Winnipeg Sun newspaper (April 4, 2000) stated, "Child mortality is on the rise in Manitoba and motor vehicle accidents are the biggest culprit." Although child mortality is always a societal concern, the Manitoba child mortality rate from 1994-1998 does not show an increasing rate. There were no statistically significant changes in child mortality by age group (1-4, 5-9, 10-14 or 15-19 years old) or by gender within each age group for the years 1994-1998, using three-year average rates.

Trends in child mortality over time
Child mortality rates for ages 1-19 years inclusive:
1994-1996: 3.87 per 10,000
1995-1997: 3.86 per 10,000
1996-1998: 3.82 per 10,000
(no statistically significant trends)

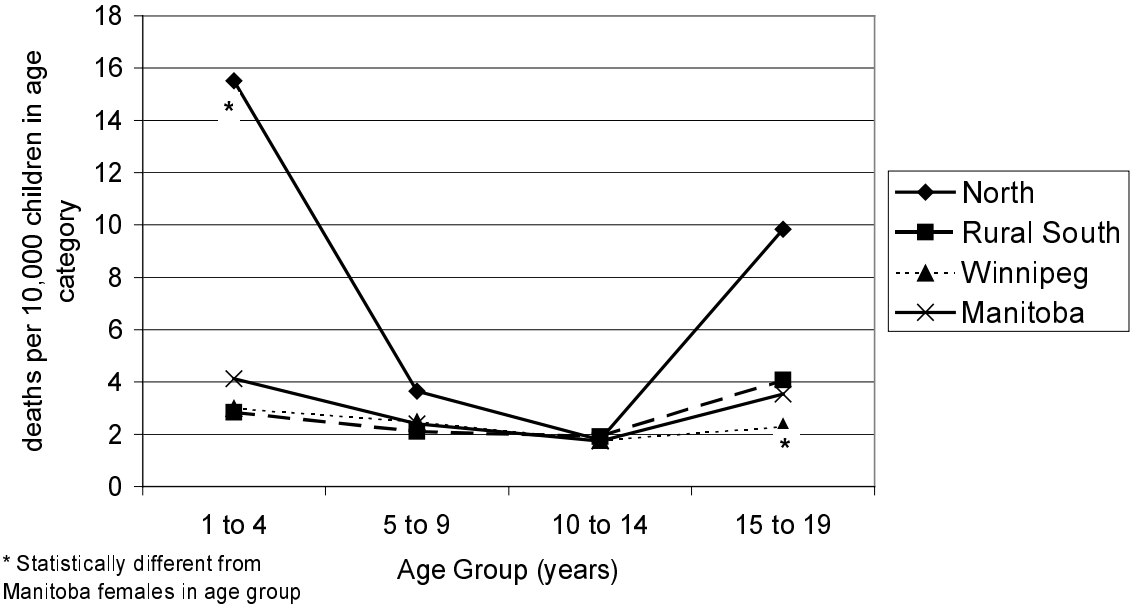
The causes of death vary by age grouping (see Figures Figure 2.19, 2.20, 2.21 and 2.22). But death due to injury is the leading cause for all age groups, ranging

Figure 2.17: Child Mortality Males 1994-98



* Statistically different from Manitoba males in age group

Figure 2.18: Child Mortality Females 1994-98



* Statistically different from Manitoba females in age group

Figure 2.19: Causes of Death, Manitoba Children Aged 1-4 Years, 1994-97

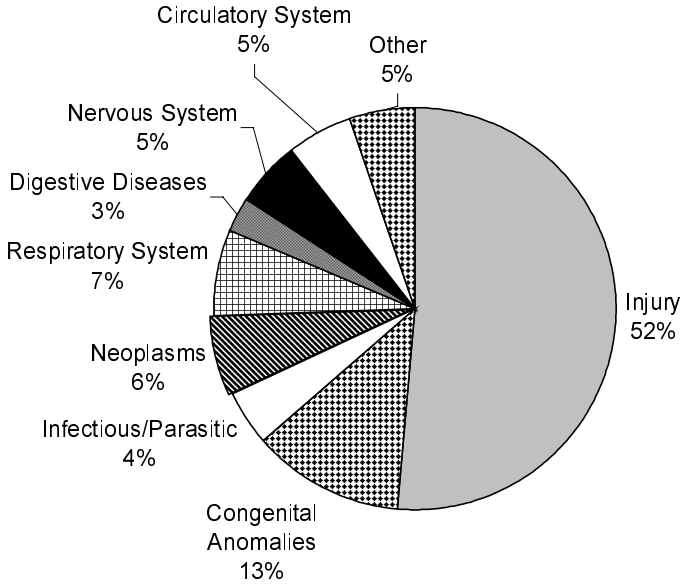


Figure 2.20: Causes of Death, Manitoba Children Aged 5-9 Years, 1994-97

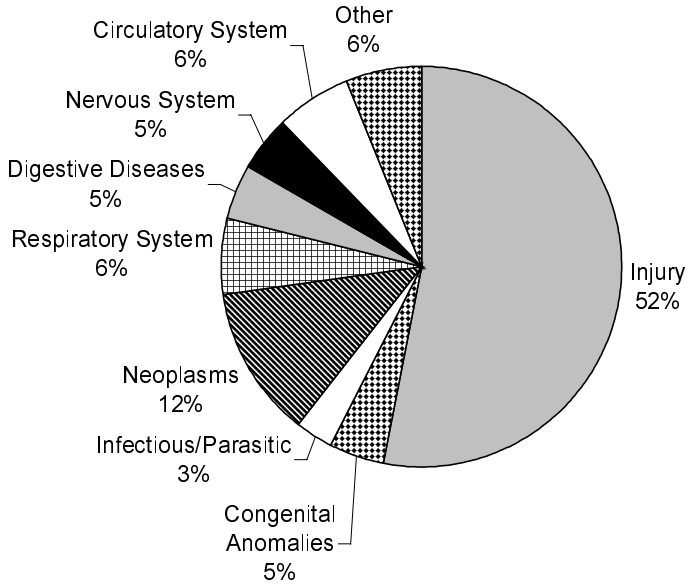


Figure 2.21: Causes of Death, Manitoba Children Aged 10-14 Years, 1994-97

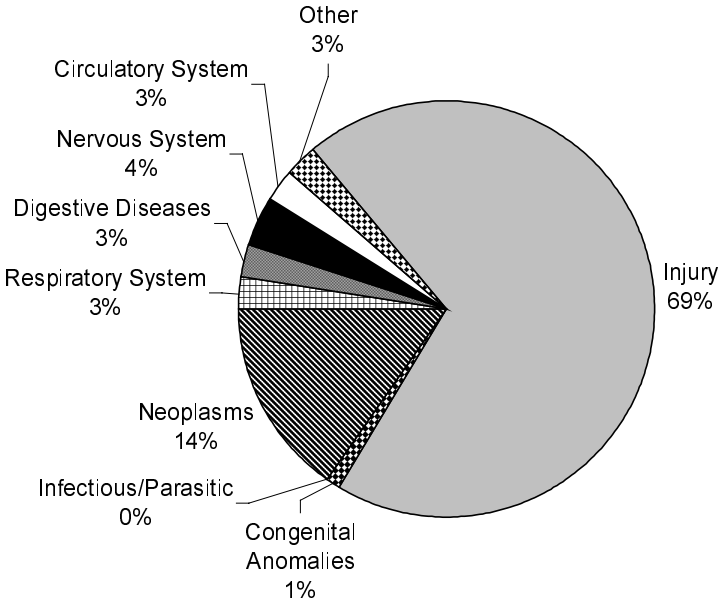
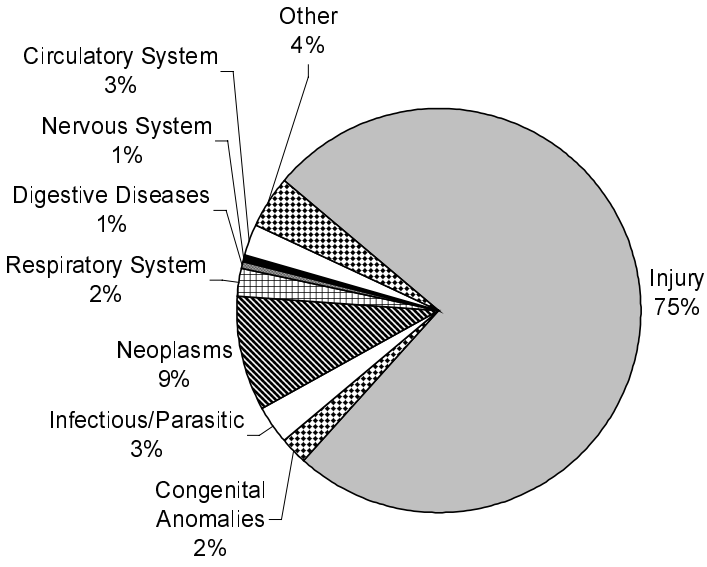


Figure 2.22: Causes of Death, Manitoba Children Aged 15-19 Years, 1994-97



from 52% for ages 1-9 years old, 69% for ages 10-14, and 75% for ages 15-19. Other leading causes include congenital anomalies and respiratory diseases for the youngest, and neoplasms for ages 5 to 19 years. These are similar to Canadian statistics which indicate that 41% of deaths for children ages 5-9 years, and 52% of deaths for children ages 10-14 years old are due to accidents, motor vehicle deaths, homicides and suicides (Nichols 2000), with cancer, nervous system disorders, and birth defects being other leading causes.

Cause of death ages 1-19 years
The leading cause of death in Manitoba for all age groups 1-19 years old is ***injury****, accounting for ½ to ¾ of all deaths and increasing with age.*

2.4 Correlations of demographic and vital statistic indicators with the healthiness of populations within a region

Correlations between the Premature Mortality Rate and the demographic/vital statistic indicators yield interesting information on the relationship of overall community health status and the need for health care with the health of a community's children. There are strong correlations (see Chapter 9) between PMR and many of the demographic indicators for the eleven rural Regional Health Authorities and 12 Winnipeg sub-regions. The less healthy a region or sub-region's population, the greater its fertility rate ($p<0.001$), infant mortality excluding the <500 g infants ($p<0.002$), and child mortality in the 1 to 4 year old ($p<0.001$), 10 to 14 year old ($p<0.002$) and 15-19 year old ($p<0.05$) category.

Premature Mortality Rate (PMR) and its association with demographic indicators
The "healthiness" of a region's population is also strongly and inversely correlated with most demographic, birth, and death rate indicators – fertility rates, infant mortality rates, child mortality rates. See Chapter 9 for correlation coefficients.

Key Points in this chapter

Demographics and fertility rates (Section 2.2)

- In 1998, children ages 0-19 years comprised 28% of the population of Manitoba. The number of live births in Manitoba dropped dramatically in five years, from 16,164 in 1994 to 14,143 in 1998 – especially in South Rural, Winnipeg and Brandon.
- The Manitoba fertility rate in 1994-1998 was 59 births per 1000 women aged 15-44 years. The urban areas of Winnipeg and Brandon were lower, at 54/1000; the North much higher at 94/1000. Burntwood RHA was the highest at 105/1000, and Marquette the lowest at 54/1000. Within Winnipeg, the lowest fertility rate was in

Assiniboine South with 41/1000, and the highest in Point Douglas at 76/1000.
- The number of children born to the average Manitoba woman during her lifetime was 1.77, compared to the Canadian average of 1.5. Burntwood RHA was the highest, at 3.15, and Marquette the lowest at 1.62.

Infant mortality (Section 2.3.1)
- Manitoba infant mortality rates from 1994-1998 were 6.6/1000 live births (or 5.5 excluding <500 g or <20 weeks gestation), from a low of 4.5 (4.2) in Brandon to a high of 10.2 (9.8) in Burntwood. Canadian rates were 6.3/1000 (5.7) in 1994.
- Infant mortality rates were double (2.14) for those residing in the lowest income quintile area compared to the highest income quintile. There was a trend of increasing infant mortality with decreasing income level.
- Main causes of death for neonates: 26% congenital anomalies, 18% short gestational age or low birth weight.
- Main causes of death for post-neonates: 29% SIDS, 14% congenital anomalies, and 19% a combination of respiratory, infectious and parasitic diseases.

Child mortality (Section 2.3.2)
- Children living in the North (Burntwood, Norman, Churchill) had an elevated child mortality rate compared to the Manitoba average, with the greatest differential for children ages 1-4 years (2.3 times higher) and 5-9 years (2.2 times higher).
- Males 5-19 years old in South Rural areas had a death rate 26% to 47% higher than the Manitoba average
- Overall Manitoba child mortality rates appear to be stable from 1994 to 1998
- The leading cause of death for children ages 1-19 years old was injury: ½ of the deaths for children ages 1-9, and ¾ of the deaths for children ages 10-19 years old.

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CHAPTER 3: BEING BORN IN MANITOBA: A LOOK AT PERINATAL HEALTH ISSUES

3.0 Introduction

"Being born in Manitoba" focuses on the health and health care use of women during pregnancy and delivery, and of infants in the early postpartum period. Issues within this chapter which address the need for, and use of, the health care system include:

- What proportion of infants are preterm, or of "at risk" (high/low) birth weight?
- What proportion of infants are breastfed, and for how long?
- What is the maternal length of stay in hospital?
- What is the hospital readmission rate in the first six weeks following hospital discharge, and causes of readmission, for newborns?
- How do women of Manitoba use prenatal care, and with what type of health care provider?
- What is the prevalence of prenatal risk factors in Manitoba, according to national surveys?

Related perinatal information in this and other reports

Fertility rates and infant mortality rates are found in Chapter 2: Demographics and Conceptual Framework.

Rates of Caesarean section delivery, and of VBAC (Vaginal Birth after Caesarean section delivery) are found in Chapter 8: Quality of Care issues.

Various perinatal indicators by RHAs and Winnipeg sub-regions are also available in reports produced by the Manitoba Health Epidemiology Unit Perinatal Project Team, called the Manitoba Perinatal Surveillance Reports (1999, 2000).

3.1 Preterm birth

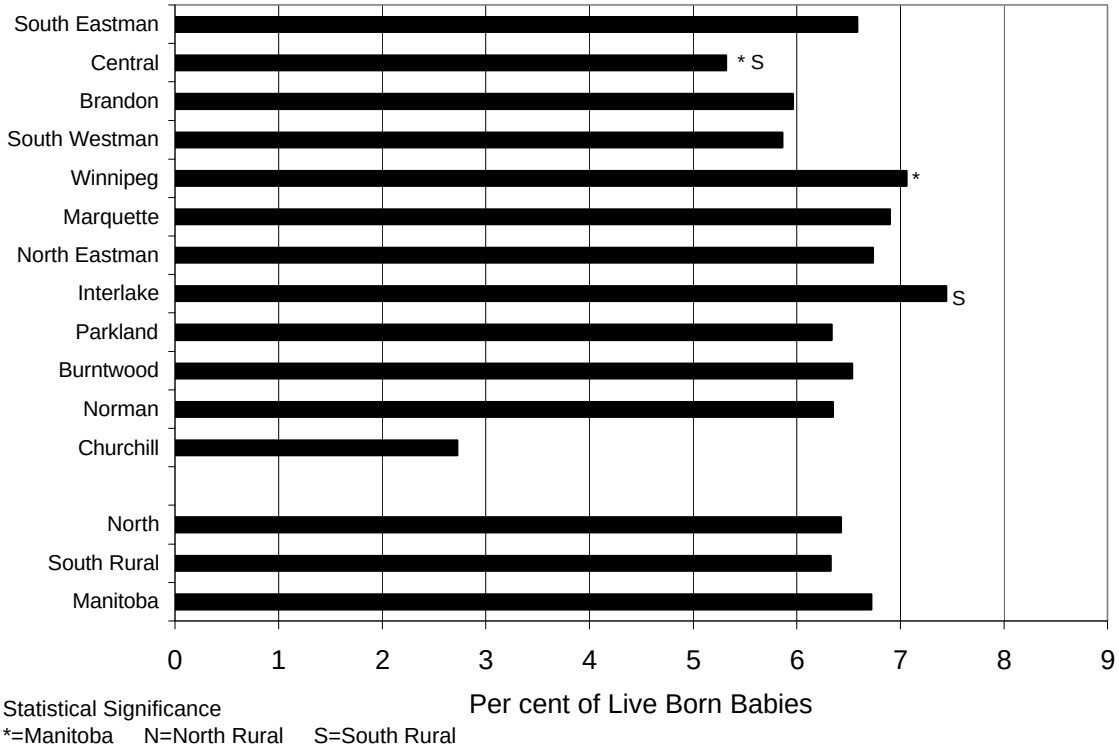
A live-born baby of gestational age less than 37 weeks is defined as being "preterm." For the years 1994-1998 in Manitoba, the overall preterm birth rate was 6.72%, or 67.2/1000 live births. Reports indicate that the overall Canadian preterm birth rate has increased – the Canadian Council on Social Development (1999) notes a rise from 6.6% to 7.1% from 1991 to 1996, and Joseph and Kramer (1999) note a similar rise from 6.25% in 1981-1983 to 6.81% in 1992 to 1994. The observed increases may be due in part to an increase in obstetrical intervention as well as an increase in multiple births, with a corresponding 25% increase in the likelihood of the infants being preterm (Joseph and Kramer 1999).

Manitoba Preterm Birth Rate

For the years 1994-1998, the overall preterm birth rate, defined as the number of live-born babies of less than 37 weeks gestation per 100 live born babies, was 6.72%.

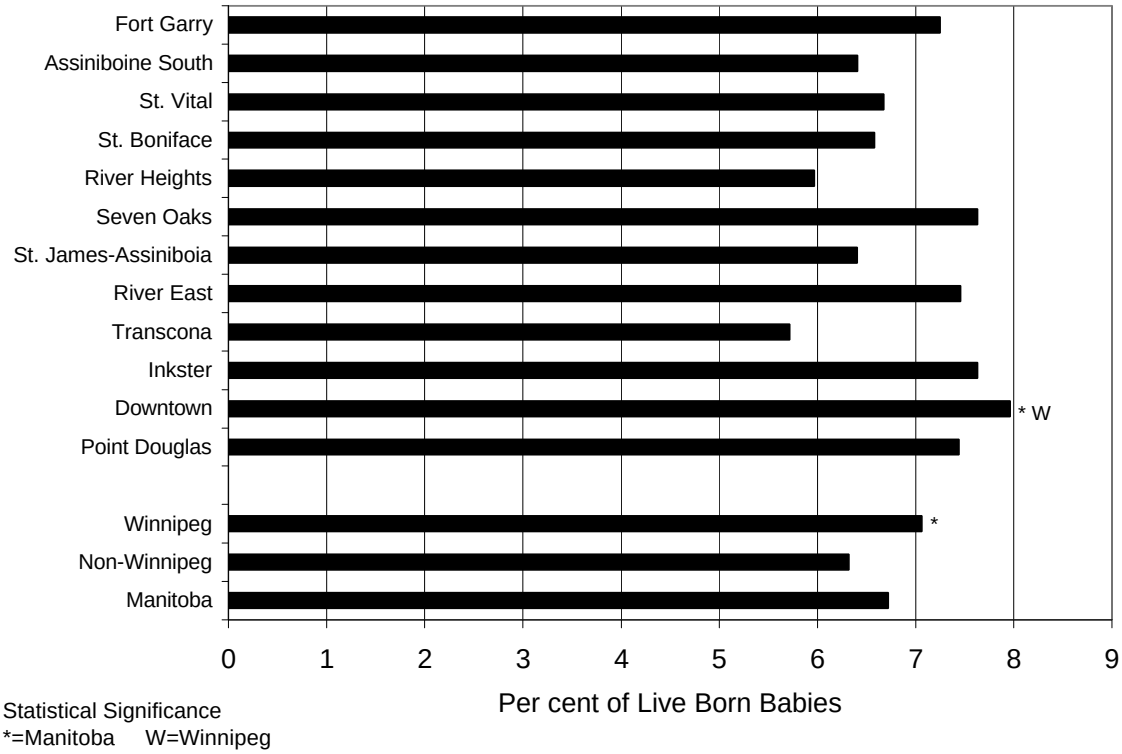
Figures 3.1 and 3.2 show preterm birth rates by Regional Health Authorities (RHAs) and by twelve sub-regions of Winnipeg. Recall that all graphs are

Figure 3.1: Preterm Birth Rate (less than 37 weeks) By RHA, 1994-98



Statistical Significance
*=Manitoba N=North Rural S=South Rural

Figure 3.2: Preterm Birth Rate (less than 37 weeks) By WCA, 1994-98



Statistical Significance
*=Manitoba W=Winnipeg

ordered by PMR or premature mortality rate, a population indicator of the healthiness of a group of people and their need for health care services (see discussion in Chapter 2 – Demographics and Conceptual Framework). Babies born to Winnipeg residents were more likely to be preterm, at 7.06% of all live births. This was higher than the Manitoba average (6.72%), Brandon (5.97%), the North (6.43%), and the South Rural (6.33%) areas. Central RHA (5.32%) showed a significantly lower preterm rate than any other region besides Churchill, whose rates could fluctuate widely due to small population size. In Winnipeg, the Downtown sub-region rate, with preterm births representing 7.96% of all births, was the highest in the entire province for 1994-1998.

Preterm birth rates by area

Winnipeg had the highest preterm birth rate compared to the North, Brandon, and the South Rural areas. The Downtown sub-region of Winnipeg had the highest rate in the province, at about 8% of all live-born babies.

Preterm births by gestational age

In Manitoba, there was a trend to increasing rates of preterm births over time, which is attributable to the increase in babies born at 34-36 weeks gestation. For extensive information on preterm births in Manitoba, refer to the Manitoba Perinatal Surveillance Reports (1999, 2000).

For a Canadian overview of preterm births, see the Canadian Perinatal Surveillance System Fact Sheets at www.hc-sc.gc.ca/hpb/lcdc/brch/factshts

3.2 "At risk" birth rates: Low and high birth weight babies

The World Health Organization considers the rate of low birth weight (less than 2,500 g) a key indicator when measuring progress towards attainment of overall population health. Low birth weight infants may be at greater risk for developmental problems, and tend to use high cost health services such as neonatal intensive care. However, high birth weight (greater than 4,000 g) may also be a concern due to increased probability of birth complications, and possible increases in adult health problems such as obesity and diabetes (Saskatchewan Health 2000).

Figures 3.3 and 3.4 compare the percent of "at risk" births by RHA and Winnipeg sub-regions. Please note that there may be small discrepancies between this report and Manitoba Health reports as to rates. Our analyses are based on the infant hospital discharge record and unusual birth weight records are excluded, whereas Manitoba Health uses a maternal/infant linked database to revise unusual birth weight records.

Manitoba "at risk" birth weight

The 1994-1998 Manitoba overall rate of babies born with "at risk" birth weights was about 20%, with 5% low birth weight (less than 2500 g) and 15% high birth weight (more than 4000 g).

The term, "at-risk birth weight", refers to the percentage of all live births with both low and high birth weights. The 1994-1998 Manitoba overall rate of babies born with "at-risk" birth weights was

Figure 3.3: "At Risk" (High/Low) Birth Weight By RHA, 1994-98

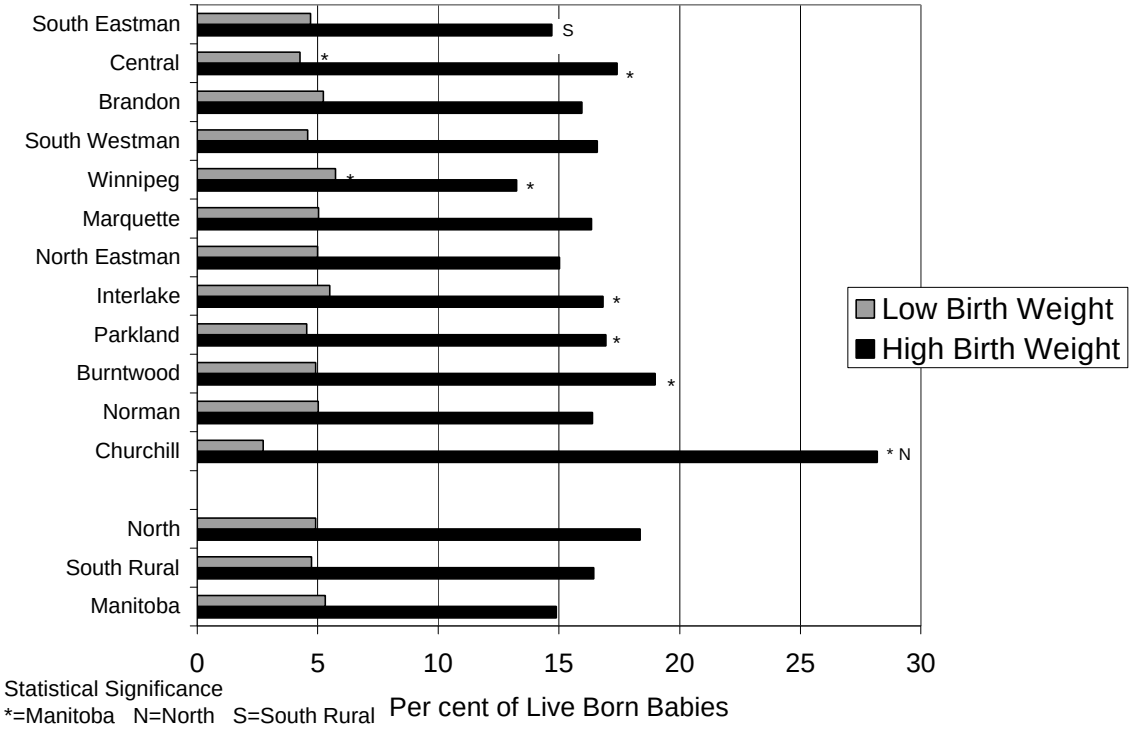
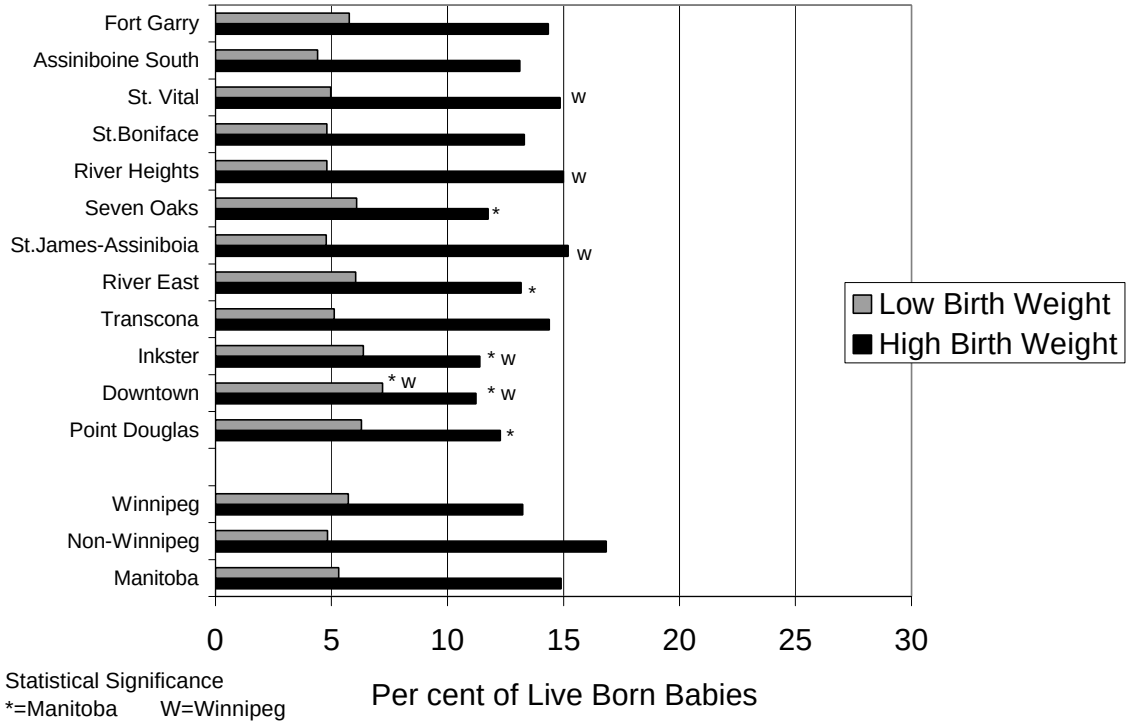


Figure 3.4: "At Risk" (High/Low) Birth Weight By WCA, 1994-98



20.2%, with 5.3% low birth weight and 14.9% high birth weight. So of the 20% "at-risk" birth weights, 74% were in the high birth weight category. This percentage has been reasonably consistent in Manitoba – the *Manitoba Perinatal Surveillance Report* (Manitoba Health 1999) reported about 20% of births being "at-risk" from 1985 to 1996. In comparison, Saskatchewan reports 18% in 1997, of which 72% were high birth weights.

For low birth weight in 1994-1998, both North (4.91%) and South Rural (4.75%) areas had lower rates than Manitoba at 5.31%. Winnipeg was the only RHA with a significantly higher rate at 5.73%, compared to the Manitoba average. Within Winnipeg, the Downtown sub-region had elevated low birth weight rates at 7.19%, the highest in the province. According to Statistics Canada, Manitoba's rate in 1996 (5.5%) was lower than the Canadian average of 5.9%, (Vital Statistics Compendium 1996), with Newfoundland and Alberta having the greatest rates at 6.1%, and New Brunswick and Saskatchewan the least at 5.1% and 5.0% respectively.

Low birth weight rate trends by income indicate decreasing rates by increasing income group ($p<0.05$), both in the rural and urban regions of Manitoba, as illustrated in Figures 3.5 and 3.6. Comparing the lowest (Q1) income group to the highest (Q5), the relative risk of having a low birth weight baby was 1.19 for rural areas, and 1.39 for urban areas. In other words, women in the lowest income group were 20% more likely (5.3% versus 4.4%) to have a low birth weight baby in rural Manitoba, and 40% more likely (6.89% versus 4.92%) in urban Manitoba. So the differential risk, as well as the absolute risk, was not as great in the rural areas of Manitoba, where women even in the lowest income group had low birth weight rates equivalent to the provincial average (5.3%).

High birth weight is defined as a birth weight greater than 4000 g. Figures 3.3 and 3.4 illustrate the fact that both the North (18.4%) and South Rural (16.4%) regions had greater high birth weight rates than the Manitoba provincial average of 14.9%, with

Manitoba low birth weight babies

For 1994-1998, Winnipeg's low birth weight rate was 5.7% of all live-born babies. This was higher than the Manitoba average of 5.3%. The Downtown sub-region of Winnipeg had the highest rate of low birth weight babies at 7.2%.

Trends of low birth weight by income quintile in Manitoba, 1994-1998

Figure 3.5: Low Birth Weight By Rural Income Quintile, 1994-98

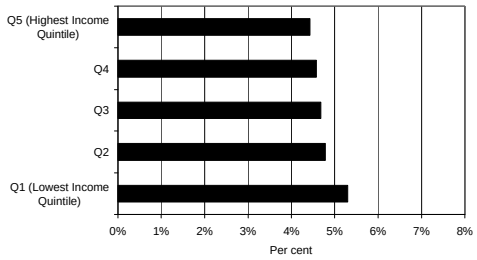
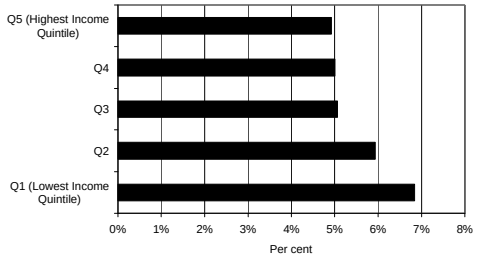


Figure 3.6: Low Birth Weight By Urban Income Quintile, 1994-98



Winnipeg having the lowest rate at 13.3%. Within Winnipeg, all sub-regions had rates similar to or lower than the provincial average, and much lower than either the North or South Rural rates.

Some researchers prefer the less inclusive definition of high birth weight as being greater than 4,500 g. Tables 3.1 and 3.2 give the percentages of infants born with birth weights of very low (<1500 g), low (1500 to <2500 g), intermediate (2500 to 4000 g), high (>4000 g to 4500 g) and very high (>4500 g), both by RHA and by Winnipeg sub-region. Most children (79.8% in Manitoba, 81.0% in Winnipeg, 76.7% in North, and 78.8% in South Rural) were in the intermediate category of birth weight. The percentage of very high birth weight (>4,500g) was 2.5% for the province, and 2.1% for Winnipeg with very little difference by sub-region. Both the North (3.5%) and South Rural (2.8%) regions had elevated rates of very high birth weight babies.

The trend of high birth weight rates ($p<0.01$) by income quintile is consistent with those of low birth rates for *rural* areas, with the women in the lowest income group 1.19 times, or 19% more likely (18.9% versus 15.9%), to have a high birth weight baby. (See Figures 3.7 and 3.8.) However, the trend is opposite in the *urban* areas, with the greatest high birth weight rates in the highest Q5 income group (14.8% versus 12.1%), for a Q1 to Q5 ratio of 0.82.

High birth weight rates in Manitoba, 1994-1998

14.9% of all live-born babies in Manitoba were high birth weight (>4000g), and 2.5% had very high birth weight (>4500g). North and South Rural regions had elevated high birth weight rates compared to Winnipeg and the overall Manitoba average.

Trends of high birth weight by income quintile, 1994-1998

Figure 3.7: High Birth Weight By Rural Income Quintile, 1994-98

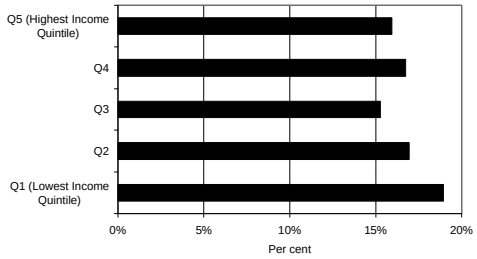
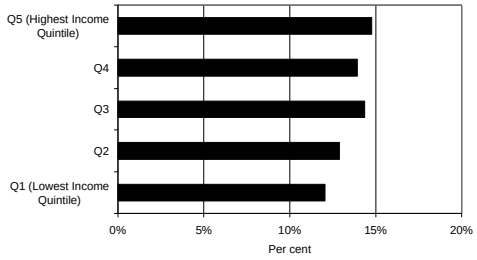


Figure 3.8: High Birth Weight By Urban Income Quintile, 1994-98



3.3 Prenatal care issues, risk factors during pregnancy

This section reports data from the two national surveys – the National Longitudinal Study of Children and Youth (NLSCY) and the National Population Health Survey (NPHS). Please refer to the Methodology section in Chapter 10, where important information on the design and limitations of these studies is included. One major limitation is the exclusion from the study sample of First Nations persons living "on reserve".

Survey data from NLSCY and NPHS indicate almost

Table 3.1: Birth Weight Distribution by WCA, 1994-98

Per cent of births by birth weight

Winnipeg Community Area	<1500 g	1500-<2500 g	2500-4000 g	4000-<4500 g	>4500 g
Fort Garry	1.28	4.48	79.89	12.21	2.14
Assiniboine South	1.21	3.21	82.46	10.89	2.24
St. Vital	0.63	4.34	80.18	12.46	2.39
St. Boniface	0.90	3.91	81.87	10.72	2.59
River Heights	0.80	4.01	80.20	12.79	2.20
Seven Oaks	1.15	4.93	82.17	10.20	1.55
St. James-Assiniboia	0.87	3.91	80.01	13.05	2.16
River East	1.22	4.83	80.76	11.12	2.07
Transcona	1.20	3.92	80.50	12.31	2.07
Inkster	1.20	5.19	82.20	8.96	2.45
Downtown	1.38	5.81	81.58	9.26	1.97
Point Douglas	0.74	5.55	81.44	10.14	2.14
Winnipeg	1.06	4.67	81.02	11.12	2.14
Non-Winnipeg	0.97	3.86	78.33	13.90	2.94
Manitoba	1.02	4.30	79.78	12.40	2.51

Table 3.2: Birth Weight Distribution by RHA, 1994-98

Per cent of births by birth weight

Regional Health Authority	<1500 g	1500-<2500 g	2500-4000 g	4000<-4500 g	>4500 g
South Eastman	1.17	3.53	80.59	12.12	2.59
Central	1.19	3.08	78.32	14.39	3.02
Brandon	1.07	4.16	78.82	13.37	2.58
South Westman	0.91	3.68	78.83	13.17	3.41
Winnipeg	1.06	4.67	81.02	11.12	2.14
Marquette	0.83	4.21	78.61	13.55	2.80
North Eastman	1.01	3.99	79.98	13.17	1.86
Interlake	1.18	4.31	77.68	13.92	2.91
Parkland	0.49	4.05	78.52	14.08	2.86
Burntwood	0.87	4.04	76.08	15.25	3.75
Norman	0.36	4.66	78.58	13.58	2.82
Churchill	0	2.73	69.09	24.55	3.64
North	0.71	4.2	76.69	14.91	3.49
South Rural	1.04	3.71	78.81	13.64	2.81
Manitoba	1.02	4.3	79.78	12.4	2.51

universal prenatal care in Manitoba. Less than 1% of women in the 1996 NPHS and NLSCY surveys reported receiving "no prenatal care" (0.8% of the 180 NLSCY respondents; 0.5% of the 336 NPHS respondents). Respondents indicated that the vast majority of prenatal care was from a physician (97% in NLSCY). But this varied slightly by region, as reported in the 1996 NPHS survey. In Winnipeg, Brandon and South Rural areas, about 3% of women reported receiving a combination of physician/midwife care, with less than 1% reporting only using a midwife. But in the North, a much higher percentage of women used a combination of physician and midwife for prenatal care: 85% used physicians only and 13% a combination of physician and midwife. There was no option of "nurse", so "midwives" presumably included nurse practitioners.

NLSCY and NPHS survey questions
The exact wording of questions used in the analyses of this report are found in the Glossary section.

Women in the 1996 NLSCY survey answered questions about risk factors during pregnancy, and a question on the maternal-rated health of their child at birth. (See Table 3.3 and Figures 3.9, 3.10, 3.11.) The majority (18.4%) of the 20% who reported smoking during pregnancy also reported this as occurring "throughout pregnancy". There was an elevated risk of smoking for low income persons (38% low income versus 16% middle/high income), lone parents (45% lone parent versus 18% dual parent families) but similar rates for rural and urban women (22% versus 20%).

Smoking during pregnancy: NLSCY 1996 survey and the Manitoba Health Postpartum Referral Forms 1997-1998
About 20% of Manitoba respondents in the NLSCY survey reported smoking during pregnancy, and the majority smoked throughout the pregnancy. High-risk groups for smoking during pregnancy included: low-income, lone parents, and rural women.

The Manitoba Health Postpartum Referral Forms indicate a higher overall smoking rate during pregnancy at 28%. Smoking rates vary by RHA from a low of 17% in South Westman to a high of 56% in Burntwood. Differences between this data and the NLSCY survey may be due to missing NLSCY information due to exclusion of First Nations communities from the national survey.

Table 3.3: Per cent of Manitoba Women Reporting Prenatal Risk Factors (NLSCY 1996 Survey)
(NOTE: need to add in the confidence limits here)

Risk Factor (maternal report)	NLSCY 1996 (per cent of respondents)
Pregnancy diabetes	3%
No prenatal care	1%
Smoked during pregnancy	20%
Consumed alcohol during pregnancy	12%
One or more prenatal problems	32%
Rated child health at birth as fair or poor	6%

Analyses of the Manitoba Health Postpartum Referral Form data for the years 1997 and 1998 (see Table 3.4 below) indicate the need for smoking cessation programs for pregnant women. In Manitoba, 28% of women were smoking during pregnancy. In the urban

Figure 3.9: NLSCY 1996 Prenatal Risk Factors By Rural versus Urban

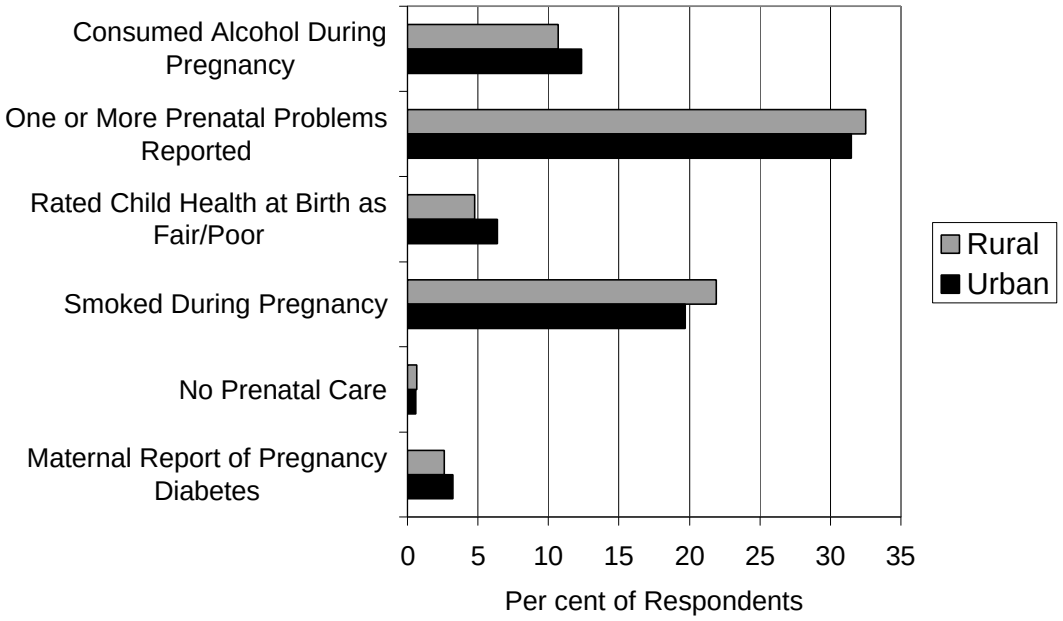


Figure 3.10: NLSCY 1996 Prenatal Risk Factors By Lone Parent Status

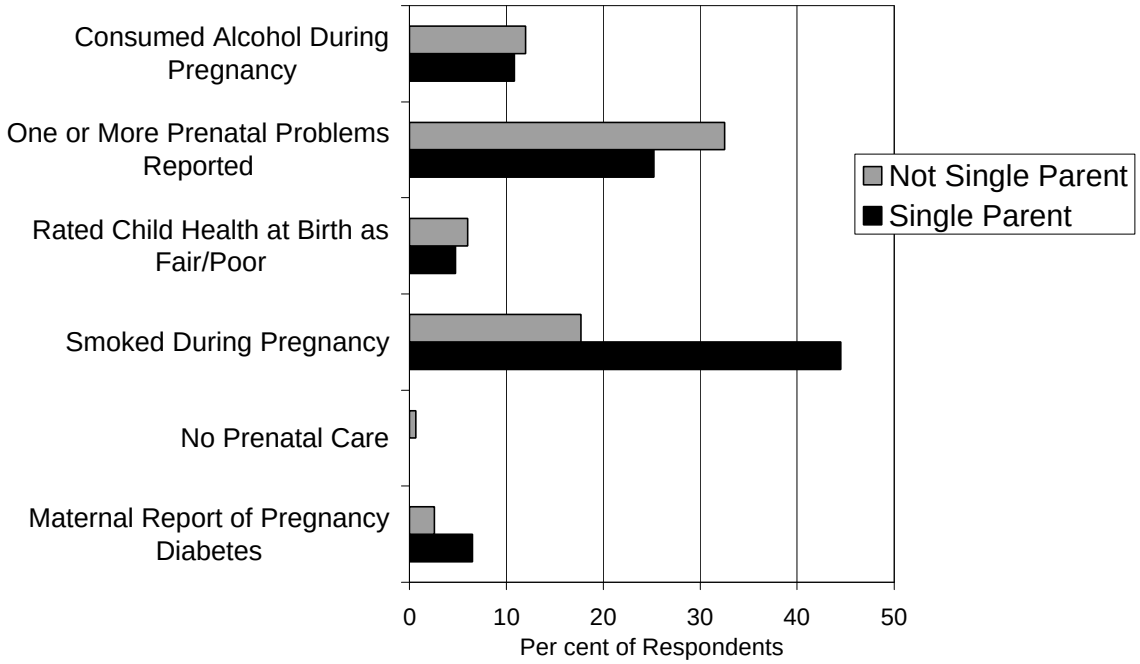
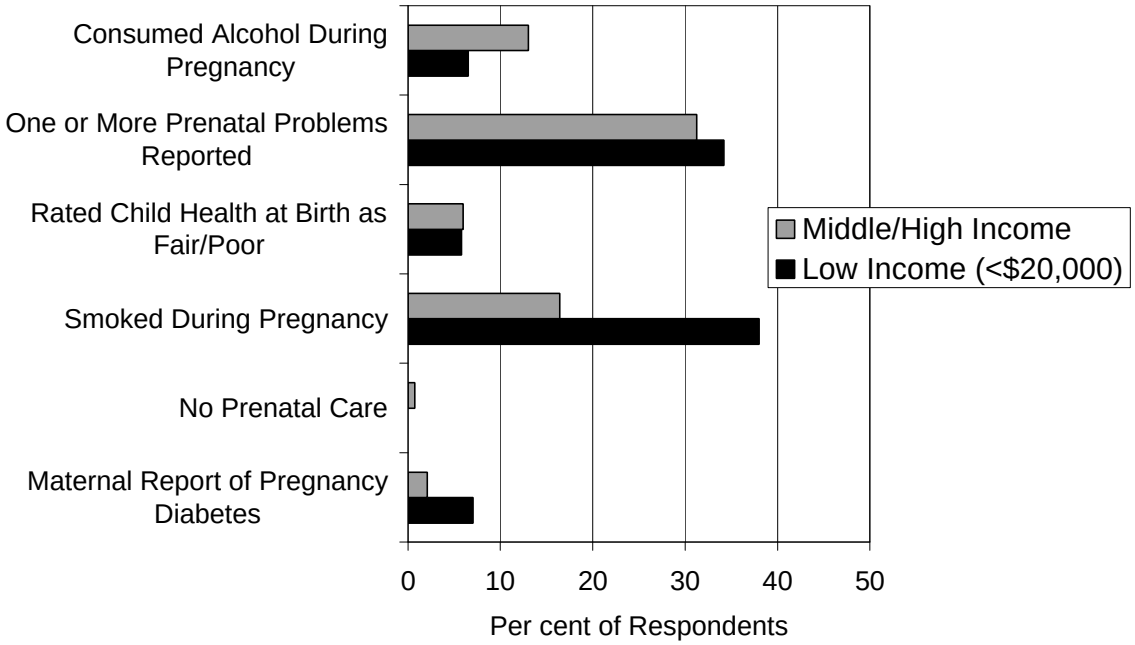


Figure 3.11: NLSCY 1996 Prenatal Risk Factors By Income Level



centres of Winnipeg and Brandon, about ¼ of the women smoked during pregnancy, and the rates were slightly lower (about ⅕ of the women) in regions south of these urban centres. In mid-Manitoba RHAs, smoking rates were higher at about ? of women smoking, and almost ½ of the women in northern RHAs smoked during pregnancy.

Table 3.4: Per cent of Manitoba Women Reporting Smoking During Pregnancy (Manitoba Health Postpartum Referral Forms 1997 and 1998)

Regional Health Authority	Sample size (number of postpartum forms)	Per cent reporting smoking during pregnancy (%)	Per cent unknown (%)
South Eastman	1190	18.1%	4.0%
Central	2230	21.7%	2.3%
Brandon	1035	27.5%	1.8%
South Westman	622	17.2%	2.6%
Winnipeg	12,797	24.7%	2.0%
Marquette	581	28.6%	2.8%
North Eastman	659	32.3%	2.0%
Interlake	1,399	31.0%	2.3%
Parkland	780	36.8%	2.8%
Burntwood	1,558	55.6%	1.4%
Norman	651	40.7%	15.1%
Churchill	30	46.7%	0.0%
Manitoba overall	25,425	28.1%	2.8%

Note: 1,893 Postpartum Referral Forms did not have an area of residence, so the RHA total is lower than the Manitoba overall total.

Source: Manitoba Health Community Health Assessment Unit

Consumption of alcohol during pregnancy is also a concern, with 12% of Manitoba respondents reporting "yes" (4% of women reported drinking alcohol *throughout* the pregnancy). Only 6.5% of the low income, compared to 13% of the middle/high (>$20,000) income group, reported consuming alcohol at some time during pregnancy. Urban and rural women report similar rates of alcohol consumption in 1996 – 12.3% urban and 10.7% rural. About equal proportion of lone parents (11%) and dual parent families (12%) reported drinking some time in pregnancy. Manitoba data somewhat corresponds to overall Canadian data, where older, higher income and married women reported more drinking during pregnancy (Canadian Perinatal Surveillance System 2000).

3.4 Use of acute care facilities for birth

The average length of stay in hospital for women

giving birth was calculated for the fiscal years 1994/95 to 1998/99, using total length of stay for a hospitalization associated with a birth (live-born or stillborn) per maternal birth record. We have presented two results per region – the "crude" and the "adjusted" length of stay. Knowing that the maternal age may influence the length of stay, the data by RHA region and Winnipeg sub-region was adjusted to the maternal age distribution in 1996.

It is important to note a limitation of the data on maternal length of stay. There is no recorded time of admission or discharge, other than the date. So if a woman were admitted/discharged at any time of a certain day, the record would only indicate the day and not the specific time. So in a sense, the "length of stay" could be interpreted as the number of overnight stays rather than entire days. As a check for the validity of this data, the Manitoba Health Community Health Assessment Unit (Lorraine Dacombe Dewar and Shoostari Shahin) provided information from Manitoba Health Postpartum Referral Forms of 1997 (n=13,794) and 1998 (n=11,631), which represented about 76% of the known births for these two years. On the Postpartum Referral Form, there is an actual time of birth and an actual time of maternal discharge from hospital, so the number of hours from birth to maternal discharge could be calculated. For vaginal deliveries, the mean time was 60.44 hours (2.5 days). Our reported Manitoba average was 2.74 days, so the difference of about 6 hours would be the in-hospital labour time prior to birth, which seems intuitively valid. Similarly, the mean Caesarean section time from birth to maternal discharge was 103 hours, or 4.29 days. Our maternal length of stay was 5.33 days, which means that the time from admission to birth would be about one day, not unlikely in situations of prolonged labour resulting in Caesarean birth.

Figures 3.12 and 3.13 illustrate the differences for lengths of stay associated with vaginal births. For vaginal deliveries in 1994-1998, the age-adjusted Manitoba average maternal length of stay was 2.74 days, including labour, delivery and postpartum. In comparison, Winnipeg residents stayed in hospital

Alcohol consumption during pregnancy: NLSCY 1996 survey

12% of Manitoba respondents to the NLSCY 1996 survey reported consuming alcohol during pregnancy. At the national level, 17% (NLSCY) to 25% (NPHS) of Canadian women in 1994/95 reported drinking at some point during pregnancy (Canadian Perinatal Surveillance System Fact Sheet on Alcohol and Pregnancy, Health Canada 2000)

According to the Canadian Perinatal Surveillance System Fact Sheet on Alcohol and Pregnancy (Health Canada 2000), the incidence of Fetal Alcohol Syndrome is estimated at 0 to 4 per 1000 live births in industrial countries. But for those reporting heavy drinking (2 or more drinks per day, 5-6 drinks per occasion), the incidence of FAS is estimated at 43 per 1000 live births. Health Canada recommends that pregnant women or women wishing to become pregnant abstain from drinking alcohol.

Figure 3.12: Average Maternal Length of Stay (days)
For Vaginal Birth by RHA , 1994/95-1998/99

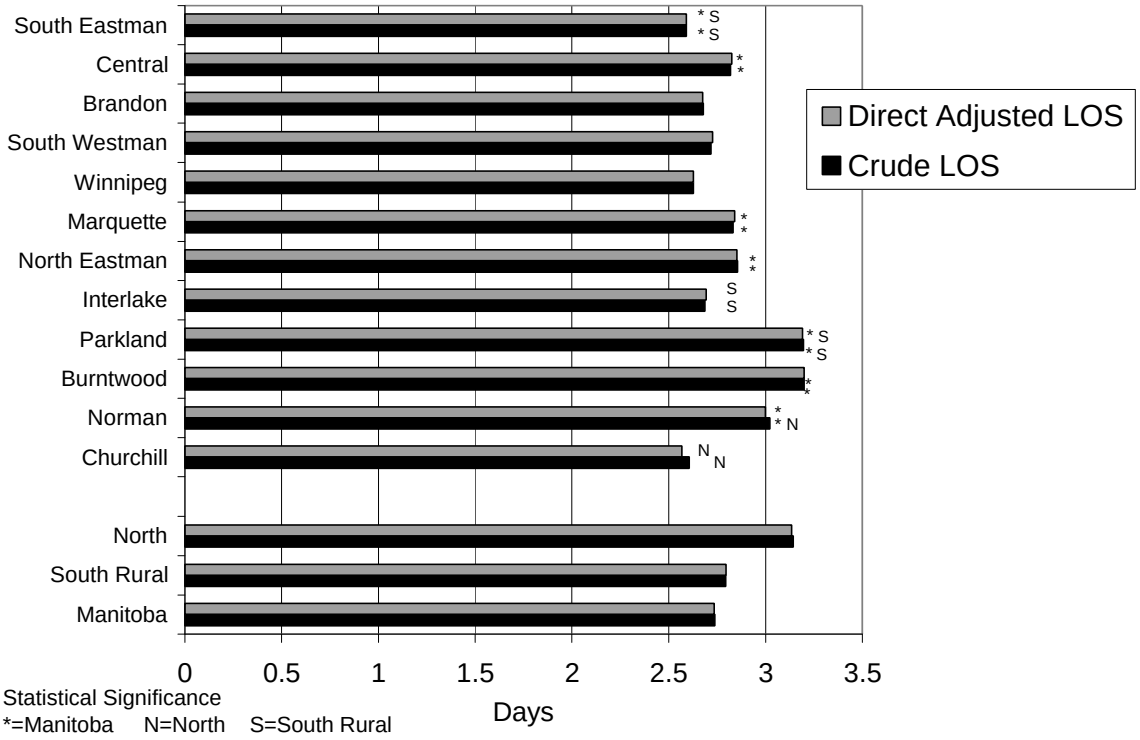
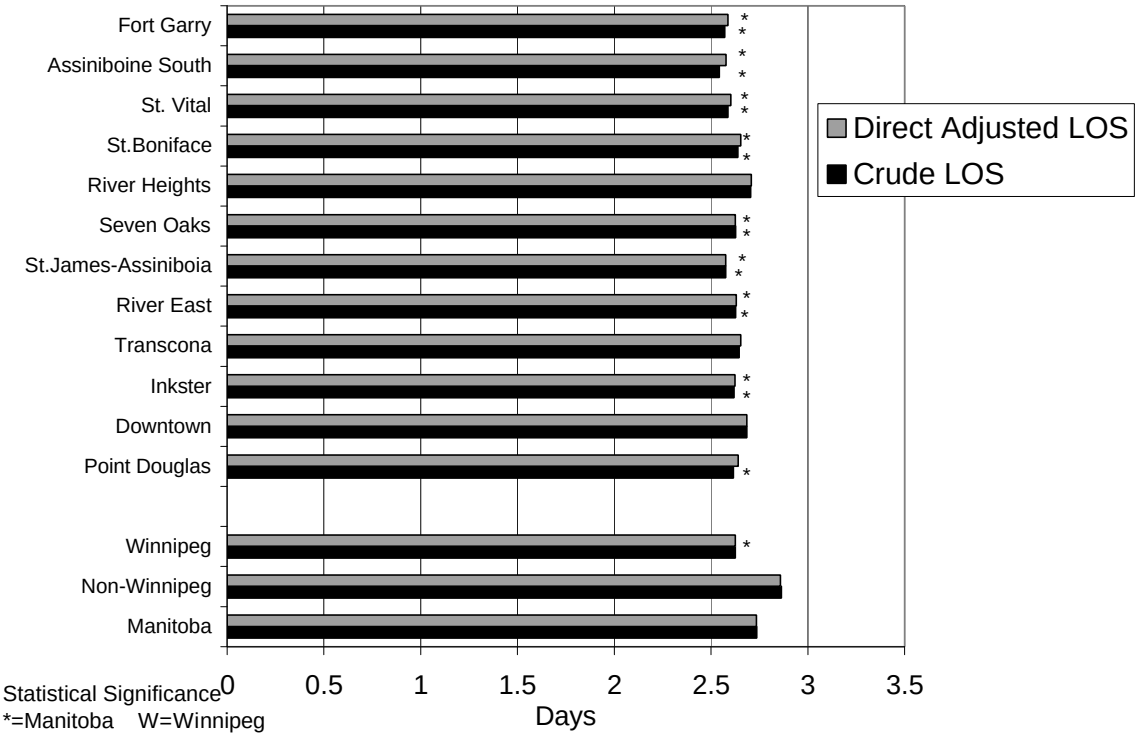


Figure 3.13: Average Maternal Length of Stay (days)
For Vaginal Birth by WCA, 1994/95-1998/99



2.63 days, South Rural residents had slightly longer lengths of stay at 2.80 days, and Northern women had the longest lengths of stay at 3.14 days. These are given as crude rates as well as *adjusted rates* which make the comparisons fairer by adjusting the age distribution of the residents to reflect that of all Manitoba women giving birth in the year 1996. The Winnipeg sub-regions had extremely similar maternal lengths of stay, with the vast majority being statistically lower than the provincial rate. In South Rural Manitoba, South Eastman RHA women have lower lengths of stay (average 2.59 days), reflecting Winnipeg patterns (2.63 days). RHAs of higher Premature Mortality Rate (PMR) have longer lengths of stay, possibly indicating cases of slightly higher intensity or cases where the location of birth is far from the area of residence. But there was no such association evident in Winnipeg sub-regions. (Note: for a discussion of the use of PMR as a healthiness indicator, see Chapter 2: Demographics and Conceptual Framework).

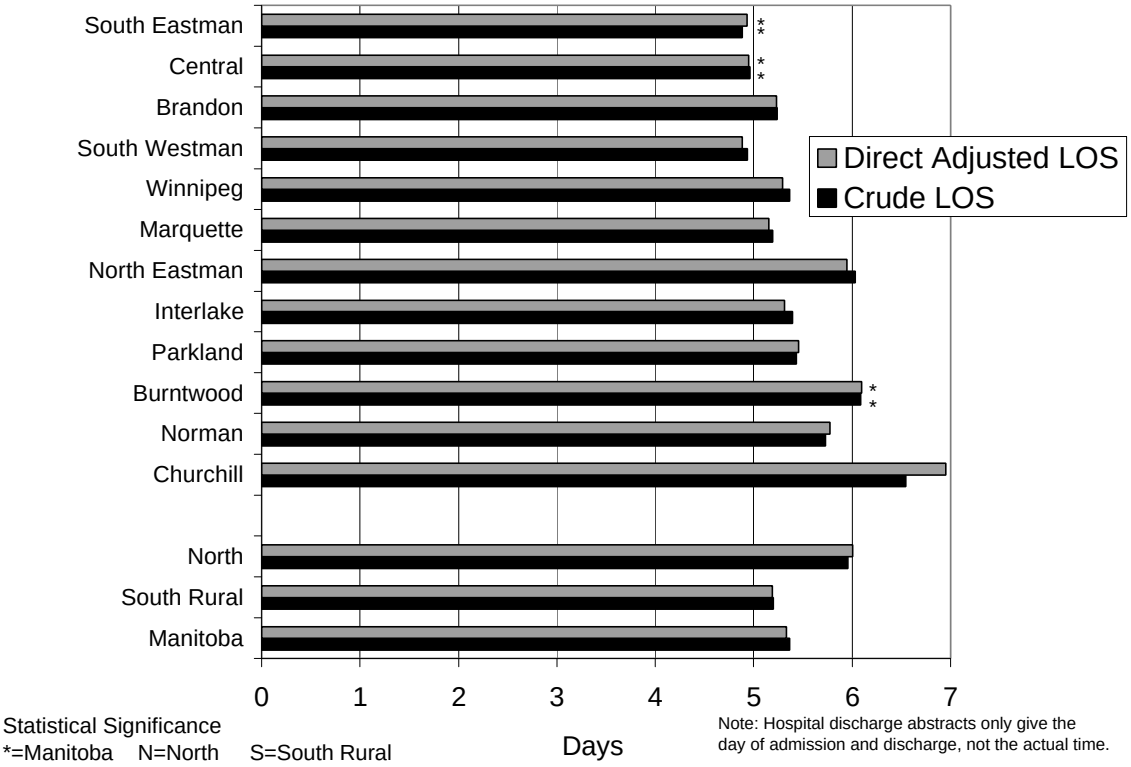
Average adjusted maternal length of stay 1994/95 to 1998/99

The Manitoba average age-adjusted maternal length of stay for a vaginal delivery was 2.7 days, with Winnipeg at 2.6, South Rural at 2.8, and North residents at 3.1 days. Note the limitation of this data – any portion of a day is calculated as "one day", since only the day, and not the actual time of admission and discharge, is available.

Figures 3.14 and 3.15 illustrate the differences in maternal lengths of stay by region for Caesarean section births. As one would expect, this was decidedly longer than for vaginal deliveries, with the Manitoba adjusted average length of stay for Caesarean at 5.33 days. This was similar for South Rural (5.19 days) and Winnipeg (5.29 days), but women from Northern RHAs experienced a longer length of stay (6.00 days). RHAs reflected a slight pattern of increasing length of stay with increasing PMR (Premature Mortality Rate), but there was no evidence of an association within Winnipeg's sub-regions. Two Winnipeg sub-region "anomalies" seem to be Assiniboine South (4.76 days) and Transcona (4.74 days), where residents stayed significantly shorter lengths of time after Caesarean section births than either the Winnipeg or Manitoba average.

Over the five-year fiscal years 1994/95 to 1998/99, there was a statistically significant trend to decreasing length of stay (Cochran Armitage trend test, $p<0.001$) both for vaginal and Caesarean section delivery.

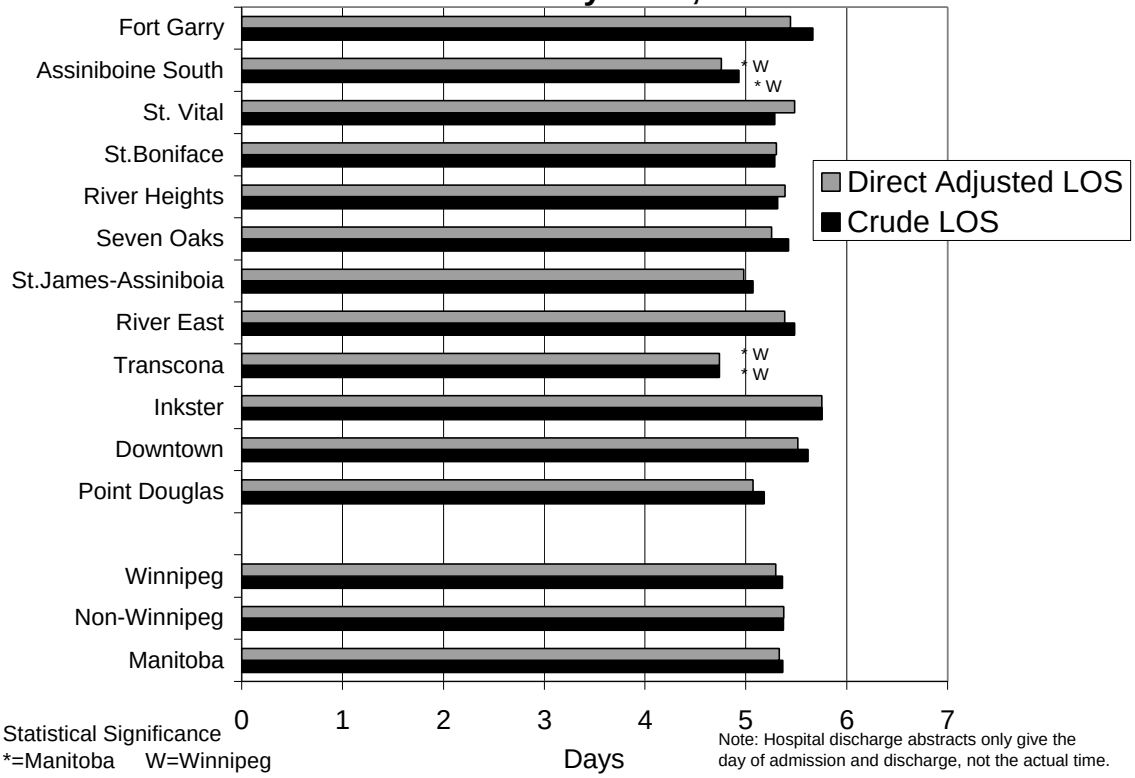
Figure 3.14: Average Maternal Length of Stay (days) for Caesarean Section Birth by RHA, 1994/95-1998/99



Statistical Significance
*=Manitoba N=North S=South Rural

Note: Hospital discharge abstracts only give the day of admission and discharge, not the actual time.

Figure 3.15: Average Maternal Length of Stay (days) for Caesarean Section Birth by WCA, 1994/95-1998/99



Statistical Significance
*=Manitoba W=Winnipeg

Note: Hospital discharge abstracts only give the day of admission and discharge, not the actual time.

Maternal age was associated with trends in length of stay ($p<0.00001$), as illustrated in Figures 3.16 and 3.17. For vaginal deliveries, the youngest and oldest women stayed about 3 days, compared to the Manitoba average of 2.7 days. For Caesarean section births, the youngest women (19 years old or less) stayed the least time (about 5.2 days), whereas the women 40 years or older stay almost 7 days, substantially longer than the Manitoba average of 5.33 days.

Figure 3.16: Average Maternal Length of Stay (days) For Vaginal Births by Maternal Age Group 1994/95 to 1998/99

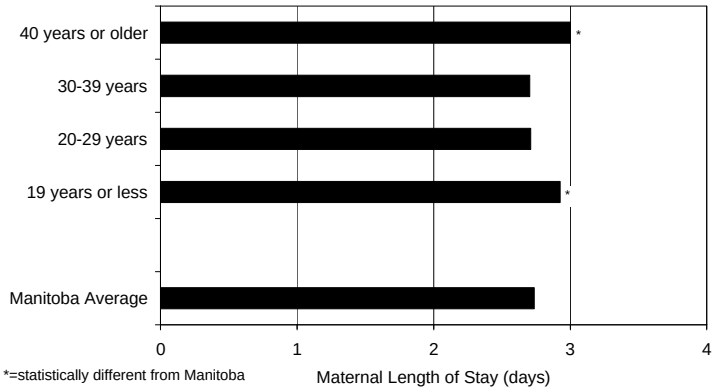
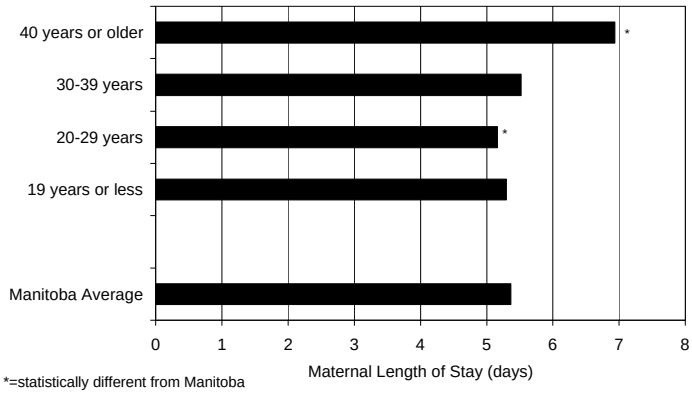


Figure 3.17: Average Maternal Length of Stay (days) For Caesarean Section Births By Maternal Age Group, 1994/95 to 1998/99



Trends in Manitoba maternal length of stay, over time 1994/95 to 1998/99

Women are staying slightly shorter lengths of time, both for vaginal and Caesarean section deliveries, over the five-year span.

Vaginal (adjusted rate)

1994/95: 2.78 days
1995/96: 2.76
1996/97: 2.71
1997/98: 2.73
1998/99: 2.69

Caesarean Section (adjusted rate)

1994/95: 5.61 days
1995/96: 5.42
1996/97: 5.25
1997/98: 5.25
1998/99: 5.10

Maternal age and hospital length of stay for giving birth

Mothers in the youngest and oldest age brackets tended to stay the longest for vaginal births. Mothers in the oldest age bracket stayed the longest for Caesarean section births.

3.5 Breastfeeding rates

3.5.1 Breastfeeding initiation rates

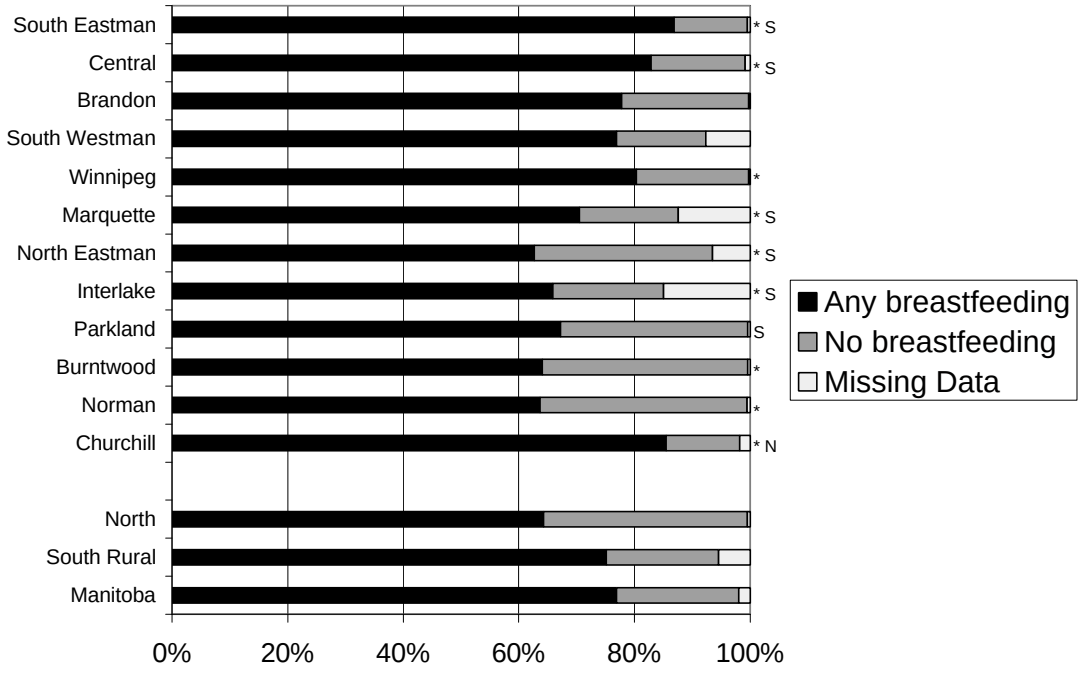
In the hospital discharge files, feeding type of newborns is recorded upon discharge as either "breast", "both breast or artificial", or "artificial". For the 1994-1998 years of data, only 1.95% of all live

born babies did not have a feeding code. While most RHAs and Winnipeg sub-regions had less than 1% of missing data on the discharge records, there were four RHAs with substantial missing data – Interlake (15%), Marquette (12.5%), South Westman (7.7%) and North Eastman (6.5%). Thus the type of feeding at hospital discharge is reported as "any breastfeeding", "no breastfeeding" (i.e., solely artificial feeds), and "missing data". Grouping together "breast" and "both breast or artificial" to produce a summation percent of "any breastfeeding" is the most valid, since it has been noted anecdotally that different institutions consider different amounts of supplement as the cutoff for coding "both" versus "only breastfed."

For the years 1994-1998, the Manitoba breastfeeding initiation rate was 77%, with South Rural slightly lower at 75%, the North substantially lower at 64%, and Winnipeg higher at 80% of newborns. Different studies have found similar provincial breastfeeding initiation rates. The Manitoba Perinatal Surveillance Report (March, 1999) found an 80% initiation rate for 1994-1996. The National Population Health Survey (Health Canada 1999) recorded 86% initiation rate in 1994/1995 for the Prairies region, and the National Longitudinal Study of Children and Youth found an 83% initiation for 1994/1995, but First Nations community women were not included in either study.

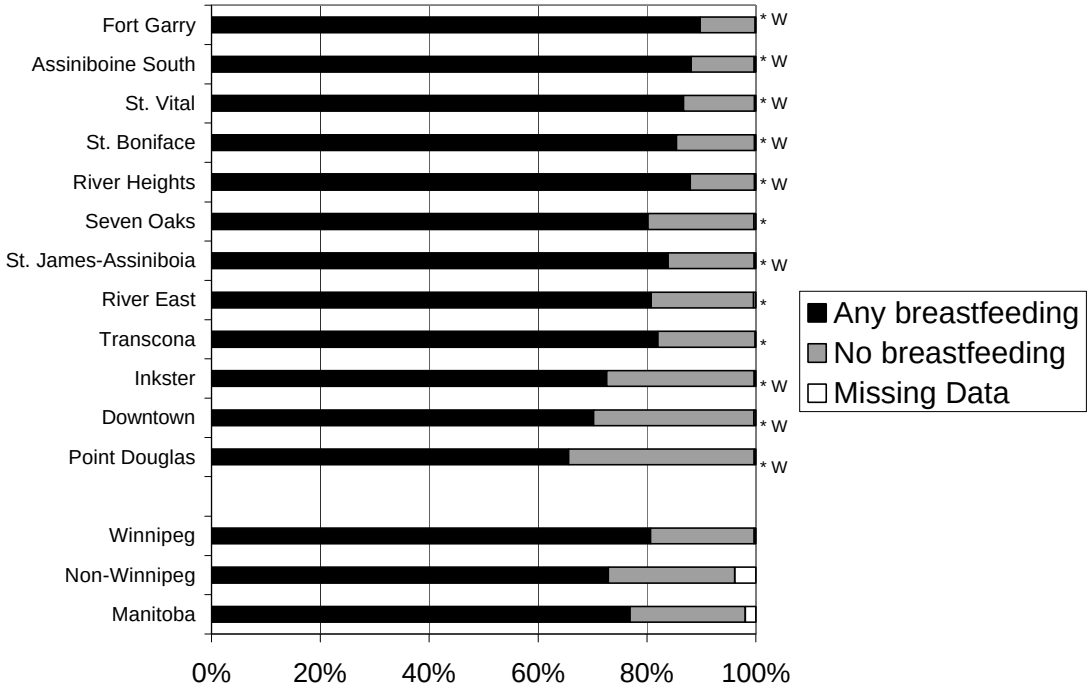
Figures 3.18 and 3.19 illustrate the breastfeeding initiation rates for the RHAs and Winnipeg sub-regions. Within the rural and northern regions, South Eastman's initiation rate of 87% was the highest, followed by Churchill RHA (and despite very small numbers in Churchill, this difference was statistically significant). Data from a longitudinal study on breastfeeding in South Eastman verifies this – their 1997 survey found a 91% initiation rate for the region (Roberts 1997). Most of the northern and mid-province RHAs, however, had significantly lower breastfeeding initiation rates in the mid-60% range. The breastfeeding rates of the four regions that were missing substantial data could be calculated using a percentage of known data (that is, number

Figure 3.18: Breastfeeding Initiation Rates by RHA 1994-98



Statistical Significance (for the "any breastfeeding" category only):
*=Manitoba N=North S=South Rural

Figure 3.19: Breastfeeding Initiation Rates by WCA 1994-98



Statistical Significance (for the "any breastfeeding" category only):
*=Manitoba W=Winnipeg

breastfeeding divided by number breastfeeding or artificially feeding), to yield the following rates of "any breastfeeding": Interlake 77.5%, North Eastman 67.0%, Marquette 80.5%, South Westman 83.3%. However, this assumes that the missing data is representative of the known data, which may or may not be the case.

Manitoba breastfeeding initiation rates for 1994 to 1998

Overall breastfeeding initiation rate, which includes "any breastfeeding" (either exclusively or partially) upon hospital discharge, was 77%.

Within Winnipeg, there was a marked difference in breastfeeding initiation rates, with regions having less healthy populations showing lower breastfeeding initiation rates for newborns ("less healthy" refers to higher Premature Mortality Rate – see Chapter 2: Demographics and Conceptual Framework, for a discussion of PMR as a surrogate of healthiness). Fort Garry (90%), Assiniboine South (88%) and River Heights (88%) had the highest initiation rates in the province.

Trends in breastfeeding initiation rates by income quintile

Manitoba women in the highest income quintile group were 30% more likely to breastfeed than those in the lowest income group, both in urban and rural areas.

There was a significant trend ($p<0.001$) in breastfeeding initiation by income quintile, with the lowest quintile having the lowest rates both in urban and rural Manitoba (see Figures 3.20 and 3.21). In both urban and rural areas, women in the highest income quintile were 1.3 times, or 30% more likely to breastfeed than women in the lowest income quintile – 90% versus 69% urban; 78% versus 59% rural.

Figure 3.20: Breastfeeding Initiation Rates By Rural Income Quintile, 1994-98

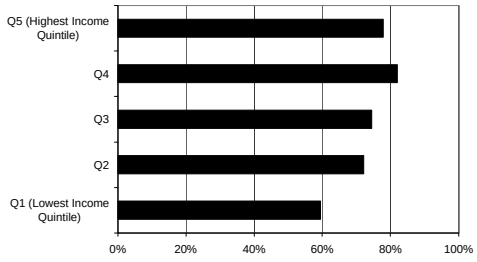
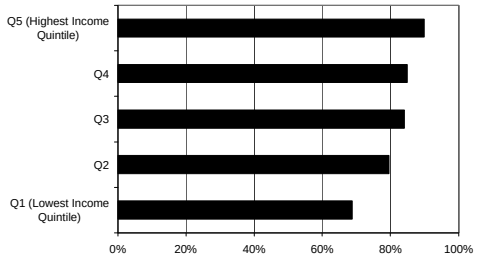


Figure 3.21: Breastfeeding Initiation Rates By Urban Income Quintile, 1994-98



3.5.2 Breastfeeding duration rates

Breastfeeding duration rates are difficult to assess. There is presently no administrative data collection provincially, and the only available duration data comes from individual community health needs assessments of RHAs or from the two national surveys – NPHS (1996) and NLSCY (1994 and 1996). *Both of these national surveys excluded "on reserve" First Nations women,* so breastfeeding rates for many of the northern RHAs may not be reflective of the entire region's population.

The NLSCY survey asked women whose infants were less than 2 years of age about the type of feedings and duration of any breastfeeding, and NPHS included children under five years of age. However, in the analysis of the data from both surveys, any infant who

was *still breastfeeding* at the time of the survey was *excluded* from the calculation of breastfeeding duration. This could presumably create a bias to underestimating breastfeeding duration rates, especially in the NLSCY cohort of younger children.

The NLSCY and NPHS data was re-analyzed in this report to calculate breastfeeding duration, using a statistical technique which allowed incorporation of data for children still breastfeeding at the time of the survey. See the Glossary for a description of the analysis. Because of the substantial underreporting of duration rates at various time periods as a result of excluding children still breastfeeding (11% under-reporting), the percentages in this report use data from all children.

Report on breastfeeding in Canada

An extensive report on the two national surveys – NLSCY and NPHS – and issues regarding breastfeeding (including reasons for initiating, and reasons for weaning) is called, "Breastfeeding in Canada: A review and update." (Health Canada 1999)

Figures 3.22 and 3.23 show the percent of Manitoba infants being breastfed at various postpartum time points, using NLSCY 1996 survey data. It is important to note the difference between the two figures. The first figure is the *population-based* proportion, in other words, what proportion of the entire population of infants is being breastfed at any given time postpartum. The second figure *only includes breastfed babies* – in other words, of all those infants who initiated breastfeeding, what proportion are still breastfeeding at any given time postpartum.

Breastfeeding duration statistics for Manitoba (analyzed using NLSCY 1996 data)

Including all surveyed infants of Manitoba (n=199 infants two years old or less), the breastfeeding duration rates of the population, that is, ***what percent of the infant population is being breastfed****:*

Initiation: 85%±5%
At least 3 months: 57%±7%
At least 6 months: 36%±7%
At least 12 months: 15%±6%

Of those Manitoba babies ***who initiated breastfeeding, the percentage still breastfeeding****:*

At least 3 months: 67%±4%
At least 6 months: 42%±4%
At least 12 months: 18%±4%

In Figure 3.22, the bottom axis indicates the time point and the side axis the percentage of children breastfeeding at that time point. In 1996, 85% (±5%) of all Manitoba infants initiated breastfeeding. About 57% (±7%) of all Manitoba infants were being breastfed at 3-months postpartum in 1996, 36% (±7%) at six-months and 15% (±6%) at 12 months postpartum. Comparison data from South Eastman RHA's prospective study in 1997 (Roberts 1997) indicates a 31% breastfeeding rate at 6 months.

In Figure 3.23, of all the infants who began breastfeeding, about 67% (±4%) were still breastfeeding at 3 months, 42% (±4%) at 6 months, and 18% (±4%) at 12 months. These figures are

Figure 3.22: Per cent of All Manitoba Infants Being Breastfed at Various Time Points Postpartum NLSCY 1996

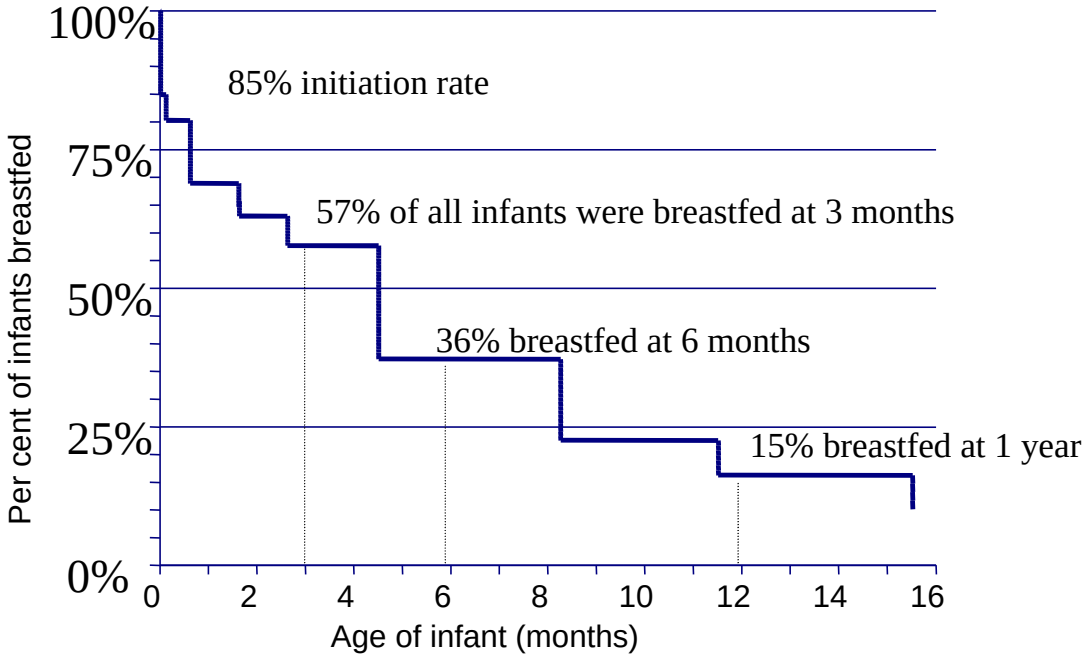
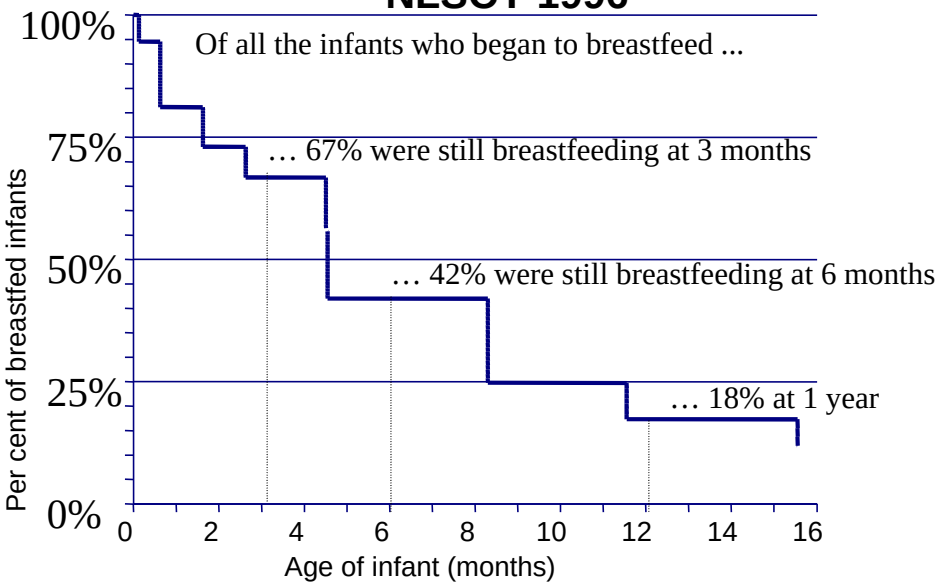


Figure 3.23: Per cent of Manitoba Infants Who had Initiated Breastfeeding, and Continued to Breastfeed At Various Time Points Postpartum NLSCY 1996



higher than those reported for 1994/95 by NPHS (Prairie region: 34% at 6 months) and NLSCY (Prairie region: 29% at 6 months), due to bias from their exclusion of children still breastfeeding at the time of the survey.

3.6 Hospital readmission rates of newborns within the first six weeks post-discharge

This is a unique way to analyze infant hospital readmission. It looks at readmission from a community health provider perspective – once an infant has been discharged from hospital, what is the likelihood (and likely cause) of a hospital readmission within *six weeks of that discharge*. This analysis does not separate out the infants by their age at time of readmission, since babies were followed for six weeks post-discharge at whatever age they were at the time of discharge. For example, a healthy newborn may have been a few days old when discharged, whereas a preterm baby may be several weeks or months old. The *Manitoba Perinatal Health Surveillance Reports (1999, 2000)* give information on neonatal (up to 28 days) and post-neonatal (29 days to 1 year) readmission, which has an age-related focus and which encompasses the entire first year of life.

Hospital readmission rates of live newborns within the first six weeks *following hospital discharge* vary considerably throughout the province (see Figures 3.24 and 3.25). The overall hospital readmission rate for Manitoba infants in 1994 to 1998 was 41.6/1000, or just over 4% of newborns. Infants from the North experienced the highest rates of readmission, at 78.3/1000 overall. Parkland RHA was also high, at 86.5/1000. Two areas with lower rates of readmission than the Manitoba average were Winnipeg (30.7/1000) and South Eastman (28.5/1000).

Figures 3.26, 3.27 and 3.28 show pie charts listing various hospital readmission diagnoses by areas of Manitoba. The leading cause of newborn readmissions within six weeks of hospital discharge in 1994-1998 was respiratory illness, representing about 18% of readmissions in Winnipeg, 22% in South Rural, and 32% in the North.

Hospital readmission rates of newborns per 1000 after hospital discharge: (1-14 days post-discharge; 15-28 days post-discharge; 29-42 days post-discharge; total)

Northern: 32.9; 24.1; 21.3 = 78.3/1000
South Rural: 24.4; 12.8; 11.1= 48.1/1000
Winnipeg: 14.8; 8.3; 7.7 = 30.7/1000
Brandon: 23.8; 7.7; 9.7 = 41.3/1000
Manitoba: 20.0; 11.3; 10.2 = 41.6/1000

Figure 3.24: Newborn Hospital Readmission Rates Within 6 Weeks of Birth Discharge by RHA, 1994-98

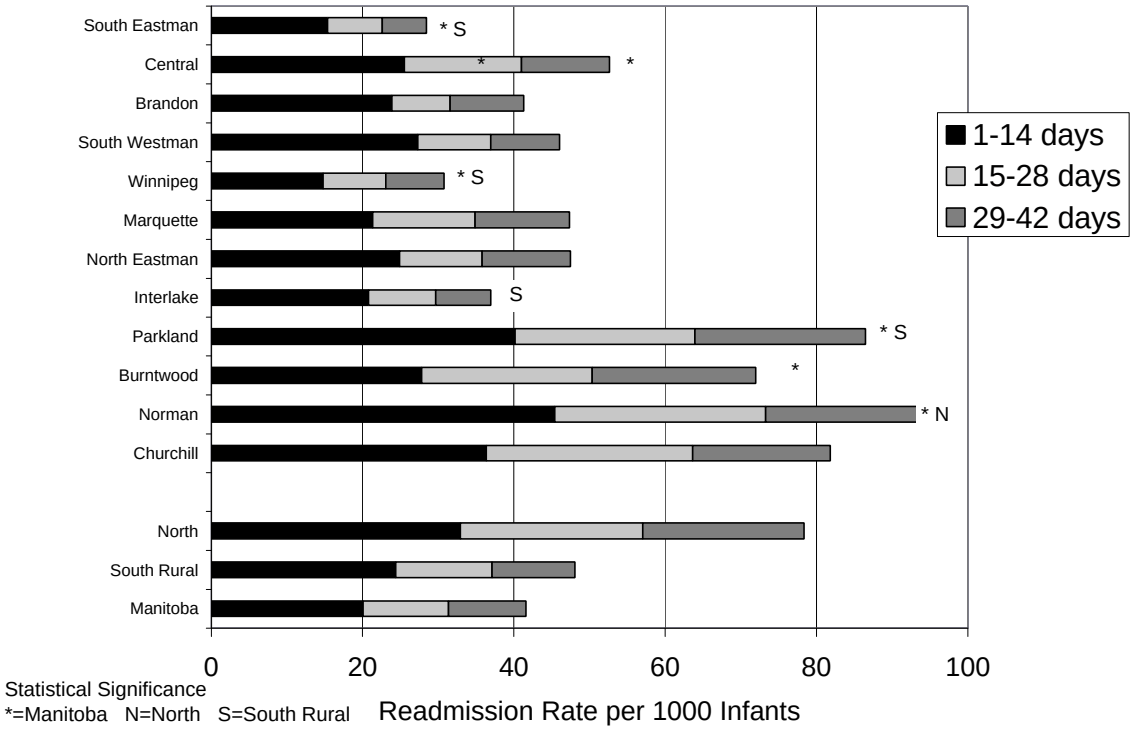


Figure 3.25: Newborn Hospital Readmission Rates Within 6 Weeks of Birth Discharge by WCA 1994-98

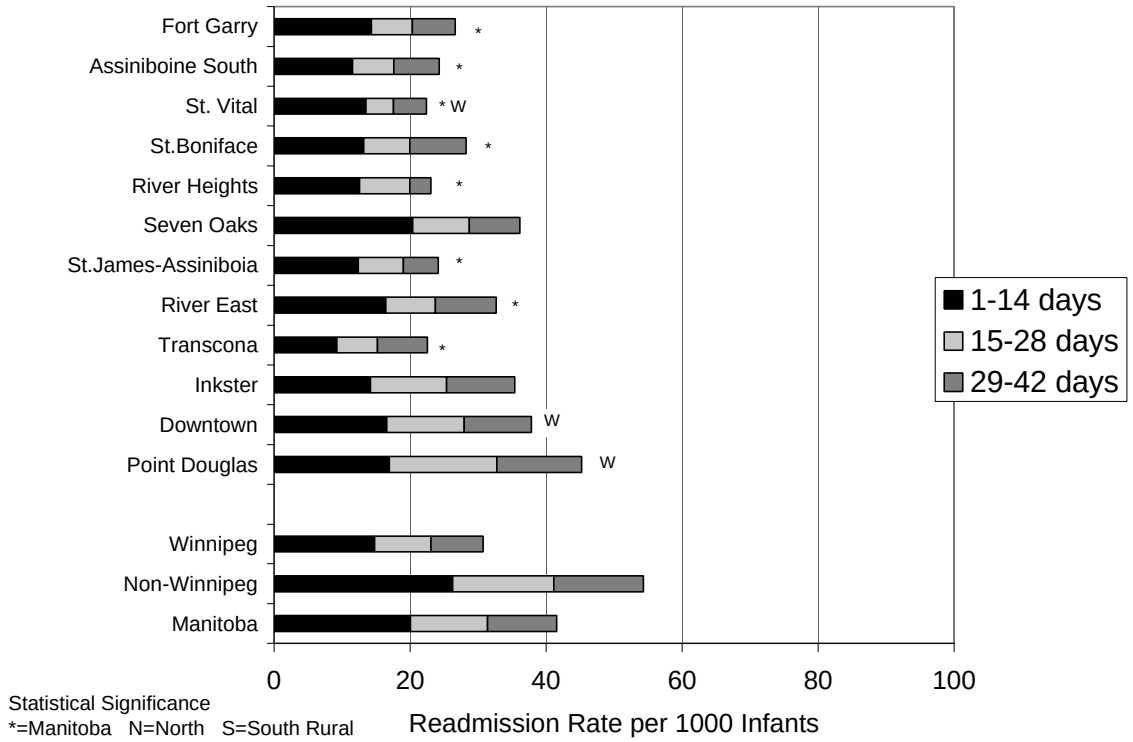


Figure 3.26: Reasons for Hospital Readmission of Newborns 6 Weeks Post-Discharge, Winnipeg, 1994-98

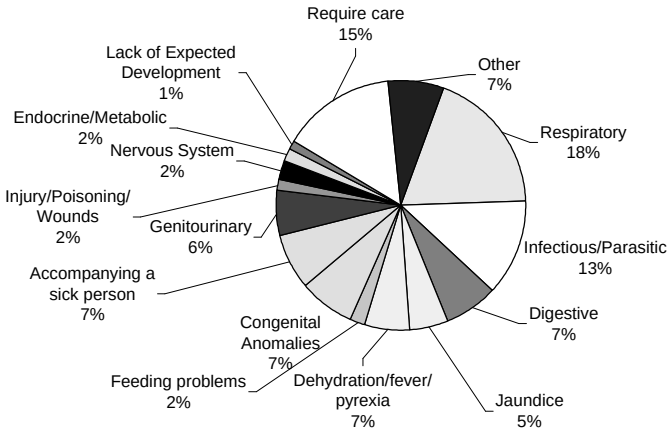


Figure 3.27: Reasons for Hospital Readmission of Newborns 6 Weeks Post-Discharge North, 1994-98

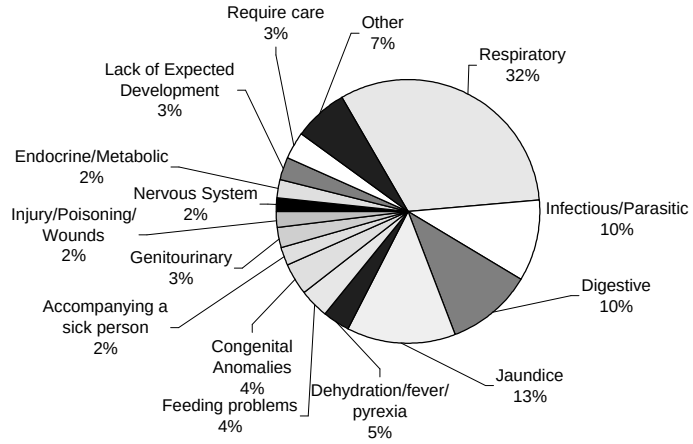
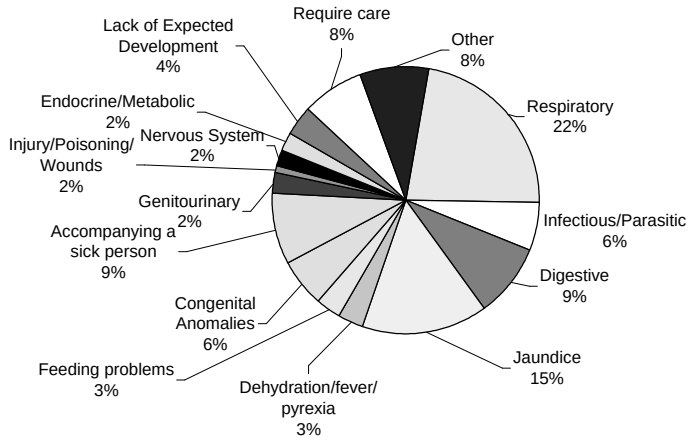


Figure 3.28: Reasons for Hospital Readmission of Newborns 6 Weeks Post-Discharge South Rural, 1994-98



Knowing that the major cause of newborn hospital readmission within six weeks of hospital discharge was respiratory illness, it is important to underscore the relationship to breastfeeding. There is extensive literature on the health benefits of breastfeeding. A seven-year follow-up study of Scottish children found that the probability of respiratory illness occurring at any time during childhood was significantly reduced if the child was breastfed – 17% chance of respiratory infection if exclusively breastfed, 31% if partially breastfed, and 32% if not breastfed, after adjustment for confounding variables (Wilson et al. 1998).

Predictors of newborn hospital readmission within the first six weeks post-discharge were analyzed. Each predictor's "odds ratio" was calculated – this can be thought of as a risk of rehospitalization. For example, the odds ratio (OR) for low birth weight, i.e., less than 2500 g, was 2.06 (95% CI 1.82 to 2.34), meaning that babies of low birth weight were twice as likely to be readmitted within six weeks of discharge, compared to babies at least 2500 g at birth. Table 3.5 gives the risk of hospitalization associated with various factors.

Reasons for hospital readmission within six weeks post-discharge, of Manitoba newborns, 1994-1998

The leading cause for hospital readmission of all newborns within six weeks of hospital discharge was respiratory infection, representing 18% of readmission for Winnipeg infants, 22% for South Rural, and 32% for infants residing in the North.

Table 3.5: Risk of Hospital Readmission of Newborns Within 6 Weeks of Hospital Discharge (univariate logistic regression), 1994-98

Indicator	Comparison group	*1.1.1.1 Crude* Odds Ratio (95% CI)
Preterm (<37 weeks gestation)	All other infants	2.36 (2.12 to 2.63)**
Infants residing in the North	Winnipeg infants	2.68 (2.43 to 2.96)**
Infants in South Rural/ Brandon	Winnipeg infants	1.57 (1.45 to 1.70)**
Not breastfed at hospital discharge	Breastfed at hospital discharge	1.65 (1.53 to 1.78)**
Lowest income quintile (Q1)	Highest income quintile (Q5)	2.44 (2.15 to 2.76)**
Second lowest income quintile (Q2)	Highest income quintile (Q5)	1.75 (1.53 to 2.00)**
Middle income quintile (Q3)	Highest income quintile (Q5)	1.29 (1.12 to 1.49)**
Second highest income quintile (Q4)	Highest income quintile (Q5)	1.13 (0.97 to 1.31, NS)
Caesarean section delivery	Vaginal delivery	1.34 (1.22 to 1.46)**
Length of stay less than 2 days post-birth	Length of stay of 2 days or more post-birth	1.14 (1.03 to 1.26)*
Low birth weight (<2500g)	All other birth weights	2.06 (1.82 to 2.34)**

NS means "not statistically significantly different", i.e., p>0.05 and the 95% CI cross over 1
*p<0.05
**p<0.001

Of course, some of these risk factors may be overlapping, such as low birth weight and being preterm. When all of these risk factors are analyzed simultaneously, being *preterm, not being breastfeed, being born by Caesarean section, residing in the three lowest income quintile areas, residing outside Winnipeg (either North or South), and having a length of stay less than two days post-birth,* were all

significant in their unique contribution as risk for hospital readmission (contact author PJM for more detailed information).

3.7 Correlations of perinatal indicators with the healthiness of populations within a region

Premature mortality rate, or PMR, is considered an indicator of the "healthiness" of a population and its need for health care services (see Chapter 2: Demographics and Conceptual Framework). The main indicators within this section were correlated with PMR (see Chapter 9 for correlations and further discussion). The age-adjusted maternal length of stay for Caesarean Section ($r=0.50$, $p=0.02$) was correlated, meaning that as the PMR increased (became less healthy a population within region), so did the maternal length of stay.

The strongest correlation existed between PMR and breastfeeding initiation rates ($r = -0.79$, $p<0.00001$), with those regions that were less healthy having lower initiation rates. One outstanding anomaly is the RHA of Churchill, with very high breastfeeding rates despite high PMR – this may be due to breastfeeding promotion strategies, or to the influence of Inuit women who traditionally have high breastfeeding rates.

Risk of hospital readmission of newborns within six weeks of discharge

Factors elevating the risk of hospital readmission of newborns include: being born at <37 weeks gestation, living in Winnipeg or the North, not being breastfed, being in the lowest two income quintiles, being born by Caesarean section, or having a low birth weight <2500g.

Key Points in this chapter

Preterm birth (Section 3.1)

- 6.7% of all live-born infants were preterm (<37 weeks gestation), with Winnipeg residents having the highest rate compared to Brandon, South Rural and North areas. Downtown Winnipeg had the highest rate in the province, at 8.0%.

"At risk" birth weights (Section 3.2)

- About 20% of Manitoba births are "at risk" for low and high birth weight – 5.3% low birth weight (<2500 g) and 14.9% high birth weight (>4500 g). Winnipeg's low birth weight rate of 5.7% was

higher than the Manitoba average, and Downtown Winnipeg had the highest rate in the province at 7.2%. Women in the lowest income group were at the greatest risk for giving birth to a low birth weight infant (20% more likely in rural, and 40% in urban areas).

- North (18.4%) and South Rural (16.4%) areas of Manitoba have elevated high birth weight rates, and Winnipeg has the lowest rate at 13.3%.

Prenatal care and risk factors (Section 3.3)

- The vast majority of women in 1996 in the province received prenatal care (over 99%). In Winnipeg, Brandon and South Rural areas, this is predominantly physician care. But in the north, 13% receive a combination of physician and nurse/midwife care.
- 20% of Manitoba women reported smoking during pregnancy, 12% consumed alcohol during pregnancy, and 32% reported having at least one prenatal problem. High risk groups for smoking included low-income, lone parents, and rural women. High risk groups for alcohol consumption included middle/high income and rural women.

Correlation of PMR (Premature Mortality Rate) and perinatal indicators
The "healthiness" of a region is strongly correlated with two perinatal indicators – maternal length of stay for birthing, and breastfeeding rates - the healthier the region, the shorter the maternal length of stay, the healthier the region, the higher the breastfeeding initiation rates. See Chapter 9 for a list of all correlations.

Use of acute care facilities for birth and for infant hospitalization within six weeks post-discharge (Sections 3.4 and 3.6)

- Average age-adjusted maternal length of stay for birthing was 2.7 days for vaginal and 5.3 days for Caesarean section deliveries (limitation: parts of a day are counted as a whole day). Maternal age affects length of stay.
- About 4% of newborns are readmitted to hospital within 6 weeks of hospital discharge, with the main cause being respiratory illness. Risk of hospitalization within six weeks post-discharge was associated with being preterm, living outside Winnipeg, not being breastfed, being in the lowest three income levels, being born by Caesarean section, having a low birth weight, and staying less than 2 days post-birth.

Breastfeeding rates (Section 3.5)

- Manitoba 1994-1998 hospital discharge records show a provincial breastfeeding initiation rate of 77%, with Winnipeg higher at 80% and the North substantially lower at 64%. The 1996 NLSCY survey data indicates an 85% initiation rate.
- Using national survey data for 1996 (which excludes First Nations women living in First Nations communities), 36% of *all* Manitoba infants, and 42% of those babies who initiated breastfeeding, were breastfed for at least 6 months.

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Patricia J. Martens

CHAPTER 4: REPRODUCTIVE HEALTH ISSUES FOR ADOLESCENTS IN MANITOBA

4.0 Introduction

Manitoba rates of teen pregnancy in 1994/95 to 1998/99, at 63.2 pregnancies per 1000 females ages 15-19 years, exceed national levels by close to 60%, with Statistics Canada data from 1994 giving the national rate as 40.2/1000. Consequences of teen pregnancy, no matter whether the choice is to continue or not continue with the pregnancy, may include physical, social and psychological risks to mother and baby. Factors influencing the rates of teen pregnancy include sexual behaviour of adolescent males and females - the frequency of sexual activity as well as the prevalence of contraceptive use.

Manitoba teen pregnancy rate in 1994/95 to 1998/99, compared to Canada
The Manitoba teen pregnancy rate of 63.2 per 1000 females ages 15-19 years old is substantially higher than the Canadian rate. In 1994, the Canadian rate was 40.2 pregnancies per 1000 females age 15-19 years.

Thus this chapter explores the context of teen pregnancy, including the following information derived from provincial administrative databases, provincial notifiable disease reports, and two national surveys (National Longitudinal Study of Children and Youth, 1994 and 1996; National Population Health Survey 1996):

- Rate of teen pregnancy ages 15 to 19 years
- Rate of sexually transmitted diseases for 15 to 19 year old males and females
- Onset of menstruation in females, reported by 10-11 and 12-13 year olds
- Dating activity of adolescents aged 12-13 years
- Reported sexual activity ages 15-19 years
- Age at first intercourse
- Birth control pill use by females ages 15-19 years
- Condom use by females and males ages 15-19 years for sexual relationships involving short-term relationships

4.1 Teen pregnancy rates in Manitoba

Teen pregnancy rates for 1994/95-1998/99 are shown in Figures 4.1 and 4.2. Teen pregnancy rates include

Figure 4.1: Teen Pregnancy Rate of Women Aged 15-19 By RHA, 1994/95-1998/99

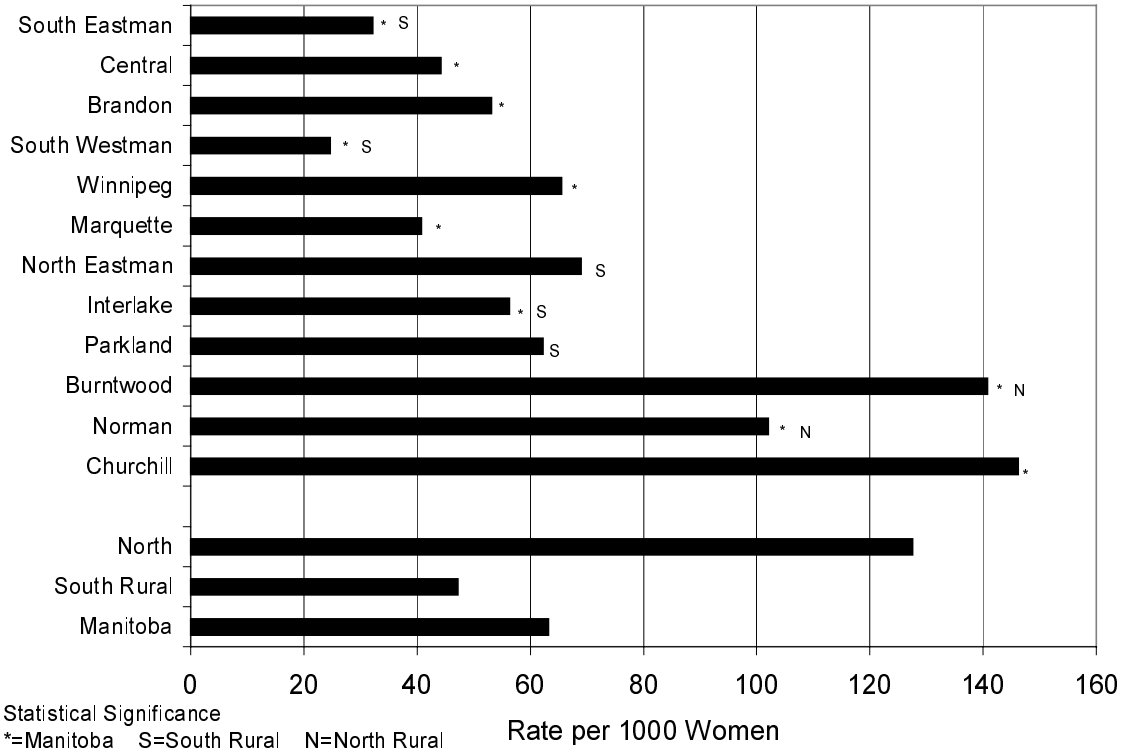
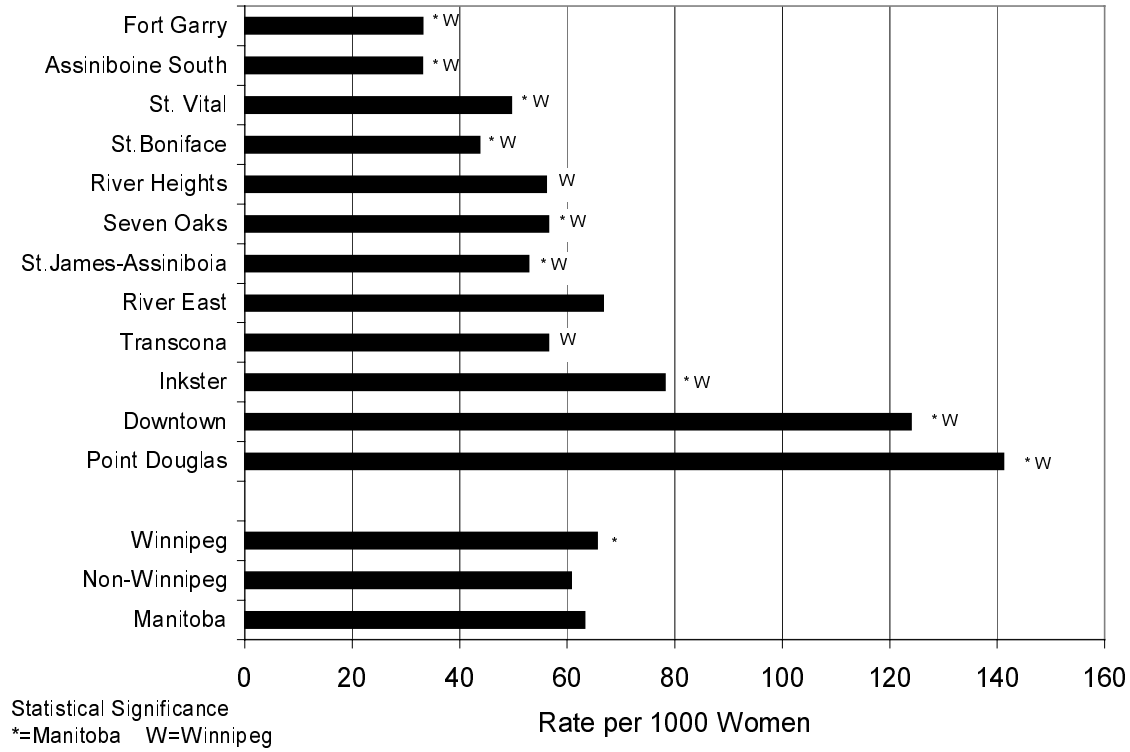


Figure 4.2: Teen Pregnancy Rate of Women Aged 15-19 By WCA, 1994/95-1998/99



all live births, stillbirths and abortions per 1000 females ages 15-19 years old. The Manitoba rate for 1994/95-1998/99 was 63.2/1000, with South Rural being lower at 47.2/1000, and Winnipeg (65.5/1000) slightly higher than the provincial average. In the North region, teen pregnancy rates (127.6/1000) were double the provincial average. South Eastman and South Westman RHAs had the lowest teen pregnancy rates, at 32.2/1000 and 24.6/1000 respectively, while Burntwood (140.7/1000) and Churchill (146.2/1000) had the highest. Within the city of Winnipeg, Fort Garry and Assiniboine South, both at 33.1/1000, had the lowest, while Point Douglas had the highest at 141.2/1000.

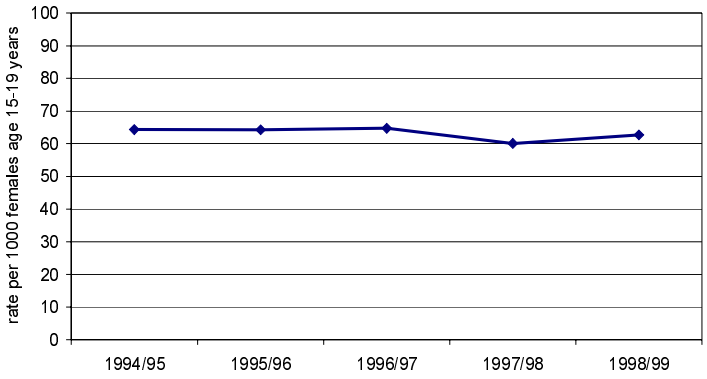
Teen pregnancy rates in Manitoba

The North region had much higher rates (128/1000) at double the provincial average of 63/1000 for the years 1994/95 to 1998/99. South Westman (25/1000) and South Eastman (32/1000) RHAs had the lowest rates in the province. Burntwood (141/1000) and Churchill RHAs (146/1000), and the Winnipeg sub-region of Point Douglas (141/1000) had the highest teen pregnancy rates.

Saskatchewan data for 1997 reported a teen pregnancy rate of 50.7/1000 (Saskatchewan Health, 2000), lower than both Alberta (53.0/1000) and Manitoba (64.7/1000 for 1996/97) in the same year.

Rates of teen pregnancy over the five years from 1994/95 to 1998/99 indicate relative stability with the possibility of a very slight decline, as seen in Figure 4.3.

Figure 4.3: Manitoba Teen Pregnancy Rate Ages 15-19 Years, Over Time, 1994/95-1998/99



Manitoba teen pregnancy rates over five years

From 1994/95 to 1998/99, the teen pregnancy rate (pregnancies per 1000 females age 15-19 years) was relatively stable, with a possible slight decline:

1994/95: 64.3 per 1000
1995/06: 64.2
1996/97: 64.7
1997/98: 60.1
1998/99: 62.7

Teen pregnancy rates are highly correlated with income. The highest rates for 1994/95-1998/99 were for females in the lowest income quintile, both in rural and urban areas of Manitoba. (See Figures 4.4 and 4.5.) Comparing the lowest to the highest quintile (Q1 to Q5), rates were 2.8 times higher in rural areas,

and 5.7 times higher in urban areas. So the gradient was not as steep in rural Manitoba compared to urban Manitoba. The actual pregnancy rate in the lowest rural income group (111/1000) was less than the corresponding lowest income group in urban areas (145/1000).

Manitoba teen pregnancy rate by income quintile, 1994/95-1998/99

Teen pregnancy rates are highly correlated to the healthiness of a region's population (see Chapter 2 for a description of the use of PMR to indicate healthiness). As the Premature Mortality Rate (PMR) of the RHAs and Winnipeg sub-areas increased, indicating decreasing healthiness, the teen pregnancy rates also increased (Spearman's $r=0.85$, $p<0.00001$). Chapter 9 has an in-depth discussion of the relationship of indicators to PMR.

Figure 4.4: Teenage Pregnancy Rates
By Rural Income Quintile, 1994/95-1998/99

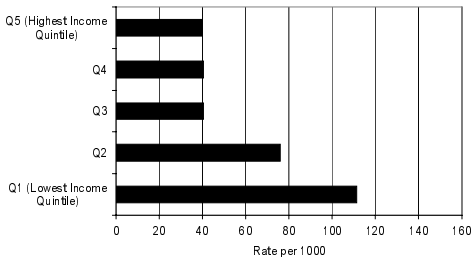
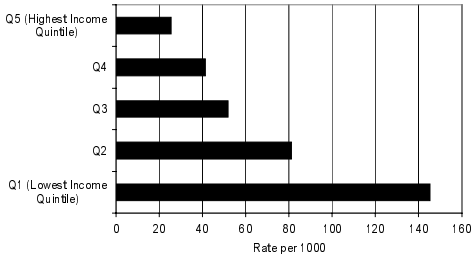


Figure 4.5: Teenage Pregnancy Rates
By Urban Income Quintile, 1994/95-1998/99



4.2 Onset of menstruation for Manitoba females

In the National Longitudinal Study of Children and Youth (NLSCY), a sample of Manitoba children aged 10-11 years old in 1994 (n=109) and 12-13 years old in 1996 answered a longitudinal section of the survey. As one would expect, the proportion of females who had begun to menstruate increased over the two sample times, with 3% of the 10-11 year olds, and 32% of the 12-13 year olds reporting menstruating. See Figure 4.6 (sexual health: menstruation) for the comparisons over time. Due to the limitations of the NLSCY data (see Chapter 10 discussion), calculation of confidence limits and statistical testing could not be done.

Age at menarche of Manitoba females (NLSCY, 1994 and 1996)

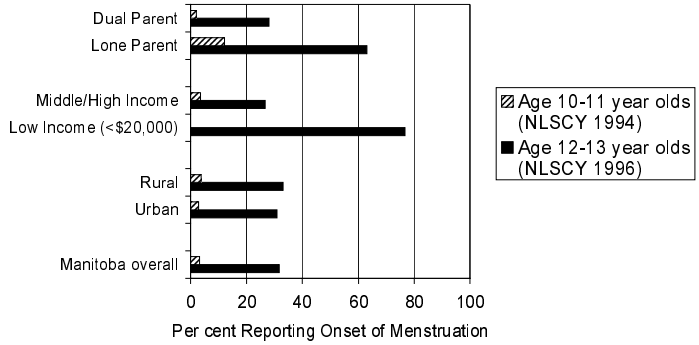
3% of 10-11 year old females, and 32% of 12-13 year old females, reported that menstruation had begun. Girls living in low income areas, or in lone parent families, were more likely to menstruate earlier.

One Canadian (Quebec) study found the average age of menarche to be 11.4 years, with a range of 10.1 to 13.3 years (Moisan et al. 1990), and a Swedish study found the mean age at menarche to be 13.1 (SD 1.0) years. This particular sample of Manitoba girls seems to reflect the pattern of the Swedish study, since less than 50% had begun to menstruate at the time of the 12-13 year old survey.

Girls living in low income families were 3 times more likely to be menstruating at age 12-13 years old (77% versus 27%). Girls living in lone parent households

were 6 times more likely to be menstruating at age 10-11 years (12% versus 2%) compared to dual parent households; and 2 times more likely at age 12-13 years (63% versus 28%).

Figure 4.6: Onset of Menstruation In Manitoba Females NLSCY 1994 (Aged 10-11 Years) and 1996 (Aged 12-13 Years) Data



Factors associated with age of menarche, according to the research literature

The age at menarche has been associated with the following:

- *body mass index measures*
- *leisure time activity*
- *maternal age at menarche*
- *environmental stress*
- *girls who were "small for gestational age" at birth*

The age of menarche has been linked to various predictors, including body mass index measures, leisure physical activity, maternal age at menarche, and possibly stress levels within the environment. A Quebec study (Moisan et al. 1990; Moisan et al. 1991) found that girls who had reached menarche at a younger age were, on average, slightly heavier for their height than were the pre-menarcheal girls of the same age. This study also found that girls participating in dance, gymnastics, figure skating, or swimming competitions had a lower risk of reaching menarche at an early age. Another USA study (Wattigney et al. 1999) also found that girls with heavier body mass index were more likely to menstruate earlier, even after adjusting for height, ethnicity and age at examination. The authors note that the increasing obesity of young persons in the USA may be driving the increased frequency of early onset menarche – a great concern due to the relationship of early menarche with adult diseases such as cardiovascular disease and breast cancer.

Family stress has been linked to early puberty, as well as early onset of sexual activity (Sarigiani and Petersen 2000). Stressful family circumstances may possibly produce physiological stress responses leading to

hormonal activity that accelerates development. Perinatal factors have also been associated with the age of puberty in females (Persson et al. 1999), with girls born "small for gestational age" tending towards earlier menarche (12.7 years compared to the "normal" of 13.1 years).

Knowing that the NLSCY Manitoba data found girls in lone parent families or in low income families more likely to be menstruating, many of these hypotheses could be operating – higher risk of family stress, greater body mass index, less chance of joining in specialized physical fitness clubs, and higher risk of being a low birth weight infant.

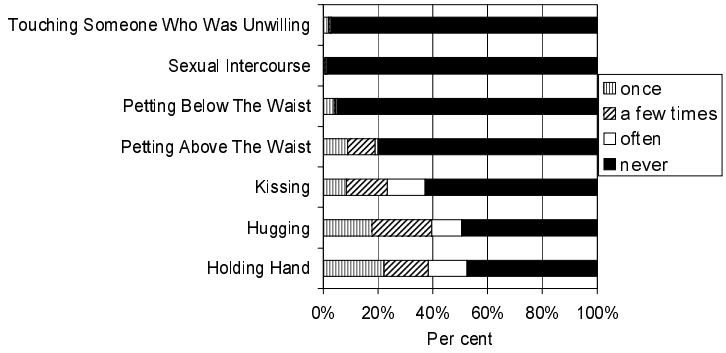
4.3 Dating, onset of sexual activity

Two sources of Manitoba data gave a picture of adolescent dating behaviour and sexual activity – the NLSCY 1996 survey of 12-13 year olds, and the 1996 National Population Health Survey (NPHS) of 15-19 year olds. Recall that neither survey included First Nations people living in a First Nations community – see Chapter 10 for more information on the survey design. As well, the NLSCY data does not give enough statistical information to calculate confidence intervals or test for significant differences.

Figure 4.7 illustrates the NLSCY 1996 survey data. Of the Manitoba age 12-13 year olds (n=204), about half report holding hands and hugging with a member of the opposite sex at least once, and about 40% report kissing at least once. Of the more intimate activities, 20% reported "petting above the waist", 5% reported "petting below the waist", and only 1% reported "sexual intercourse". About 3% of the sample reported "touching someone who was unwilling."

Dating activity: Manitoba 12 and 13 years olds (NLSCY 1996)
About half of Manitoba 12-13 year olds reported having hugged or held hands of a boyfriend/girlfriend of the opposite sex, and 40% had kissed at least once. 20% reported having "petted above the waist", and 5% "petted below the waist."

Figure 4.7: Dating Activity Of Manitoba Adolescents Aged 12-13 Years Per cent of Adolescents Having the Experience with Boyfriend/Girlfriend NLSCY 1996



Using data from the NPHS for 15-19 year olds (n=1049), Figures 4.8 and 4.9 illustrate the proportion of adolescents who have had sexual intercourse ever and within the past year by age, gender, parental status, income and geographical location. The proportion of those reporting "ever having sexual intercourse" was 39% (95% CI 32.9 to 45.4), and those reporting sexual intercourse within the past year was 36% (95% CI 29.7 to 42.1). There were increased proportions with increasing age, with 12% (95% CI 2.3 to 21.4) of the 15-year olds and 72% (95% CI 58.5 to 85.4) of the 19-year olds reported "ever having sexual intercourse."

Per cent of Manitoba adolescents ages 15-19 who reported "having sexual intercourse within the past 12 months" (NPHS 1996)

	% (95% Confidence Interval)
Age 15: 8.8%	*(0.1 to 17.6)*
Age 16: 24.0%	*(11.6 to 36.4)*
Age 17: 34.9%	*(22.0 to 47.9)*
Age 18: 50.2%	*(35.1 to 65.2)*
Age 19: 70.6%	*(57.0 to 84.2)*

Overall ages 15-19: 35.9% (29.7 to 42.1)

Groups *more* likely to report having sexual intercourse *within the past year* include: females (44.9% versus 28.6% males, $p<0.05$); adolescents living in a lone parent family (42.4 % versus 31.2% dual parent family, $p<0.05$); adolescents living in a low income area (63.9% versus 31.4% middle/high income, $p<0.05$); and adolescents living in the North or Urban Manitoba (North 45.5%, Urban 41.8% versus South Rural 27.2%, $p<0.05$).

Figure 4.10 illustrates that almost one-quarter (22%) of Manitoba adolescents (ages 17 to 19 years) who had experienced sexual intercourse were 14 years old or less at the time of their first experience. Adolescents were more likely to have intercourse at a younger age in urban areas and the North. First

Figure 4.8: Sexual Activity of Manitoba Adolescents Aged 15-19 Years NPHS 1996

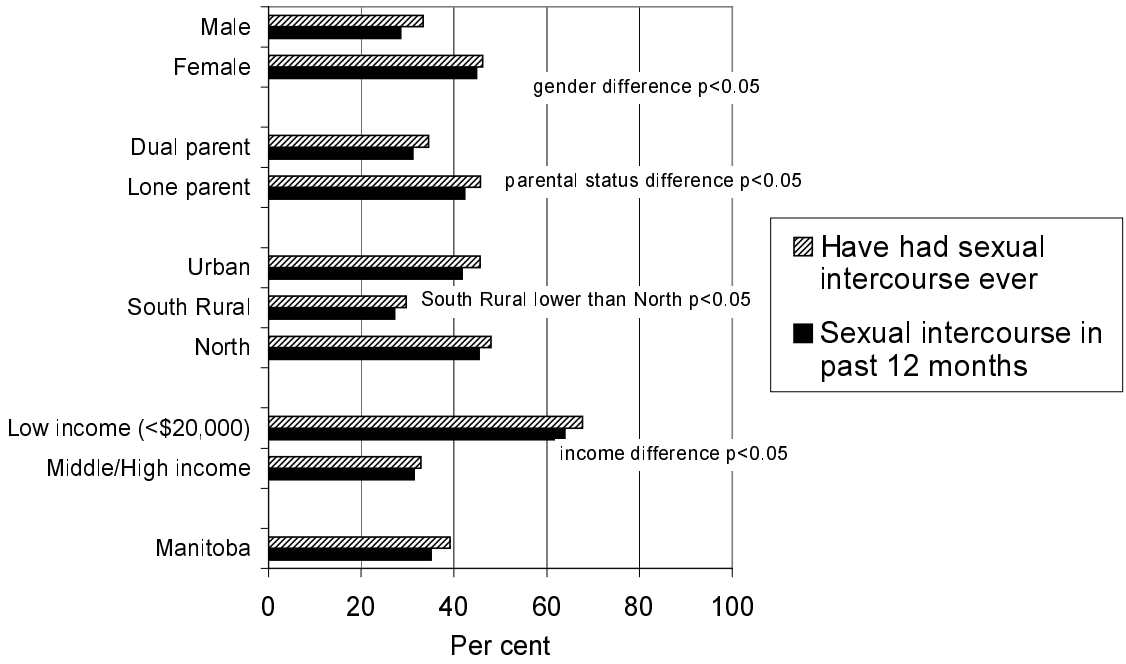


Figure 4.9: Sexual Activity of Manitoba Adolescents Aged 15-19 Years by Age NPHS 1996

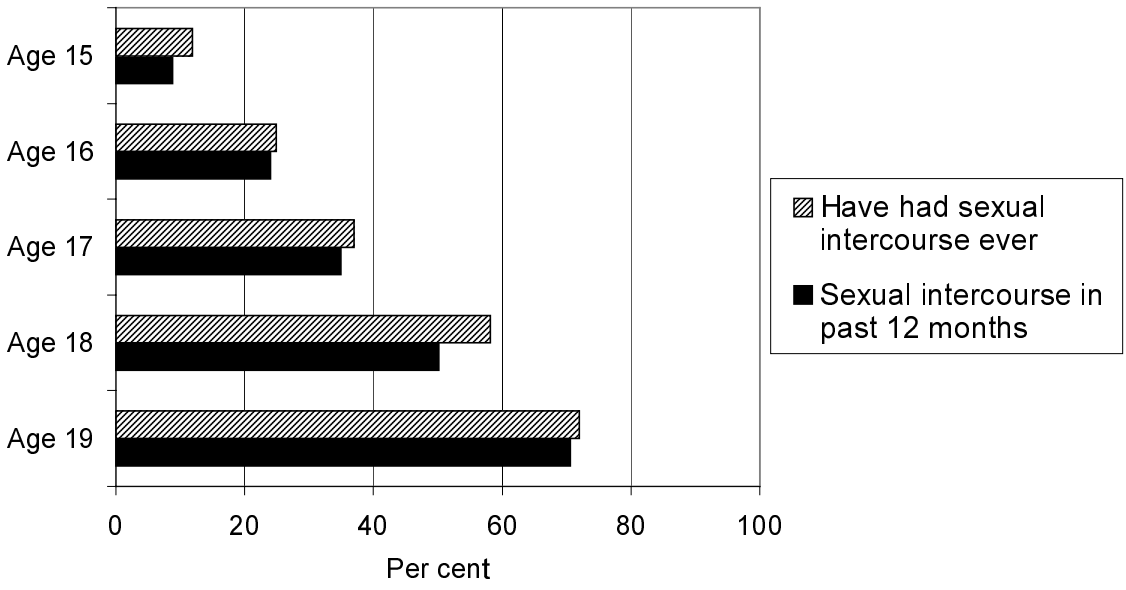


Figure 4.10: Age at First Intercourse of Manitoba Adolescents (Aged 17-19 Years) Who Reported Sexual Intercourse By Geographical Area NPHS 1996

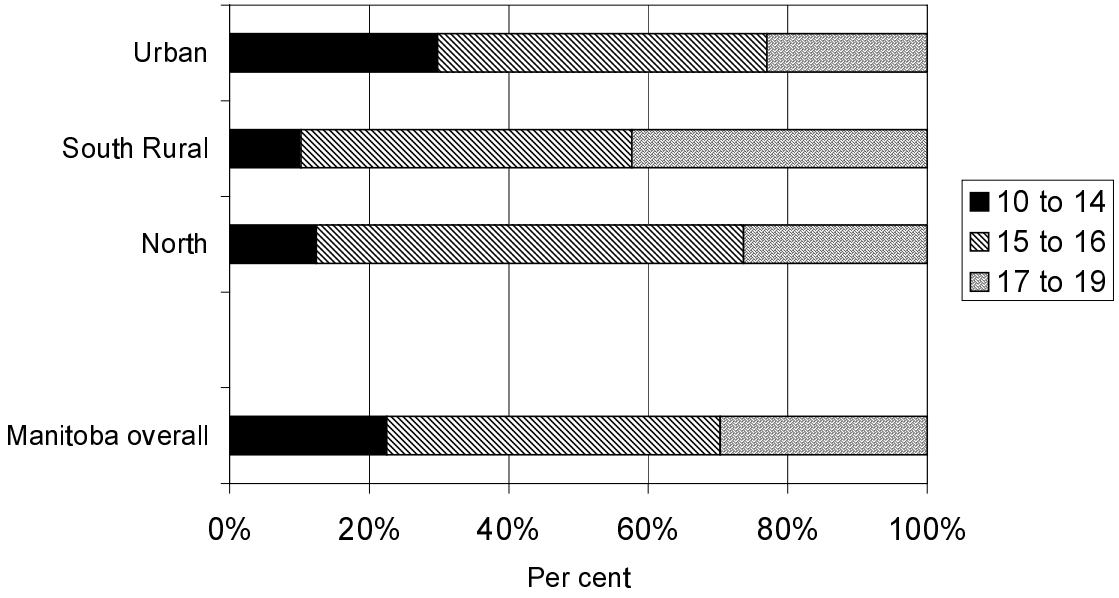
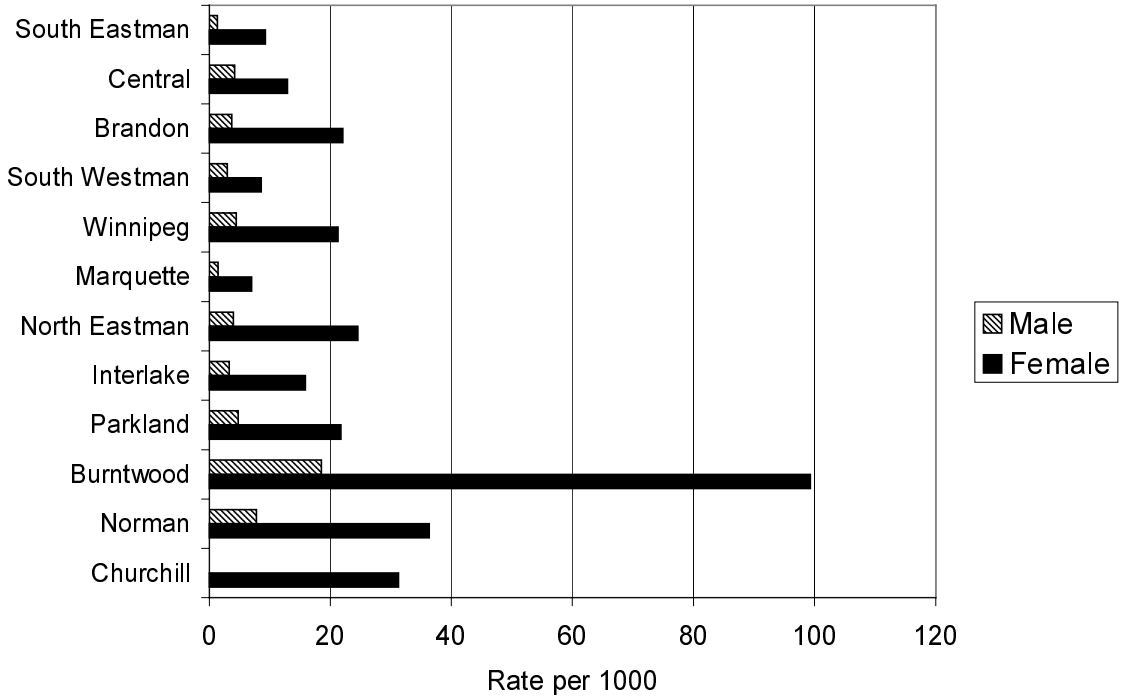


Figure 4.11: Chlamydia Crude Rates for Males and Females Aged 15-19 Years by RHA, 1996



(Source: Notifiable Diseases Manitoba: CDC Unit
Annual Review Calendar Year 1996, Manitoba Health Public Health Branch)

intercourse at age 16 years or less was reported by about three-quarters of the Urban (77%) and North (74%) adolescents, compared to 58% of South Rural adolescents. Urban areas may be of particular concern, with a three-fold rate of sexual intercourse at age 14 years or less (Urban 30%, South Rural 10%, North 12%).

The World Health Organization Youth Health Survey (website: http://ww.who.dk/cpa/pr00/pr0001e.htm) of 15-year old respondents from nine countries indicated that 10-38% of girls, and 23-42% of boys had experienced sexual intercourse. The average age at first intercourse ranged from 13.8 to 14.9 years for boys and from 14.2 to 15.5 years for girls. In comparison, the Manitoba NPHS survey indicated that 11.9% of all 15-year old adolescents had experienced sexual intercourse, and a median age of first intercourse was similar at about 15 years old.

Age at first sexual intercourse (NPHS, 1996) as reported by 17 to 19 year old males and females

Of those adolescents reporting at least one experience of sexual intercourse, per cent reporting various ages at first intercourse were:

% (95% Confidence Interval)

At 10-14 years old: 22.5% (10.4-34.7)

At 15-16 years old: 47.8% (35.8-59.8)

At 17-19 years old: 29.7% (19.7-39.6)

The age at first sexual intercourse varies by geographical area, with Urban and North adolescents reporting younger ages compared to South Rural adolescents.

4.4 Sexually transmitted diseases

Manitoba Health's Public Health Branch produces extensive reports called *Notifiable Diseases Manitoba: CDC Unit Annual Review*. The report for the year 1996 gives data for reportable sexually transmitted diseases, including chlamydia and gonorrhea, by age group, gender and RHA. In this report, Figure 4.11 shows the chlamydia rate for males and females ages 15-19 years old in 1996. For females, rates vary from a low of 7.0/1000 in Marquette to a high of 99.3/1000 in Burntwood, with similar patterns - albeit substantially lower rates - for males of these regions.

Sexually transmitted diseases

Extensive information on STDs is available by age group and gender for each RHA in Manitoba. Refer to the Notifiable Diseases Manitoba: CDC Unit Annual Review documents (Manitoba Health - Public Health Branch).

4.5 Contraceptive use by Manitoba adolescents

It is very difficult to obtain accurate information on contraceptive use by adolescents. Many clinics and health centres distribute condoms and birth control pills free to adolescents. Consequently, there is no record of a pharmaceutical purchase in the Manitoba administrative databases for these free samples. The NPHS 1996 data does request this information from respondents aged 15-19 years old, and the data is

shown in Figures 4.12 and 4.13. The NPHS question on condom use is somewhat limited – the question was only asked of those who had one or more sexual partners within the past 12 months, with at least one relationship lasting less than 12 months. Birth control use is a more universal question in the NPHS, and was studied two different ways – first, as a prevalence of all women aged 15-19 years old, and then as a prevalence of women 15-19 years old who also reported having sexual intercourse within the past 12 months.

Condom use in Figure 4.13 reflects the answer to a question regarding *use of a condom the last time the person had sexual intercourse*. Overall, about 82% of 15-19 year olds answered "yes" to this question – 79% of males (95% CI 64.9 to 93.6) and 85% of females (95% CI 74.7 to 94.6). There were no significant differences by age, family status (lone parent versus dual parent family), or gender. However, there were differences by income level and by geographical location – middle/high income adolescents (82%, 95% CI 70.4 to 92.6) were more likely to have used a condom compared to adolescents in low income areas (59%, 95% CI 29.4 to 88.4). Urban adolescents (86%, 95% CI 73.8 to 98.0) were more likely than South Rural (73%, 95% CI 60.0 to 95.2) or the North (63%, 95% CI 32.7 to 93.9). Comparison to the *WHO Health Behaviour in School-Aged Children Study* indicates similarities – their study of nine countries indicated a condom-use prevalence in sexually active 15-year olds of 63-87% for boys and 55-86% for girls.

Condom use (NPHS 1996) for Manitoba adolescents 15-19 years old
About 82% of males and females had used a condom the last time the person had sexual intercourse.

There were no differences by age, family status, or gender. Middle/high income adolescents were more likely than low income adolescents (82% versus 59%) to have used condoms, and Urban (86%) more likely than either South Rural (73%) or the North (63%).

For Manitoba females (n=476) 15-19 years old in 1996, 20.6% (95% CI 13.5 to 27.7**)** reported taking birth control pills. The vast majority of birth control pill use was related to contraception. Of those females who were not sexually active (n=252), only 1.8% reported using birth control pills, compared to 42.4% (95% CI 27.7 to 57.1) who reported having sexual intercourse within the past 12 months (n=205).

The prevalence of female adolescents using birth control pills did not differ by family status (lone versus

Figure 4.12: Birth Control Pill Use by Manitoba Females Aged 15-19 Years, NPHS 1996

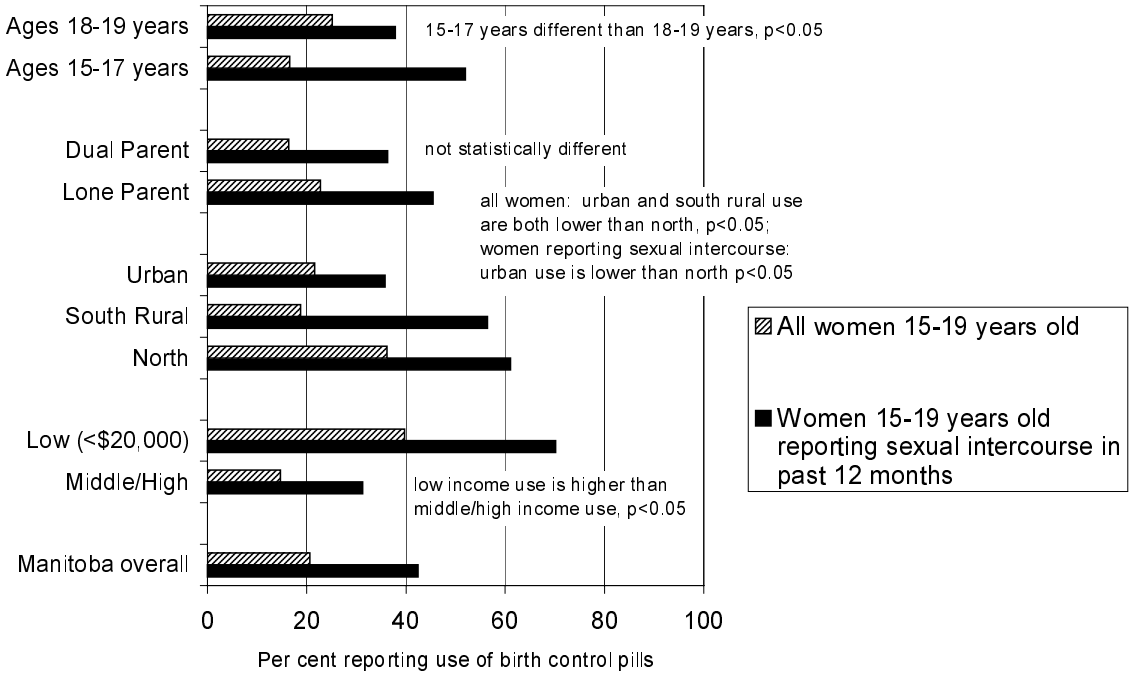
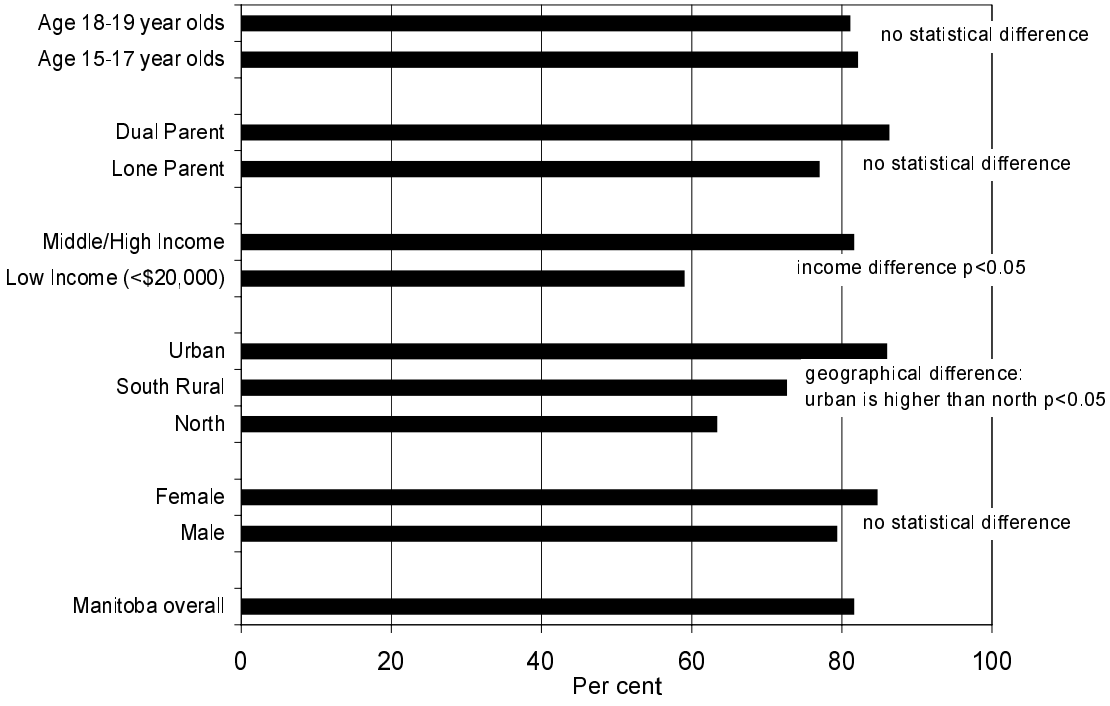


Figure 4.13: Condom Use (used condom last time) For Manitoba Adolescents Aged 15-19 Years Who had One or More Partners, At Least One Relationship For Less than 12 Months, NPHS 1996



dual parent families). But the overall prevalence, as well as the prevalence for females reporting sexual intercourse in the previous year, differed by age category, geographical location, and income group, as shown in Figure 4.12.

Females reporting having sexual intercourse within the previous year were more likely to use birth control pills in the 15-17 year old group (52%, 95% CI 27.4 to 76.4) than in the 18-19 group (38%, 95% CI 19.8 to 55.8), even though the overall prevalence of birth control pill use was lower in the younger age group (17% , 95% CI 8.2 to 24.9) compared to the older group (25%, 95% CI 13.1 to 37.3). These females in the South Rural(56%, 95% CI 43.6 to 69.2) and the North (61%, 95% CI 39.0 to 83.1) were also more likely to use birth control pills, compared to Urban females (36%, 95% CI 15.0 to 56.5). But the *overall* prevalence in the North, at 36% (95% CI 18.9 to 53.5) of females ages 15-19 years, was higher than in Urban (22%, 95% CI 8.9 to 34.2) or South Rural (19%, 95% CI 13.4 to 24.1) regions. Females in low income areas reporting sexual intercourse within the previous year were more likely to use birth control pills (70%, 95% CI 50.0 to 90.2) than in middle/high income areas (31%, 95% CI 14.4 to 48.1). And the *overall* prevalence in low income areas (40%, 95% CI 19.3 to 60.0) was more than double that of middle/high income areas (15%, 95% CI 7.6 to 21.8).

Birth control pill use by Manitoba females 15-19 years old (NPHS 1996)
About 21% of Manitoba females ages 15-19 years old reported using birth control pills. Of those who also reported having sexual intercourse within the previous year, 42% used birth control pills.

Factors influencing use of birth control pills by Manitoba females ages 15-19 years (NPHS 1996)

*The **overall prevalence** of birth control use was higher for females:*
Ages 18-19
Living in the North
Living in a low income area

Females 15-19 years old who reported having sexual intercourse within the past year were more likely to use birth control pills if they were:
**15-17 years old*
**residents of South Rural or North areas*
**in a low income area*

Key Points in this chapter

Teen pregnancy (Section 4.1)

- The Manitoba teen pregnancy rate 1994/95-1998/99 was 63.2 per 1000 females ages 15-19 years, with at least double the rates in the lowest urban income quintile group. This was higher than the 1994 Canadian rate of 40.2/1000. Teen pregnancy rates have been stable or slightly declining provincially from 1994/95 to 1998/99.

Onset of sexual activity (Section 4.3)

- About 1/3 of Manitoba adolescents ages 15 to 19 years reported having sexual intercourse within the

past year, with rates increasing with increasing age, from 9% of 15 year olds to 70% of 19 year olds.
- The proportion of adolescents 15 to 19 reporting having had sexual intercourse was higher for females, for adolescents living in lone parent families, for adolescents living in the North or Urban areas, and highest in the low income group and in the oldest adolescents (age 19 years).
- Of those adolescents 17 to 19 years old reporting having had sexual intercourse, the age at first intercourse was between age 10 to 14 years for about one-quarter (22.5%), and 15 to 16 for about half (47.8%). Urban and North adolescents reported younger ages compared to South Rural adolescents.

Contraceptive use (Section 4.5)
- The prevalence of birth control pill use by females ages 15 to 19 years was highest in the North, in low income areas, and in the oldest age category of 18 to 19 year olds.
- Birth control pill use by those females who reported having sexual intercourse within the previous year was highest in the 15 to 17 year old group, in South Rural and North areas, and in low income areas.
- Condom use (using a condom the "last time" a male or female had sexual intercourse) was highest in Urban areas, and in middle/high income areas.

An overview of the chapter by geographical area
- Urban Manitoba (Winnipeg and Brandon) had pregnancy rates similar to the Manitoba average of 62.3/1000 (Winnipeg slightly higher at 65.5/1000, Brandon lower at 53.1/1000). There were huge variations in Winnipeg sub-regions. Over 40% of urban 15-19 year olds reported having sexual intercourse within the past year. 21% of females 15 to 19 years old reported being on the birth control pill; of those who also reported being sexually active, only 1/3 were on the pill. Higher than average, 85% of urban males and females with short term partners reported using a condom during the last time they had sexual intercourse.

Urban chlamydia rates were mid-range in the province, at about 2% of females and 0.4% of males ages 15 to 19 years old.

- South Rural Manitoba had lower than average teen pregnancy rates (47/1000), but still slightly higher than the Canadian average and showing high variation by RHA (South Eastman and South Westman low; North Eastman, Parkland and Interlake higher). About 30% of South Rural 15 to 19 year olds reported having sexual intercourse within the past year. 19% of females ages 15 to 19 reported being on the birth control pill, but 56% of females reporting sexual intercourse in the past year were on the birth control pill. 72% of males and females reporting sexual intercourse in the past year also reported using a condom during the last time they had sexual intercourse. Rates of chlamydia were the lowest in the province for South Eastman, Central, South Westman, Interlake and Marquette. But North Eastman and Parkland were mid-range, similar to urban areas.
- The North (Norman, Burntwood and Churchill RHAs) had extremely high teen pregnancy rates (128/1000), double the Manitoba rate and triple the Canadian rate. There were similar patterns of reported sexual activity to urban youth, with about ½ of 15-19 year olds reporting having sexual intercourse within the preceding year. This area had the highest prevalence of females using the birth control pill at 36% of females ages 15 to 19 years, as well as the highest prevalence of sexually active females using the pill at 61%. Only 63% of males and females reported using a condom during the last time they had sexual intercourse, lower than any other area of Manitoba. The rate of chlamydia was highest in the province for both females and males in the 15 to 19 year old age group – for females, as high as 99/1000, or almost 10%, in Burntwood, and about 3% in Norman and Churchill.

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Anita Kozyrskyj

CHAPTER 5: HEALTH STATUS: CHILDHOOD ACUTE AND CHRONIC CONDITIONS

5.0 Introduction

Assessment of health status plays an important role in the planning, delivery and evaluation of the effectiveness of health care systems. Premature mortality has been accepted as a population health measure, but the measurement of child health has been problematic. Childhood mortality has been utilized as a measure of child health status, but has limitations because it is an uncommon event in childhood. Other common domains of child health are chronic illness and disability (Newacheck and Halfon 1998).

Domains of child health

The 1989 Convention on the Rights of the Child proposes a broad definition of health which describes a child's right to adequate circumstances for physical, mental, spiritual, moral and social development. Numerous child health status measures have been developed, ranging from simple scales assessing physical and mental health to activity continuums which assess the impact of illness on normal social role performance (Pal 1996).

To represent child health status, we have selected the following indicators: 1) lower respiratory tract infections, 2) chronic conditions (asthma, cardiovascular disease, Type I diabetes mellitus and seizure disorders) and 3) physical disabilities (spina bifida, cerebral palsy and paralytic conditions). These conditions impose a considerable morbidity burden for the child, in terms of limitations in function, and dependency on medications or technology (Newacheck and Halfon 1998, Stein et al 1993). Diseases such as cancer, AIDS and tuberculosis also impose a significant morbidity burden on the child; the number of Manitoba children affected with these conditions can be identified by disease surveillance registries in the province.

Child health in disease registries

- *1997 Annual Report Statistics, Cancer Care Manitoba*
- *CDC Surveillance System, Communicable Disease Control Unit, Public Health Branch, Manitoba Health*

The selected health indicators were identified on the basis of contact with the health care system over a one year period, or for asthma, cardiovascular conditions and seizure disorders, on the basis of health care contact or a prescription drug for the condition. Care must be taken in the inference of health status from these data sources subsequent to differential utilization of the health care system. Children living in rural areas may be less likely to contact the health care system than children living in urban areas. Further, physician contact and prescription use in nursing stations in northern Manitoba is under-recorded in health care

Impact of chronic conditions on the life of children [National Health Interview Survey, 1992/94 (Newacheck and Halfon 1998), National Health Interview Survey 1988 (Newacheck and Taylor 1992)]:

- ***% limited in usual activities***

asthma	*13-29*
heart disease	*14-22*
seizures	*58*
diabetes	*30*
spina bifida/ cerebral palsy	*12-89*

- ***% taking medications***

asthma	*85*
heart disease	*15*
seizures	*84*
diabetes	*82*
cerebral palsy	*24*

administrative databases. Lower health care contact or prescription use rates are observed in northern Manitoba as compared with Winnipeg (Table 5.1).

Table 5.1: Age-Standardized Per cent Health Care Contact By Children Aged 0-19 Years by Region, 1998/99

Region	Physician or Hospital Use	Prescription Use	Prescription, Physician, or Hospital Use
Winnipeg	83.6%	62.3%	86.3%
Brandon	82.4%	63.6%	85.1%
Rural South	78.1%	57.4%	80.8%
North	61.7%	47.4%	67.6%
Manitoba	79.7%	59.3%	82.6%

We assessed the face validity of defining chronic conditions according to diagnosis or prescription drug data by comparing the rate of children defined on this basis to the prevalence of children reported to have the condition in the Manitoba sample of the NLSCY and NPHS (Table 5.2). Recognizing the limitations of survey estimates of disease due to small sample sizes and wording of questions (i.e., ever had asthma versus current asthma), we felt that these surveys would provide an approximation of the prevalence. No comparisons were made for the Type I diabetes case definition, as it has been previously validated by comparison to the Diabetes Education Resource Database (Blanchard et al. 1997).

Table 5.2: Comparison of Treatment Prevalence Rates from Health Care Data (1996/97) and Disease Prevalence Rates from NLSCY (1994,1996) and NPHS (1996) Survey

Condition	Age (yr)	Drug/diagnosis definition*	95% CI	NLSCY 1994	NLSCY 1996	NPHS 1996	95% CI
Asthma	05-09 yr	11.00	10.70-11.30	11.70	12.20	12.40	7.90-16.99 M
	10-14 yr	9.00	8.80-9.30			10.40	6.14-14.58 M
	15-19 yr	7.70	7.50-8.00			12.70	8.13-17.25 M
Cardiovascular **	05-09 yr	0.45	0.40-0.52	0.96	1.22	0.84	0.34-1.35 M
	10-14 yr	0.58	0.52-0.66			0.64	neg0.04-1.32 U
	15-19 yr	1.11	1.02-1.21			0.54	0.13-0.95 U
Cardiovascular excluding stroke **	05-09 yr	0.27	0.23-0.32	0.96	1.22	0.84	0.34-1.35 M
	10-14 yr	0.42	0.37-0.49			0.64	neg0.04-1.32 U
	15-19 yr	0.89	0.81-0.98			0.54	0.13-0.95 U
Diabetes (Type I)	05-09 yr	0.11	0.08-0.14				
	10-14 yr	0.22	0.18-0.27				
	15-19 yr	0.37	0.31-0.43				
Seizures	05-09 yr	0.36	0.31-0.42	0.35	0.00	0.14	neg0.07-0.35 U
	10-14 yr	0.44	0.39-0.51			0.89	neg0.16-1.93 U
	15-19 yr	0.62	0.56-0.70			2.29	neg0.38-4.96 U

* diagnosis data from physician claims/hospital separations and drug data from prescription database
** change in drug/diagnosis definition, but survey question remains the same (see side bar)
M=marginal estimates due to high sampling variability, U=unacceptable estimates due to high sampling variability

Age-specific asthma treatment rates fell within the 95% confidence intervals for asthma prevalence

Impact of chronic conditions on the life of children [National Health Interview Survey, 1992/94 (Newacheck and Halfon 1998), National Health Interview Survey 1988 (Newacheck and Taylor 1992)]:

- ***average no. school days missed***
  - *asthma* — *5-9*
  - *heart disease* — *2-7*
  - *seizures* — *3*
  - *diabetes* — *3*
  - *spina bifida/ cerebral palsy* — *10-11*
- ***% hospitalized in last year***
  - *asthma* — *7-12*
  - *heart disease* — *8-13*
  - *seizures* — *19*
  - *diabetes* — *36*
  - *spina bifida/ cerebral palsy* — *12-20*
- ***average no. physician visits***
  - *asthma* — *5-10*
  - *heart disease* — *3-8*
  - *seizures* — *4*
  - *diabetes* — *8*
  - *spina bifida/ cerebral palsy* — *10-20*

NLSCY questions on asthma, cardiovascular and seizure disorders:

1. *Has ... ever had asthma that was diagnosed by a health professional?*
2. *Does ... have any of the following long-term conditions? (03) heart condition or disease, (04) epilepsy*

NPHS questions on asthma, cardiovascular and seizure disorders:

For children < 12 years old

See NLSCY questions

For children 12 years and older:

1. *Does ... have asthma?*
2. *Does ... have heart disease, high blood pressure or effects of stroke?*
3. *Does ... have epilepsy?*

reported on the NPHS survey, indicating similarity. The treatment rates of the other conditions were also similar to survey rates, but because of their low prevalence, survey rates were unreliable.

5.1 Findings

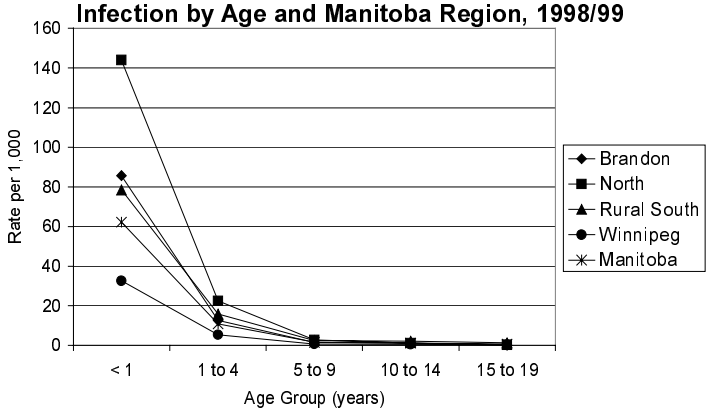
1) Lower respiratory tract infections

Hospitalization of children for respiratory conditions has declined over the past two decades, (Hodge et al. 1995) but our data show that infections/respiratory system conditions make up 10-20% of childhood mortality in children < 5 years old. In 1998/99, less than 1% of all children were hospitalized for a lower respiratory tract infection (LRI), which included pneumonia, bronchiolitis, bronchitis, and asthma (only in ages < 5 years in whom asthma and viral-associated wheezing are not easily differentiated). The prevalence rate of hospitalization for LRI in children < 1 years old (6 per 100) was 60 times higher than the rate in adolescents, but declined dramatically by the age of five (Figure 5.1). Hospitalization for LRI in infants was significantly greater in northern and southern rural regions, than in Winnipeg, and remained so until the age of 10 years.

Infectious and respiratory system cause of mortality in Manitoba children, 1994-1998:

< 28 days old	*12%*
29 days-1 year	*19%*
1-4 years	*11%*
5-9 years	*9%*
10-14 years	*3%*
15-19 years	*5%*

Figure 5.1: Rate of Children with at Least One Hospitalization for Lower Respiratory Tract Infection by Age and Manitoba Region, 1998/99



As hospitalization for LRI represents the greatest burden in children less than 5 years old, more detailed regional comparisons are presented for this age group. The prevalence rate of LRI hospitalization was highly correlated with the healthiness of the RHA populations (Spearman rank correlation =0.66,

p<0.02). The rate of children < 1 years old hospitalized for LRI was significantly higher in Norman, Burntwood and Parkland, than the southern rural and the provincial average (Figure 5.2). LRI hospitalization was also highly correlated with the healthiness of populations in Winnipeg communities (Spearman rank correlation =0.61, p<0.04) (Figure 5.3). Children living in the Point Douglas area were significantly more likely to be hospitalized for LRI than all Winnipeg children combined (Figure 5.3). Of note, the prevalence rate of LRI hospitalization in northern RHAs (15 per 100 children) was 10-fold greater than the rate for children living in the Winnipeg communities with the healthiest populations. Similar regional trends in LRI hospitalization were observed in children 1-4 years old (Figures 5.4 and 5.5).

Figure 5.6: Rate of Children Aged < 1 Year With at Least One Hospitalization for Lower Respiratory Tract Infection by Rural Income Quintile, 1998/99

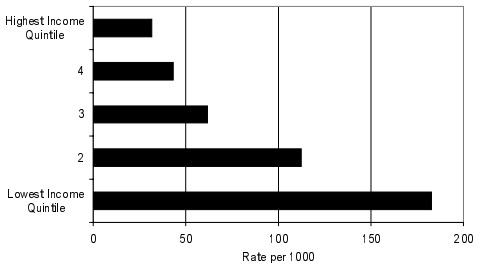
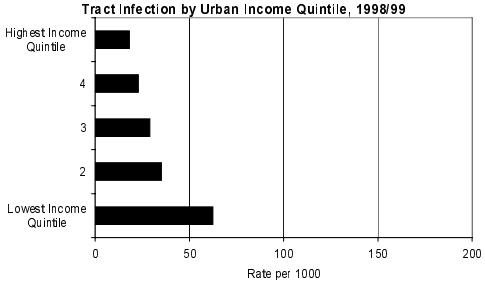


Figure 5.7: Rate of Children Aged < 1 Year With at Least One Hospitalization for Lower Respiratory Tract Infection by Urban Income Quintile, 1998/99



Hospitalization for LRI represents only the "tip of the iceberg" for all LRI morbidity as shown by the rates of LRI hospitalization and physician contacts (Figure 5.2). However, under-reporting of physician contacts in nursing stations makes this a less useful measure for comparisons across RHAs. Furthermore, variation in hospitalization for LRI may exist within regions. We observed increases in LRI hospitalization with decreasing neighbourhood income; (Figures 5.6 and 5.7) this gradient effect was substantially steeper in rural areas (Cochran-Armitage trend test, p<0.0001). Higher LRI hospitalization rates in children <2 years old have been reported in US geographic areas characterized by poverty, than in areas which have lower rates of poverty (McConnochie et al. 1995). A variety of risk factors for LRI have been associated with living in a low income household (Graham 1990).

Social environment risk factors for LRI: (Graham 1990)

- *crowded living conditions*
- *large family size*
- *household smoking*
- *lower breast-feeding*
- *environmental pollutants*

2) Asthma

Chronic conditions in childhood are not common. Asthma is the most frequent condition, and accounts for considerable morbidity in the child. On the basis of physician diagnosis or prescription use for asthma in 1998/99, 10% of school-age children (5-19 years old) had asthma, similar to the prevalence reported by the recent Canadian Student Lung Health Survey (Health Protection Branch 1998). However, not all

Morbidity of asthma in schoolchildren: (Student Lung Health Survey 1995/96)

- *17% experienced daily symptoms*
- *64% had sleep disturbance due to asthma*
- *19% had visited an emergency room for asthma treatment*
- *4% were hospitalized for asthma*
- *16% had missed more than one week of school because of asthma*

Figure 5.2: Rate of Children Aged < 1 Year With at Least One Health Care Contact for Lower Respiratory Tract Infection by RHA, 1998/99

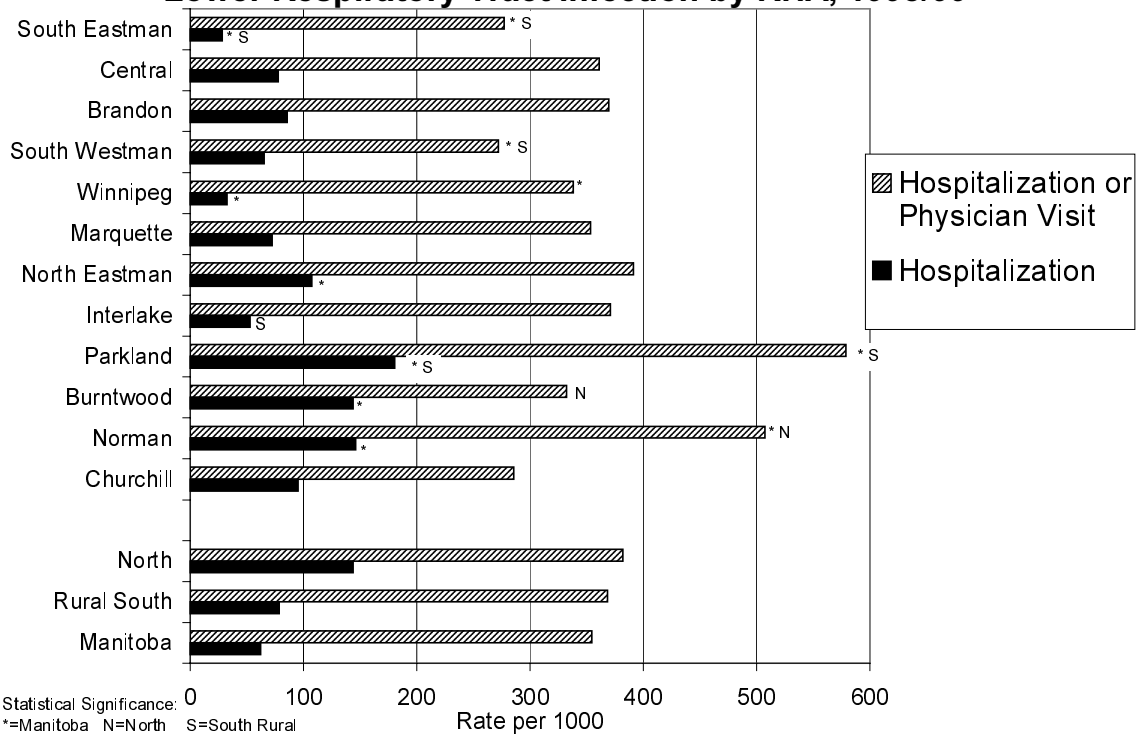


Figure 5.3: Rate of Children Aged < 1 Year With at Least One Health Care Contact for Lower Respiratory Tract Infection by WCA, 1998/99

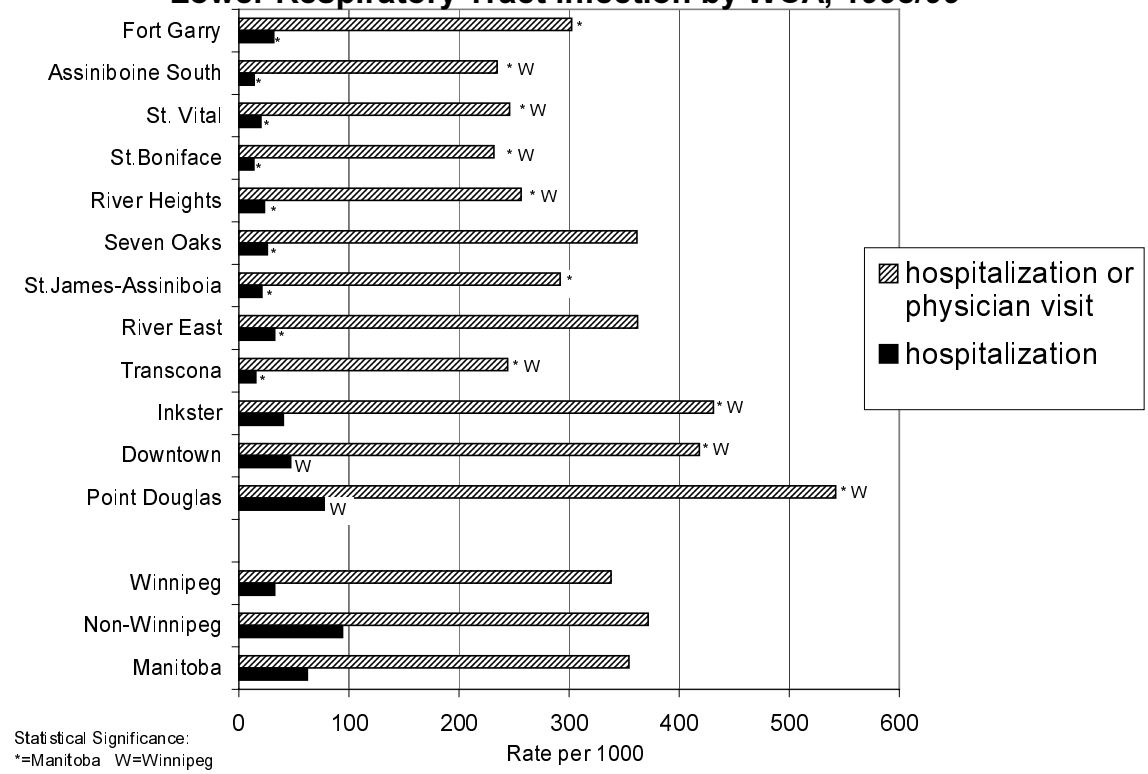


Figure 5.4: Rate of Children Aged 1-4 Years With at Least One Hospitalization for Lower Respiratory Tract Infection by RHA, 1998/99

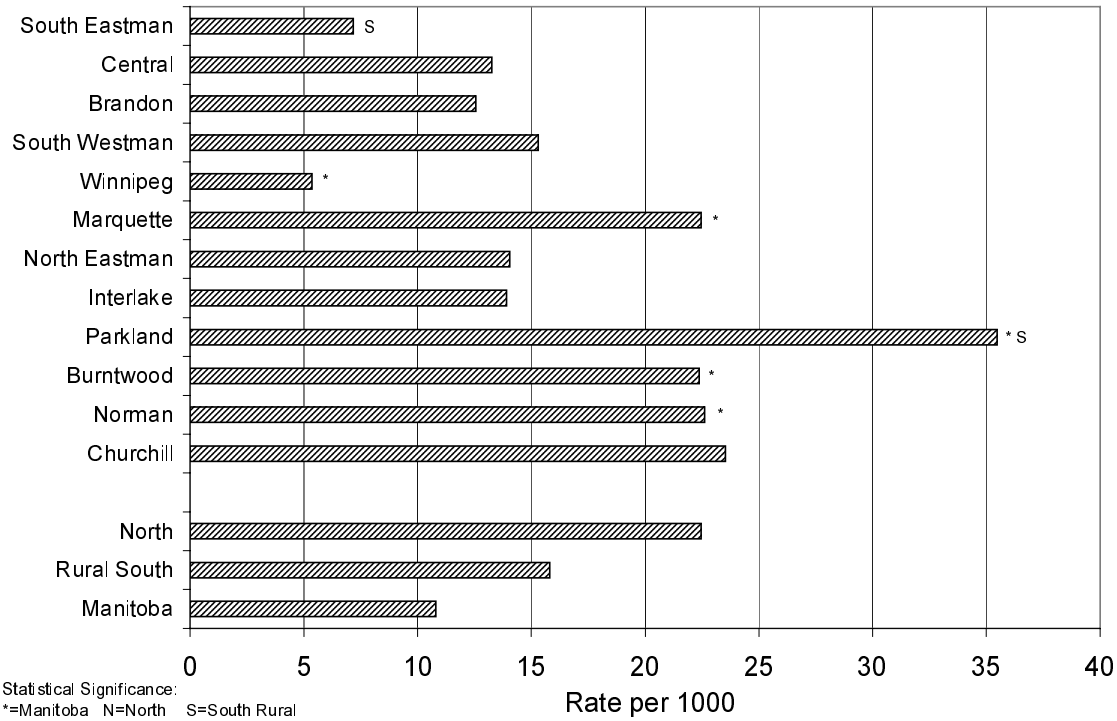
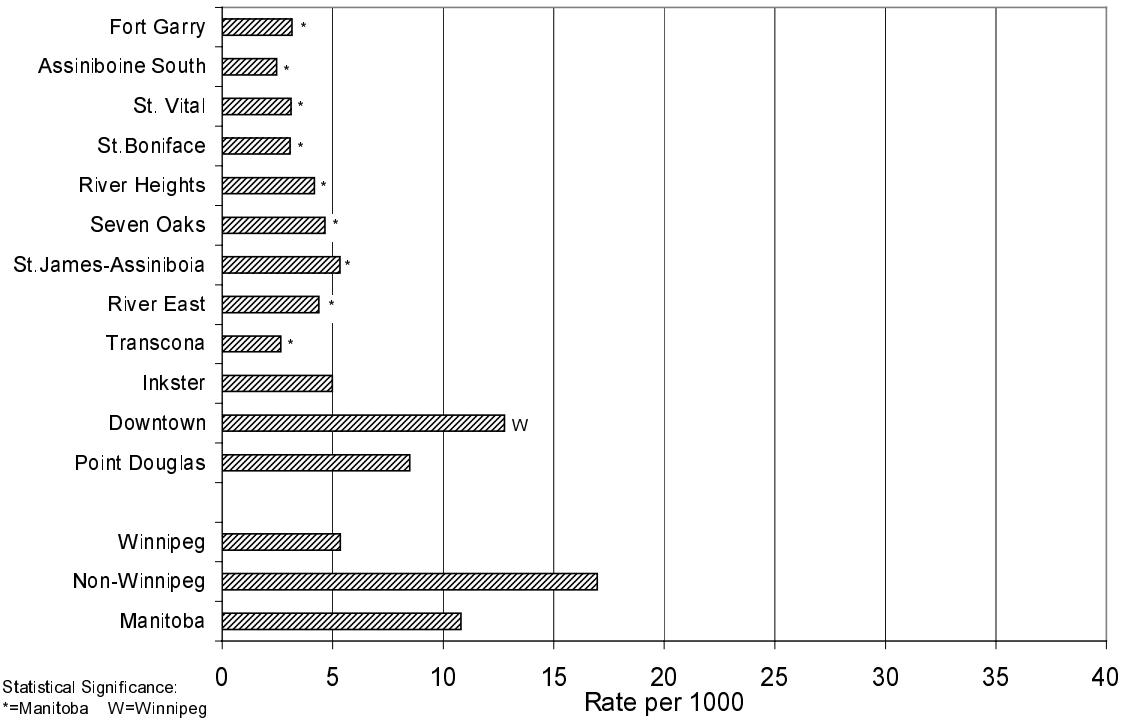
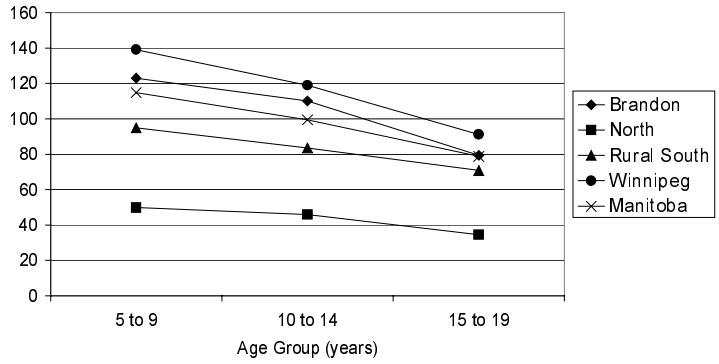


Figure 5.5: Rate of Children Aged 1-4 Years With at Least One Hospitalization for Lower Respiratory Tract Infection by WCA, 1998/99



children with asthma symptoms will continue to have asthma. We observed that the treatment prevalence for asthma declined from 11.5% in children 5-9 years to 8% in adolescents, compatible with the "growing out of asthma" phenomenon (Figure 5.8) (Barbee and Murphy 1998).

Figure 5.8: Rate of Children with at Least One Health Care Contact or Prescription Drug for Asthma By Age and Manitoba Region, 1998/99



What happens to the child with asthma? (Barbee 1998)

- *50% of children with an asthma diagnosis at age 5 years no longer have a diagnosis of asthma at age 10 years*

Regional comparisons of asthma treatment show that rates are highest in Winnipeg (and Brandon in younger children), followed by southern rural areas, and then by the North (Figure 5.8). Much lower rates in northern Manitoba may be due to missing data on physician visits and prescriptions dispensed in nursing stations. However, relative differences in asthma treatment between Winnipeg and northern Manitoba (Winnipeg/North ratio=2.7) were in excess of overall differences in health care contact between the two regions (Winnipeg/North ratio=1.3, Table 5.1), suggesting that other factors may be operative. Lower asthma treatment prevalence rates may be attributed to lower health care contact rates, but our definition of asthma treatment which also includes prescription drug use, diminishes this source of variation. Children are more likely to take their asthma medication during a year than to visit a physician for asthma care (Health Protection Branch 1998).

Health care use of school children with asthma: (Student Lung Health Survey 1995/96, Health Protection Branch, 1998)

- *72% had seen a doctor in the previous 12 months*
- *90% had been taking an asthma medication in the previous year*

Our observations of lower asthma treatment rates in northern and southern rural regions do have some biological plausibility. Firstly, a lower prevalence of asthma has been reported in aboriginal children

(Pasterkamp et al. 1996, Whybourne et al. 1999). Second is the cleanliness hypothesis that children exposed to "germs" at an earlier age are much less likely to get asthma, which has been proposed to explain geographical differences in asthma prevalence (Cookson 1997). Northern and southern regions were also more likely than Winnipeg to have infants with lower respiratory tract infections.

…" asthma prevalence has increased because of something lacking in the modern environment, rather than through the positive actions of some toxic factor. Childhood infections may, therefore, paradoxically protect against asthma." (Cookson 1997)

Inter-RHA comparisons reaffirm the north-south-Winnipeg difference in treatment prevalence for asthma in children (Figures 5.9-5.14). Winnipeg rates for asthma treatment were significantly higher than the southern rural average for all age groups, and Brandon rates were higher in children less than 15 years old. Northern RHAs had a treatment prevalence similar to the northern average, but some differences were observed for RHAs in southern regions. In addition to Winnipeg and Brandon, the asthma treatment prevalence rate was significantly higher in the Interlake region than the southern rural average; Interlake rates were comparable to Winnipeg rates. Within Winnipeg, most asthma treatment rates did not differ by community from the Winnipeg average, but a significantly higher rate was observed in the St. James-Assiniboine area for children 10 years of age and older.

Other chronic conditions in childhood are much less common than asthma, especially among younger children.(West 1997, Mustard et al 1997) On the basis of physician visits, hospitalization or prescription drug data, 1.2% of children, aged 15-19 years, had a cardiovascular condition, 0.7% had a seizure disorder, and 0.3% had Type I diabetes mellitus. Data are presented for all cardiovascular conditions, and cardiovascular conditions, excluding cerebrovascular (e.g. stroke) and vascular disorders for two reasons. Firstly, parents may not view vascular diseases as "heart conditions" and the latter category allows for some standardization in comparisons with survey data (survey question on heart disease is compared to both versions of the cardiovascular definition). Secondly, diagnoses in the latter category (e.g. ischemic heart disease) have a greater link to risk factors such as smoking and obesity, which may appear in childhood.

Figure 5.9: Rate of Children Aged 5-9 Years With at Least One Health Care Contact or Prescription Drug for Asthma by RHA, 1998/99

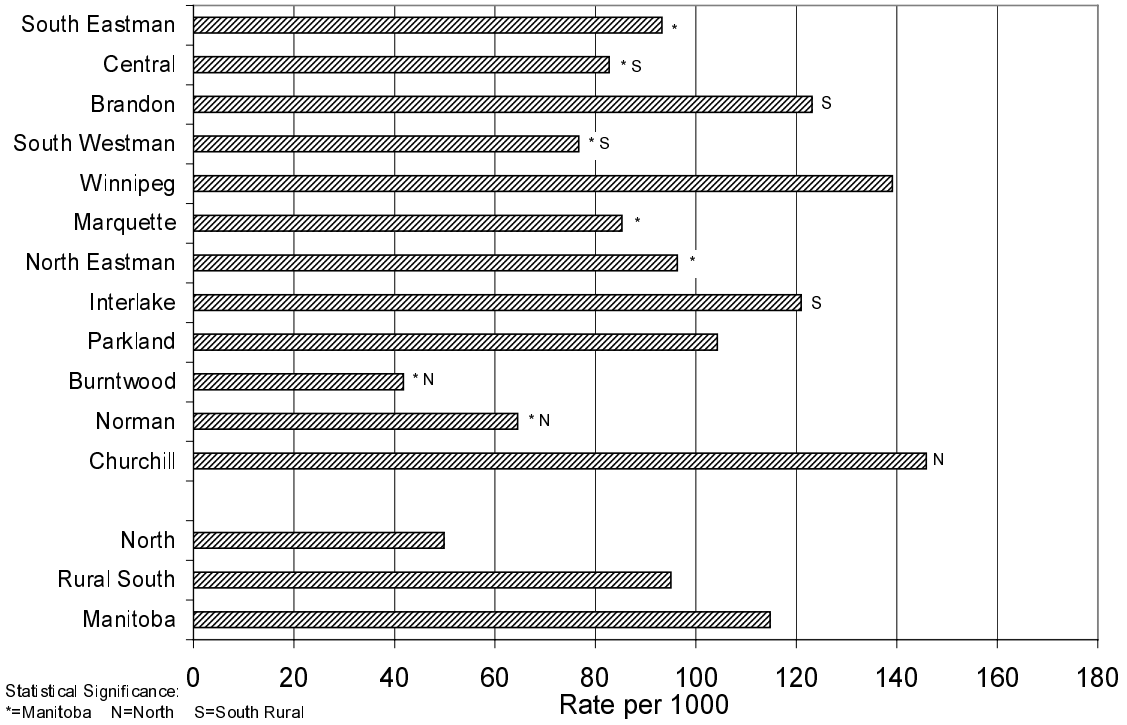


Figure 5.10: Rate of Children Aged 5-9 Years With at Least One Health Care Contact or Prescription Drug for Asthma by WCA, 1998/99

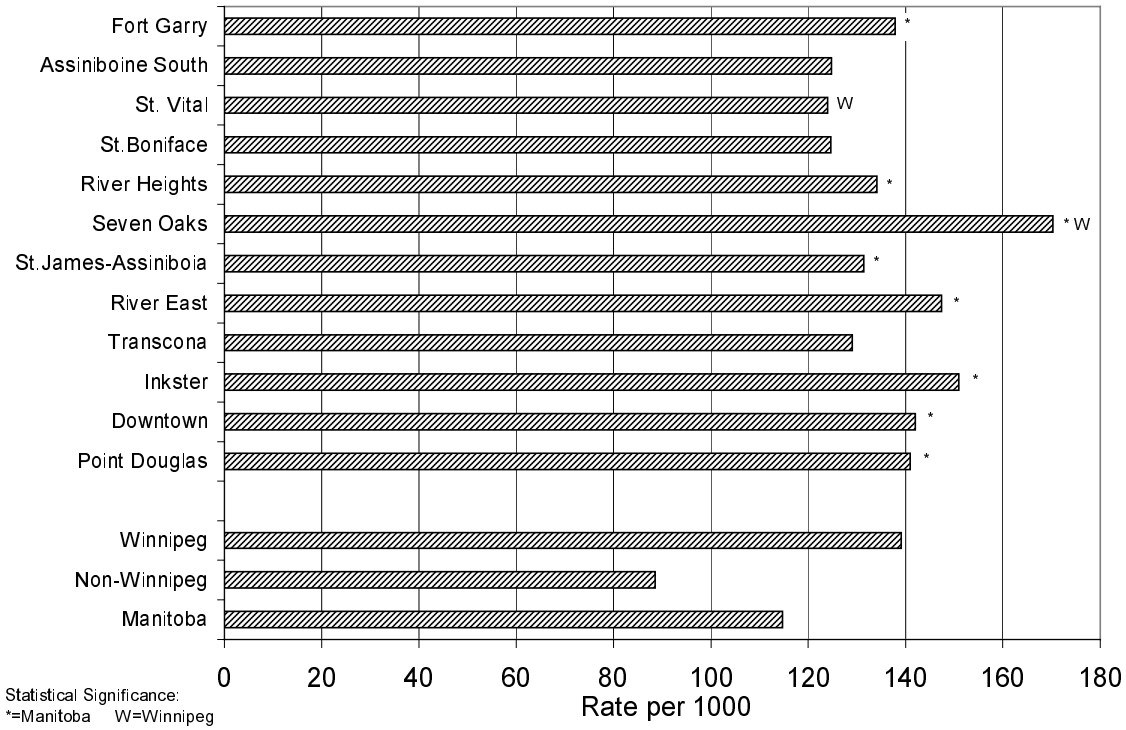


Figure 5.11: Rate of Children Aged 10-14 Years With at Least One Health Care Contact or Prescription Drug for Asthma by RHA, 1998/99

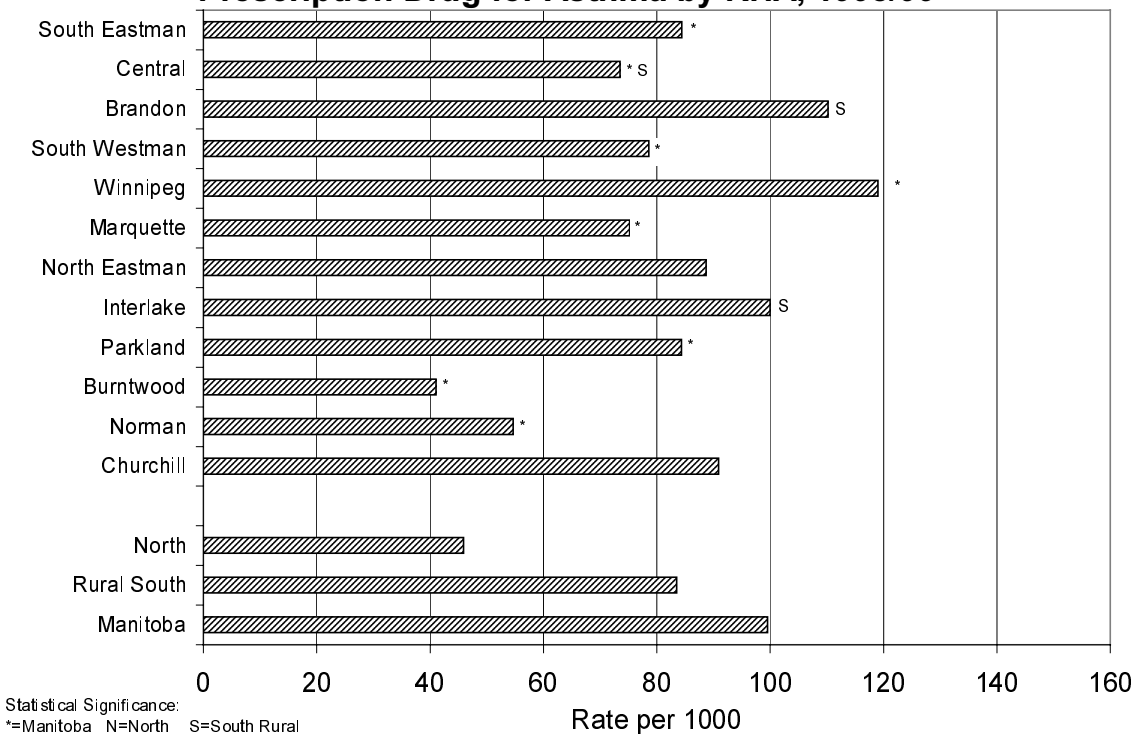


Figure 5.12: Rate of Children Aged 10-14 Years With at Least One Health Care Contact or Prescription Drug for Asthma By WCA, 1998/99

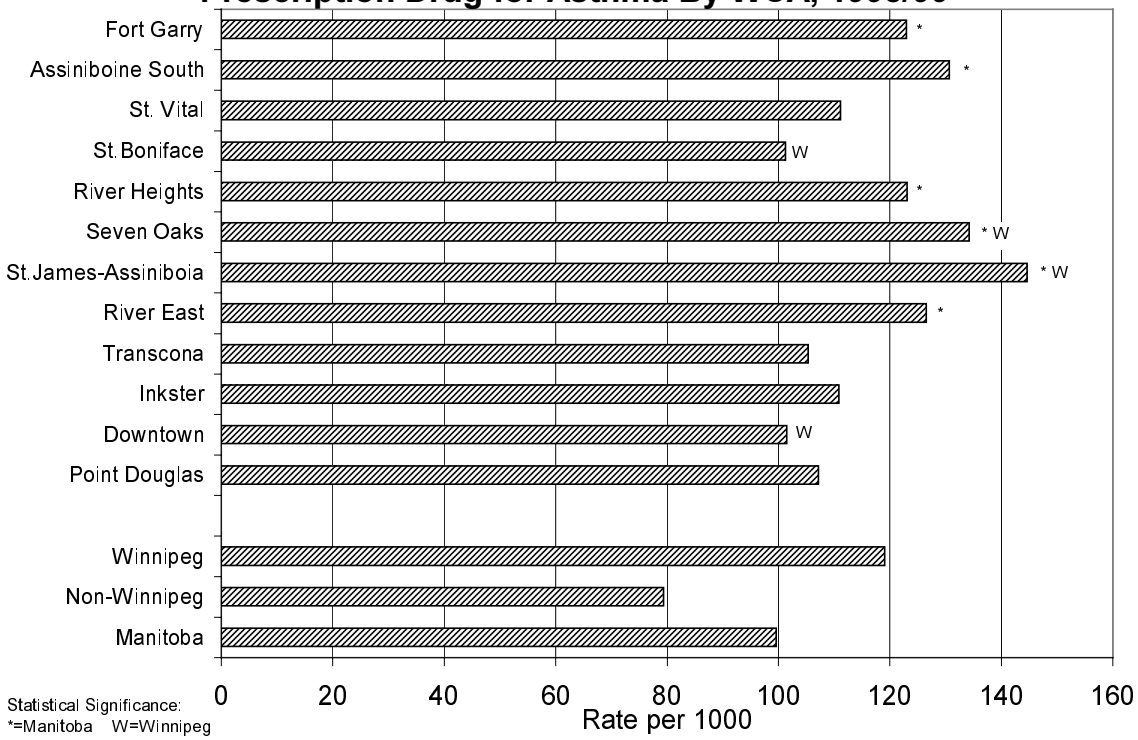


Figure 5.13: Rate of Children Aged 15-19 Years With at Least One Health Care Contact or Prescription Drug for Asthma by RHA, 1998/99

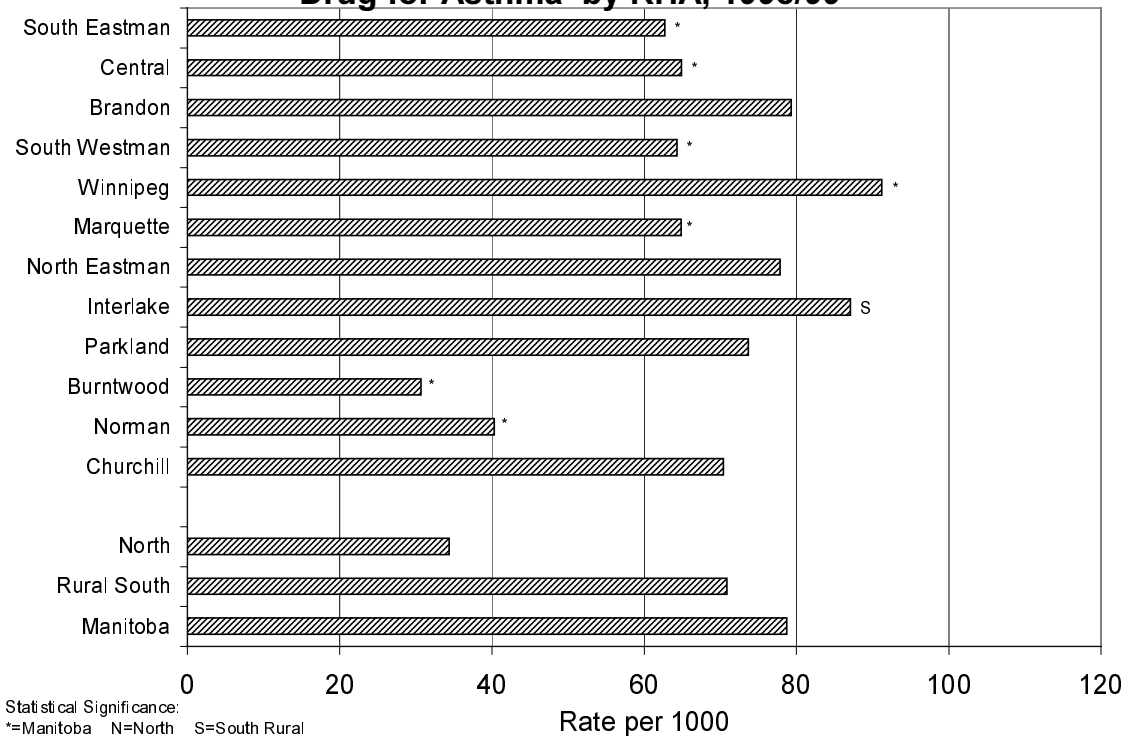
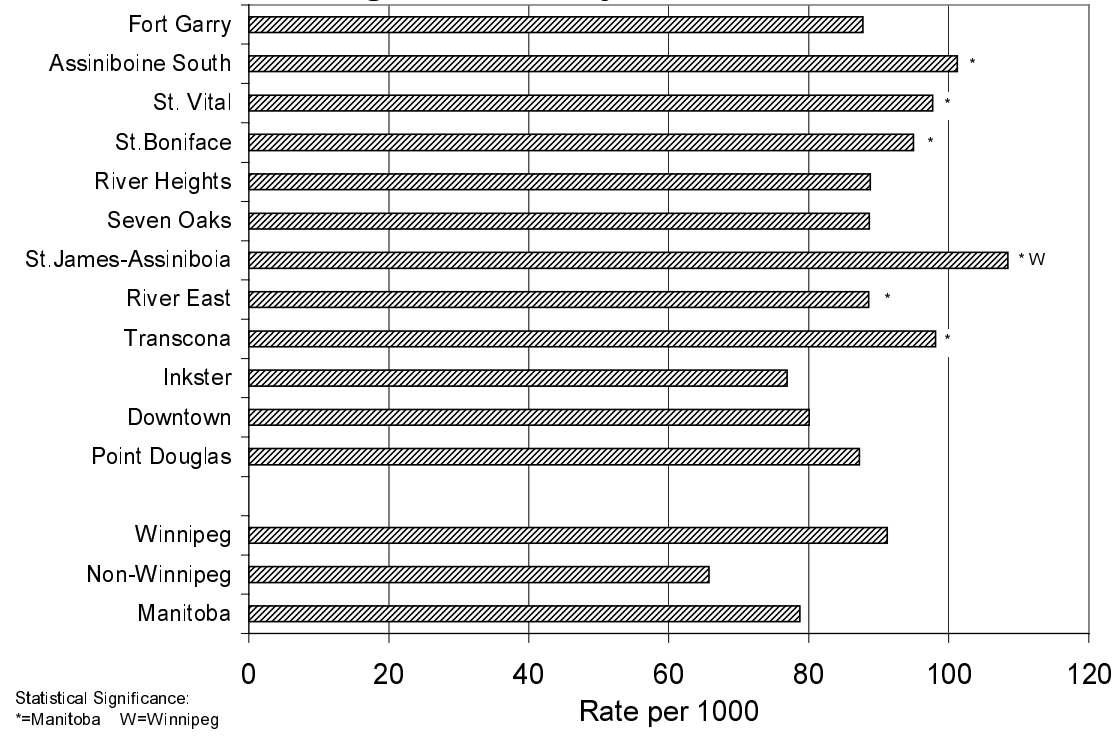


Figure 5.14: Rate of Children Aged 15-19 Years With at Least One Health Care Contact or Prescription Drug for Asthma by WCA, 1998/99



As in 1996/97 (Table 5.2), the treatment prevalence for these conditions in 1998/99 increased with age and no differences were seen between Winnipeg, the northern average, the southern rural average and Winnipeg in any of the age groups (data not shown). As children with these conditions are referred to specialists in Winnipeg, missing health care data or differential health care contacts are not as significant data validity issues.

Although the treatment prevalence of cardiovascular conditions, seizure disorders and type I diabetes among children aged 15-19 years in some regions appeared higher than regional averages, no differences were statistically significant (Figures 5.15-5.20). However, comparisons of the treatment prevalence of cardiovascular conditions by neighbourhood income area in children 5-9, 10-14 versus 15-19 year olds, document the beginnings of a gradient effect (Figure 5.21). Higher cardiovascular condition rates were observed with decreases in neighbourhood income in urban areas [Cochran-Armitage trend test for 5-9 year olds (NS), for 10-14 year olds ($P<0.05$), for 15-19 year olds ($P<0.10$)] and rural areas. This phenomenon has been documented by others, and has been attributed to the differential acquisition in children of risk factors, such as sedentary lifestyle and smoking, by household income (West 1997, Leino et al. 1996).

Figure 5.21: Rate of Children with at Least One Health Care Contact or Prescription Drug for Cardiovascular (CVS) Conditions by Age and Urban Income Quintile, 1998/99

Physical disability can be the outcome of the prenatal period or of events later in childhood. In 1998/99, less than 1% of children were found to have spina bifida, cerebral palsy or paralytic conditions, determined on the basis of their health care utilization records from birth (some conditions are diagnosed around the time of birth and subsequent health contacts may not record original diagnosis (Palfrey et al. 1987). Figure 5.22 shows age-standardized disability rates by Winnipeg, Brandon, and northern and southern Manitoba. Winnipeg and northern regions were more likely to have children with these disabilities, but the only statistically significant difference was between northern versus southern rural rates of cerebral palsy/paralytic conditions. These disabilities represent a major interference with the

Figure 5.15: Rate of Children Aged 15-19 Years With at Least One Health Care Contact or Prescription Drug for Type I Diabetes by RHA, 1998/99

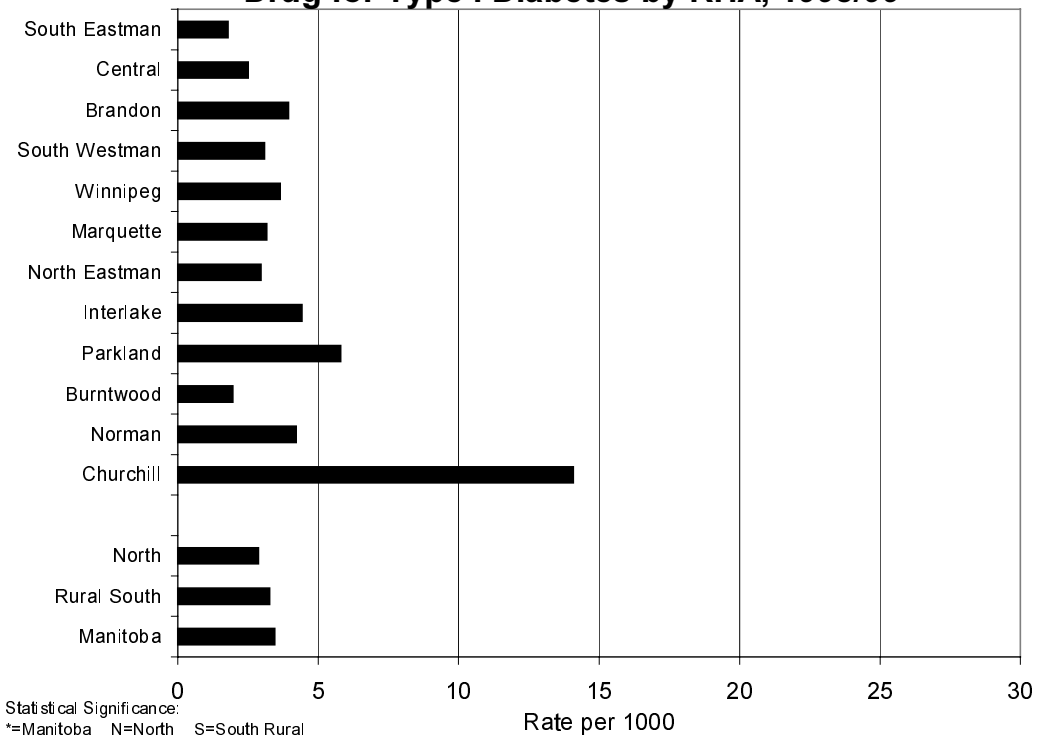


Figure 5.16: Rate of Children Aged 15-19 Years With at Least One Health Care Contact or Prescription Drug for Type I Diabetes by WCA, 1998/99

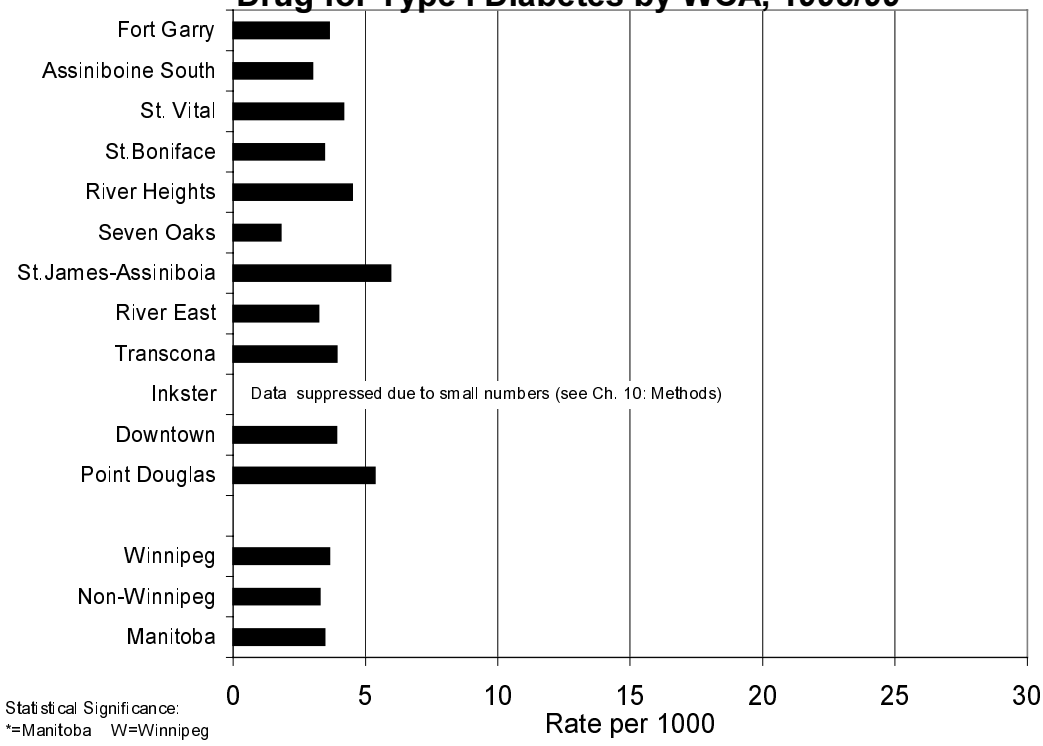


Figure 5.17: Rate of Children Aged 15-19 Years with at Least One Health Care Contact or Prescription Drug for Cardiovascular (CVS) Conditions by RHA, 1998/99

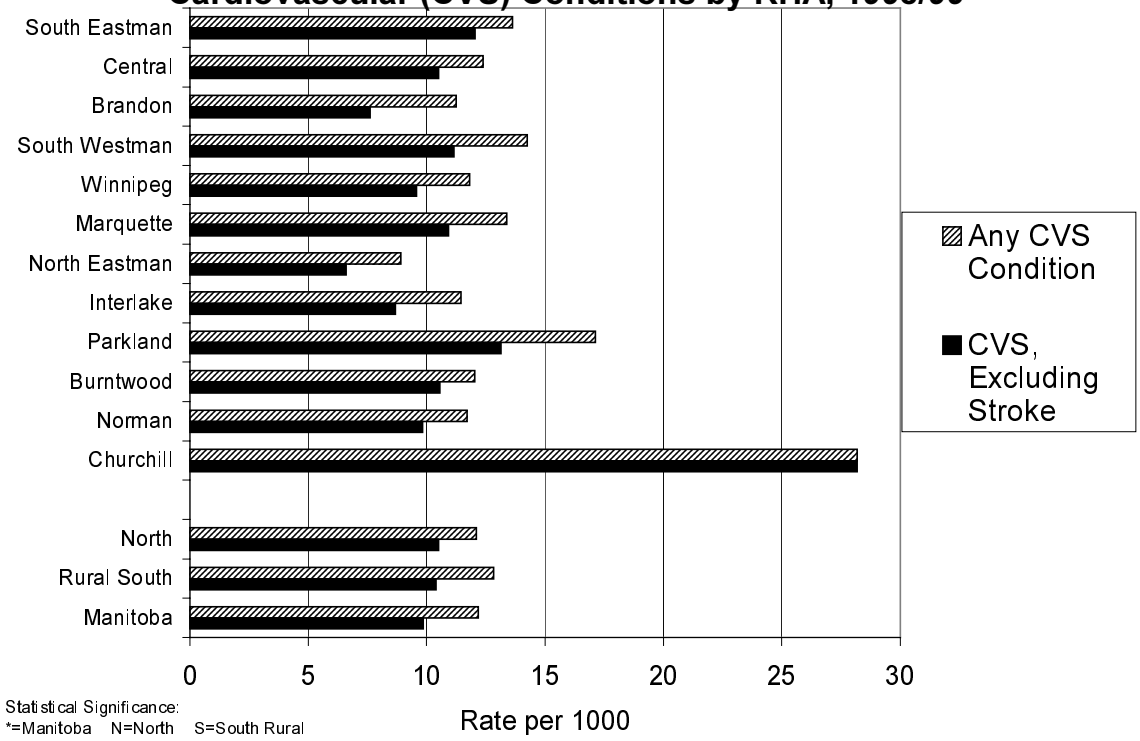


Figure 5.18: Rate of Children Aged 15-19 Years with at Least One Health Care Contact or Prescription Drug for Cardiovascular (CVS) Conditions by WCA, 1998/99

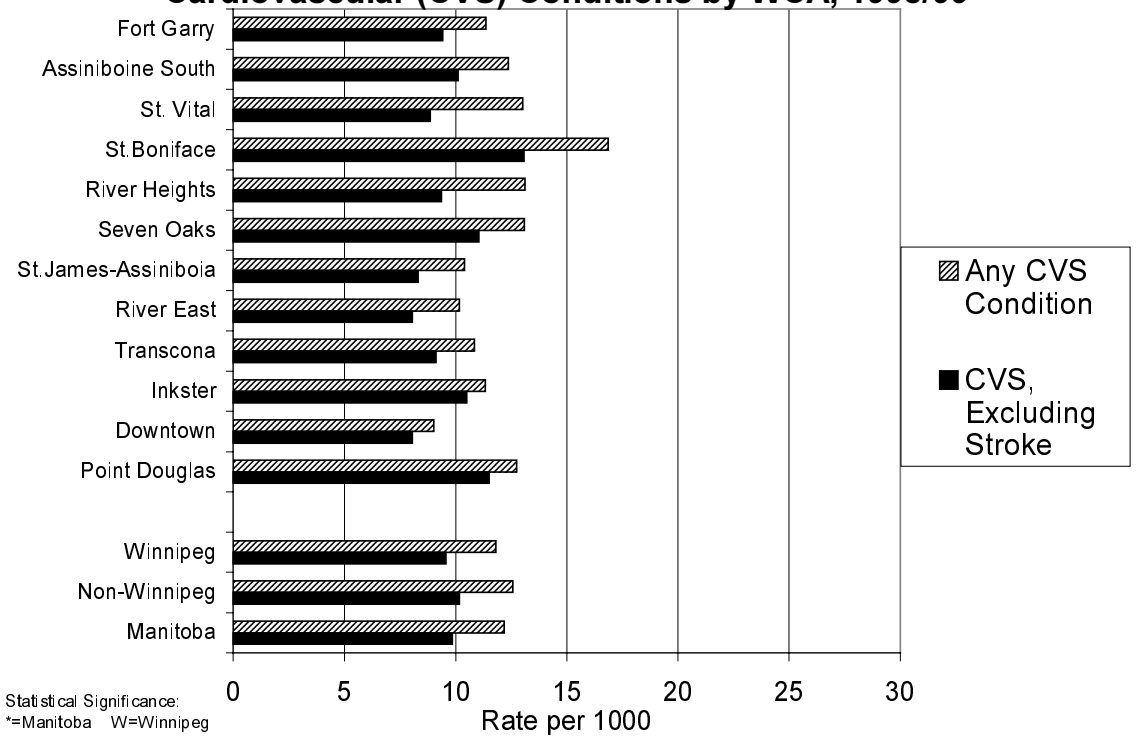


Figure 5.19: Rate of Children Aged 15-19 Years with at Least One Health Care Contact or Prescription Drug for Seizure Disorders by RHA, 1998/99

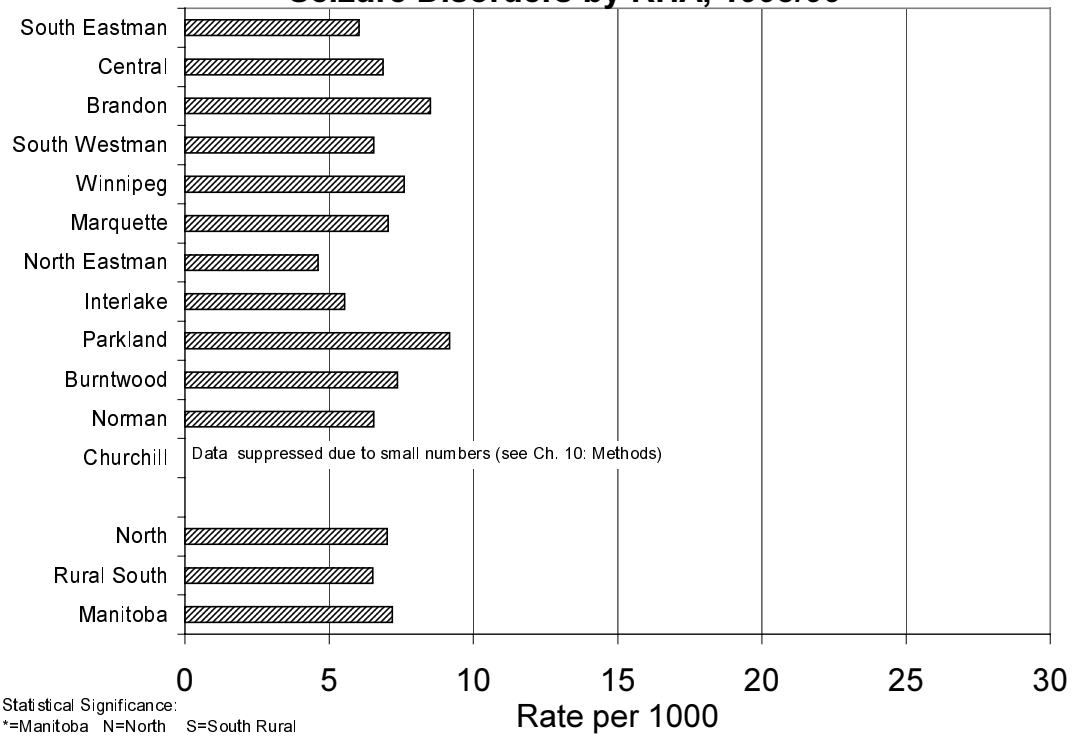
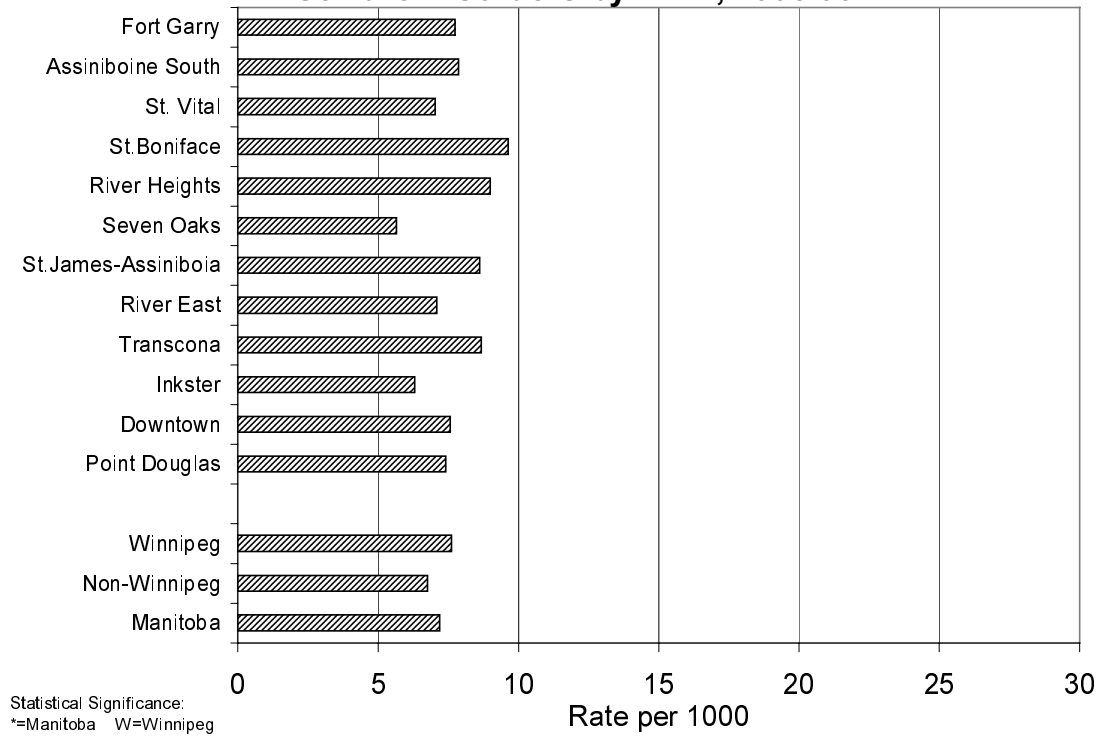
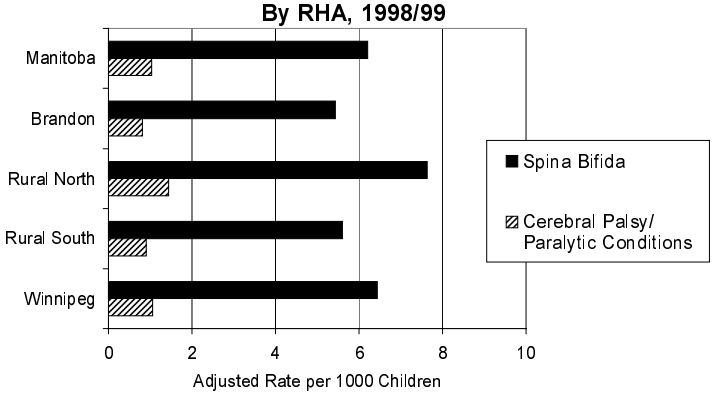


Figure 5.20: Rate of Children Aged 15-19 Years with at Least One Health Care Contact or Prescription Drug for Seizure Disorders by WCA, 1998/99



activities of these children, significant consumption of health care services, and a high level of dependence on families for personal care (Blum et al. 1991).

Figure 5.22: Rate of Children Aged 0-19 Years With a Major Physical Disability By RHA, 1998/99



Key Points in this chapter

- Six percent of Manitoba children < 1 years old were hospitalized for lower respiratory tract infection.
- Infants were more likely to be hospitalized for lower respiratory tract infections if they lived in the less healthy populations of RHAs, Norman, Burntwood and Parkland, and of Winnipeg communities such as Point Douglas.
- The rate of children hospitalized for LRI in northern RHA's (15 per 100) was 10-fold greater than the rate for children living in Winnipeg communities with the healthiest populations.
- Asthma was the most common childhood chronic condition; 10% of school-age children were treated for asthma, and 1 % or less of adolescents were treated for cardiovascular conditions, seizure disorders or Type 1 diabetes
- Higher asthma treatment rates were documented for children living in Winnipeg than the southern rural average.
- Asthma treatment rates in Winnipeg were much higher than rates in northern Manitoba (Winnipeg/North ratio=2.7), far in excess of differences in overall health care contact (Winnipeg/North ratio=1.3).
- No regional differences in treatment rates for

cardiovascular conditions, Type I diabetes and seizure disorders were observed.

- The treatment prevalence of cardiovascular disease increased with decreasing neighbourhood income in children 10 years of age and older.
- Treatment rates for cerebral palsy and paralytic conditions were higher in northern Manitoba than the southern rural average.

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Marni Brownell

CHAPTER 6: HEALTH STATUS: INJURIES

6.0 Introduction

Injuries are the leading cause of death among Canadian children between the ages of 1 and 19. In 1995, over 30% of the deaths to Canadian children under 20 years were the result of injuries, compared to 5% for cancer and 1.8% for infectious diseases (Health Canada 1998). In Manitoba, injuries account for over half of all deaths to children between 1 and 9 years of age, and about three-quarters of all deaths between 10 and 19 years of age. (Please see the section on child mortality in Chapter 2, Demographics and Conceptual Framework for a breakdown of causes of childhood mortality.) Most of these injury-related deaths are preventable. Fifty-nine of the 60 child and adolescent injury deaths in Manitoba in 1997 were deemed preventable by The Paediatric Death Review Committee (1997).

Injury vs. "Accident"

Referring to injuries as "accidents" implies that these incidents are beyond our control. Using a more appropriate term such as "injury" allows us to see these incidents are predictable events, and enables us to focus on the causes of injuries and develop preventive strategies.

For further information please see http://www.smartrisk.ca

Mortality represents only part of the story of injuries. Recent estimates suggest that for every injury-related death there are 40 hospitalizations and an estimated 670 emergency room visits for treatment of injuries for Canadian children (Health Canada 1999). Injuries are responsible for about one-sixth of all hospitalizations for Canadian children between the ages of 0 and 19 years (Health Canada 1998). In this chapter we report injury mortality rates and injury hospitalization rates. Rates of visits to physicians' offices and hospital emergency rooms are not included in the analyses. Also excluded are injuries resulting from misadventures during surgical or medical care, and adverse drug reactions.

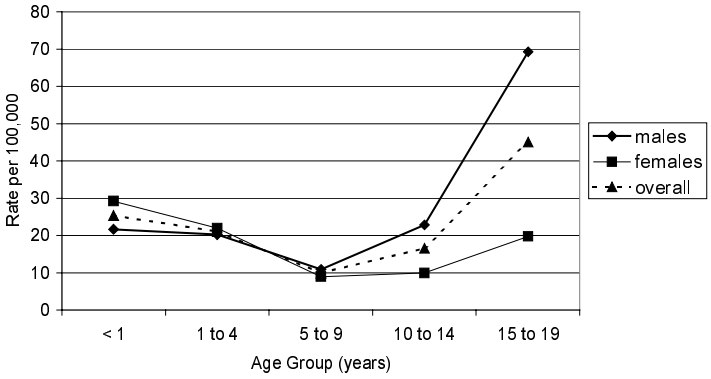
The Manitoba Injury Data Resource (1998) is a comprehensive report prepared by the Manitoba Health Epidemiology Unit in collaboration with Injury Prevention Centre of Children's Hospital (website http://www.hsc.mb.ca/impact*). This report provides cause-specific mortality and hospitalization rates by age, cause-specific mortality and hospitalization rates by RHA, and overall mortality and hospitalization rates by age by RHA for 1996. This report is currently being updated and expanded. For more information please contact the Epidemiology Unit, Public Health Branch, Manitoba Health.*

6.1 Age and gender differences in injury

Injury mortality and hospitalization rates differ by age and by gender. Injury mortality rates by age for Manitoba children form a j-shaped curve, with rates decreasing after the first year of life and then increasing again after age 14 years (Figure 6.1). The

highest rate of injury deaths is found in the oldest (15 to 19 years) age category, with the second highest death rates in the youngest (less than one year) age category, and the lowest mortality rate for those in the 5- to 9-year-old category.

Figure 6.1: Injury Mortality Rates By Age and Gender, 1994-1997



National age and gender differences

In Canada in 1996, 1,280 (16.0/100,000) children between the ages of 0 and 19 years died from injuries, constituting 30.5% of all deaths in this age group. Males had much higher injury mortality rates (21.5/100,000) than females (10.2/100,000). The injury mortality rates were higher in the 15-19 year age group (39.0/100,000) than at younger ages, and comprised 74.8% of all deaths for this age group (Health Canada 1999).

The injury mortality rate for Manitoba males 0 to 19 years is almost twice as high as that for females (4-year rates, males – 30.4/100,000, females – 15.4/100,000). Figure 6.1 shows that females have a higher mortality rate in the first year of life; however, due to the small number of deaths at this age group, and because this pattern is contrary to what is found in national datasets, it is most likely due to random fluctuations that could differ should different years of data be examined. Gender differences are minimal between 1 and 9 years of age, and begin to reappear at 10 to 14 years of age, with males having higher injury mortality rates than females. The greatest gender differences occur at 15 to 19 years of age, with males having an injury mortality rate over three and a half times higher than females (males – 69.3/100,000, females – 19.8/100,000). Figures showing regional breakdowns of injury mortality rates by age and gender are available from the authors on request.

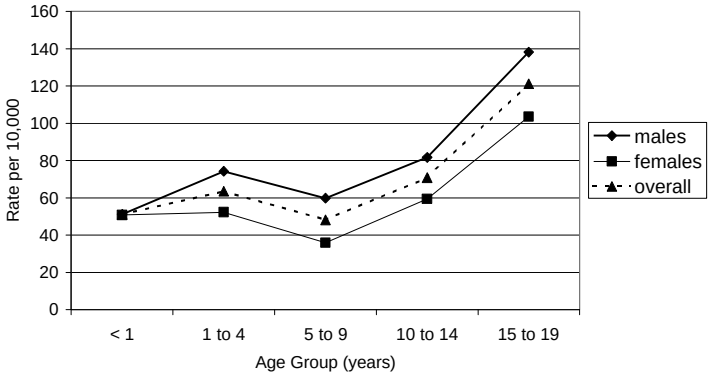
Hospitalization rates for Manitoba children increase slightly after the first year of life, then drop after the 1- to 4-year-old category and increase after the 5- to 9-year-old category, with the most dramatic increase in the 15- to 19-year-old category (Figure 6.2). As was found with mortality rates, males have a higher

Developmental changes in injuries

As children develop their capabilities change and this has implications for where on their bodies injuries are sustained. Survey data from the 1996 National Population Health Survey

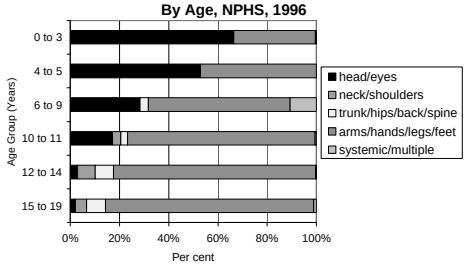
rate of injury hospitalization than females (males – 86.8/10,000, females – 62.2/10,000), with the differences starting younger (at 1 to 4 years) than was seen with mortality rates, but being much less dramatic. Figures showing regional breakdowns of injury hospitalization rates by age and gender are available from the authors on request.

Figure 6.2: Injury Hospitalization Rates By Age and Gender, 1994/95 - 1998/99



(NPHS) on injuries that resulted in a limitation of normal activities (these would include both hospitalized and non-hospitalized injuries) show that over 60% of the injuries to infants and toddlers occur to their heads (Figure 6.3 below). This per cent steadily declines, so that by 15 to 19 years, less than 5% of the injuries sustained occur to the head. Injuries to arms, hands, legs and feet increase as children develop. Up to age 3, injuries to these extremities account for less than 35% of the total injuries to this age group; by 15 to 19 years, they account for almost 85% of the total injuries sustained.

Figure 6.3: Per cent Body Part Most Likely to Be Injured By Age, NPHS, 1996



6.2 Location

The location where a hospitalized injury occurs can be broken down into home, traffic, farm, workplace, hospital and "other" (which includes playgrounds and schools). The majority of hospitalized injuries (48%) occur in "other" locations, followed by home (35%), traffic (11.5%), hospital (1.2%)[1] workplace (0.8%) and farm (0.6%). Not surprisingly, these location patterns vary as a function of age. Whereas over 63% of the injury hospitalizations for infants (less than one year) and over 54% for preschoolers (1 to 4 years) occur within the home, this per cent steadily decreases with age, to less than 23% in the 15- to 19-year-old group. As children grow and develop, they are more likely to be injured in traffic, increasing from 3% for infants to over 19% for 15- to 19-year-olds. Children are also more likely to be injured in "other" locations as they grow, increasing from almost 26% for infants to over 51% for 15- to 19-year-olds.

Farm Injuries

Although the rate of hospitalization of Manitoba children for farm injuries (5-year rate - .50/10,000) is relatively low (compared to other types of injury), farm injuries are of significant concern, particularly for residents of regions such as South Westman and Marquette, which have significantly higher rates of hospitalizations for farm injuries. The Canadian Agriculture Injury Surveillance Program publishes reports on farm fatalities (CAISP 1999) and hospitalized farm injuries (CAISP 1998). More detailed Manitoba data are compiled by and housed at the Occupational Health Branch, Manitoba Department of Labour.

[1] Injuries that are the direct result of surgical or medical care, or due to adverse reactions to therapeutic drugs are excluded from analyses.

6.3 Regional differences in injury rates

Figure 6.4 shows the four-year injury mortality rates across RHAs and Figure 6.5 shows these rates for children residing in Winnipeg. There is a tendency for higher overall injury mortality rates in regions where the populations are found to be generally less healthy. (Please see Chapter 2: Demographics and Conceptual Framework, for a discussion of healthiness indicators.) Children residing in the north have a significantly[2] higher injury mortality rate than those residing in the rural south, who in turn have a significantly higher rate than those children residing in Winnipeg. Children living in the Burntwood region have the highest injury mortality rate in the province (72.7/100,000), significantly higher than the provincial average (23.4/100,000). Children living in North Eastman also have a higher mortality rate (43.6/100,000) than the provincial average. Children living in the Downtown area of Winnipeg have a significantly higher injury mortality rate (42.2/100,000) than the average for Winnipeg children (14.6/100,000), as well as the average for Manitoba children.

In the year before the 1996/97 National Longitudinal Survey on Children and Youth, 12% of Canadian children younger than 14 years had been injured seriously enough to require medical attention. By far, the most frequently reported injury was a cut, scrape or bruise, followed by broken or fractured bones, and sprains/strains. The majority of injuries happened in or around the home, and most often the injury resulted from an accidental fall (Statistics Canada 1998).

Figure 6.6 shows the five-year injury hospitalization rate by RHA. There is a tendency for higher overall injury hospitalization rates in regions where the populations are found to be generally less healthy. (Please see Chapter 2: Demographics and Conceptual Framework, for a discussion of healthiness indicators.) Burntwood, Norman, Parkland, North Eastman, Interlake and Marquette children all had significantly higher overall rates of injury hospitalization than the Manitoba rate, whereas children living in Winnipeg, South Eastman and Brandon had significantly lower rates than the Manitoba average. Both the rural north and rural south totals were also significantly higher than the Manitoba rate, which is driven largely by the substantially lower injury hospitalization rate for Winnipeg children. Although this pattern of substantially higher injury hospitalization rates in rural regions may in part reflect admission practices (Chapter 7: Health Service Utilization reports overall higher hospitalization rates in rural areas), judging from the higher injury mortality rates in rural areas,

Activity-limiting injuries

The NPHS provides a slightly different perspective on regional differences in injury rates. The 1996 survey asked whether children had an injury limiting normal activities within the past 12 months. This would capture a broader range of injuries, including those that were not serious enough to receive medical attention and those that were treated in hospital emergency rooms or physicians' offices. According to this survey, 12.4% of Manitoba children between 0 and 19 years of age experienced an injury limiting normal activities within the 12-month timeframe. The per cent of children sustaining an activity-limiting injury differed across regions (Figure 6.8 below); however the differences were not as great as those found for injury hospitalizations, nor did the rates seem to be related to the healthiness of the populations in the regions. The Winnipeg rates were again the lowest in the province. Keep in mind

[2] The term "significant" refers to statistically significant differences in rates. Please see the entry "statistical testing of rates" in the Glossary for details of statistical testing done for this report.

Figure 6.4: Injury Mortality Rates for Children Aged 0-19 Years By RHA, 1994-97

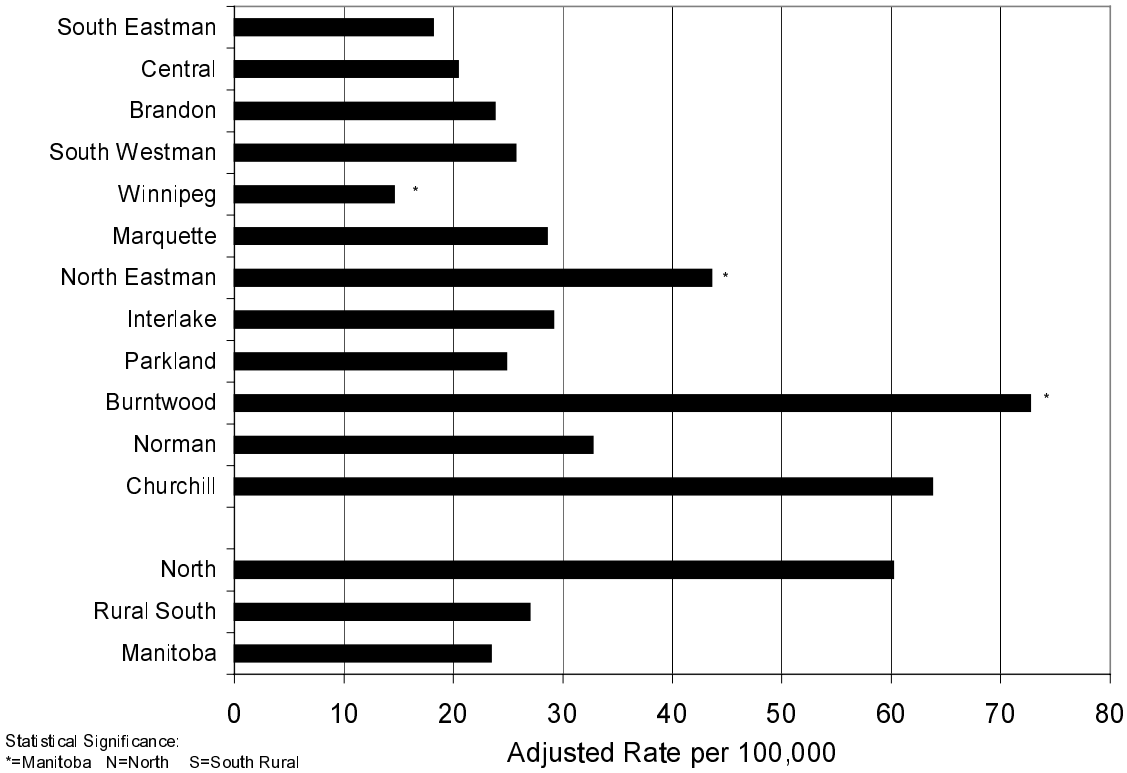


Figure 6.5: Injury Mortality Rates for Children Aged 0-19 Years By WCA, 1994-97

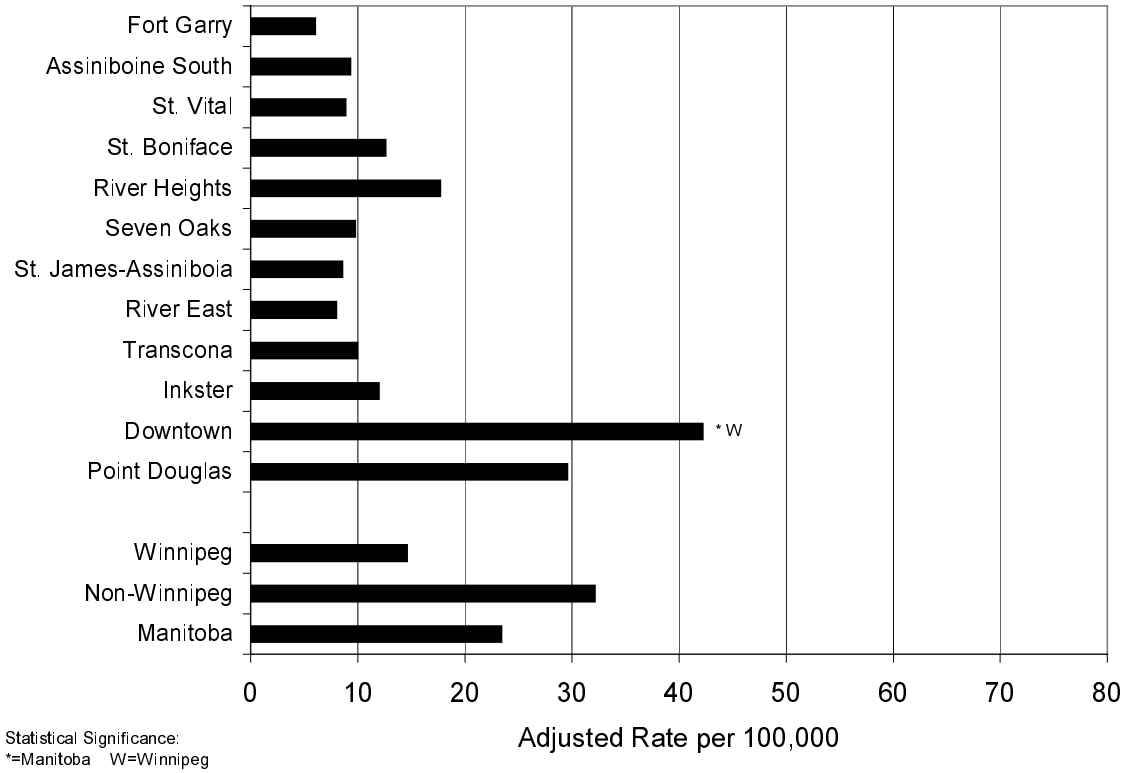
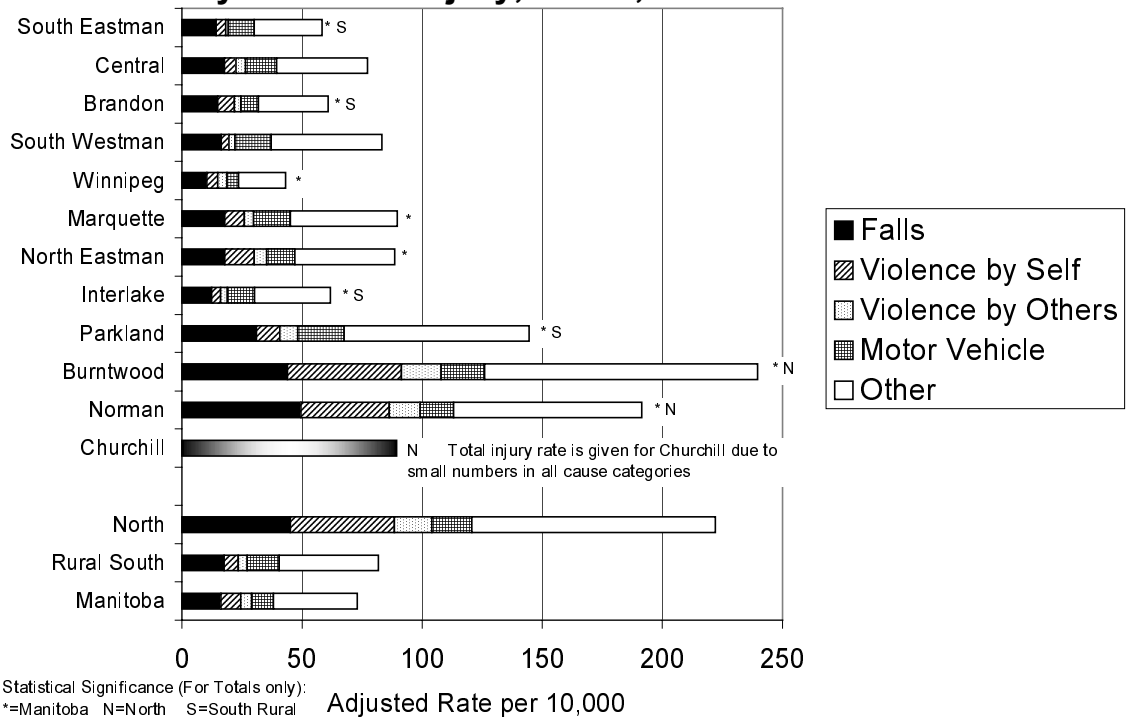
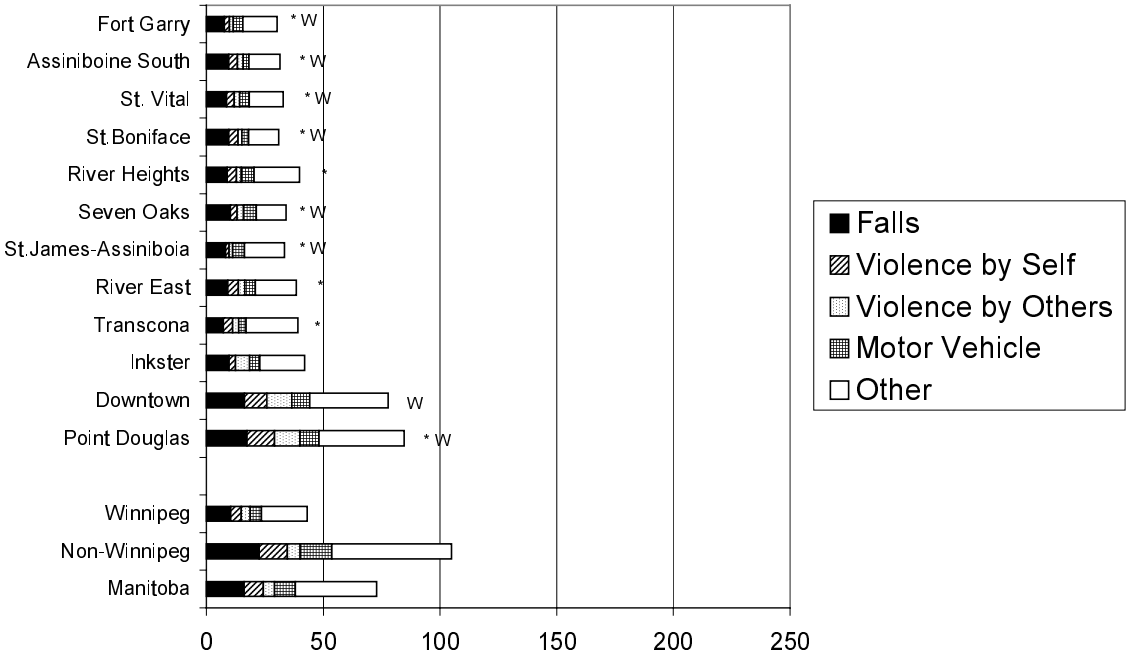


Figure 6.6: Injury Hospitalization Rates For Children Aged 0-19 Years By Cause of Injury, RHAs, 1994/95-1998/99



Statistical Significance (For Totals only):
*=Manitoba N=North S=South Rural

Figure 6.7: Injury Hospitalization Rates For Children Aged 0-19 Years By Cause of Injury, WCAs, 1994/95-1998/99



Statistical Significance (For Totals Only):
*=Manitoba W=Winnipeg

injuries are a more significant problem in rural than urban areas, particularly more serious injuries. (Please see sidebar for information on activity-limiting injuries by region.) The location of hospitalization for injuries tends to follow the same pattern as hospitalizations for other reasons (for more detail, please see Chapter 7: Health Care Utilization).

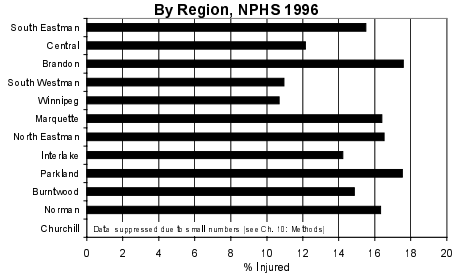
As with the RHA graph, the five-year injury hospitalization rates for children living in the Winnipeg areas also show a tendency for higher rates in areas where the populations are found to be generally less healthy (Figure 6.7**)**. Children living in Downtown and Point Douglas areas had significantly higher injury hospitalization rates than the mean for Winnipeg children. Children from all Winnipeg areas except Downtown and Point Douglas had significantly lower injury hospitalization rates than the Manitoba average**,** whereas the rates for children from Point Douglas were significantly higher than the Manitoba average.

6.3.1 Causes of injuries

For both mortalities and hospitalizations, injuries were broken down into 14 categories, based on the external cause of the injury. (Please see the Glossary for more detailed information of external causes of injury. Table G.5 in the Glossary provides the ICD-9-CM codes and labels that fall into each of the categories used.) Motor vehicle crashes (MVCs) are the leading cause of injury death in Manitoba children, findings that are replicated both nationally (Health Canada 1999) and internationally (Fingerhut et al. 1998). About 34% of all injury deaths in Manitoba children over a five-year period were due to MVCs, with a rate of 7.7/100,000. Other major causes of childhood injury deaths include violence to self (4.2/100,000), drowning (2.6/100,000), suffocation and choking (2.4/100,000), and violence by others (1.6/100,000). Figure 6.9 shows the breakdown of the causes of injury mortality for all Manitoba children.

that persons living in First Nations communities were excluded from the NPHS, leading to considerable undercounting in areas such as Burntwood and Norman (please see Methods Chapter 10).

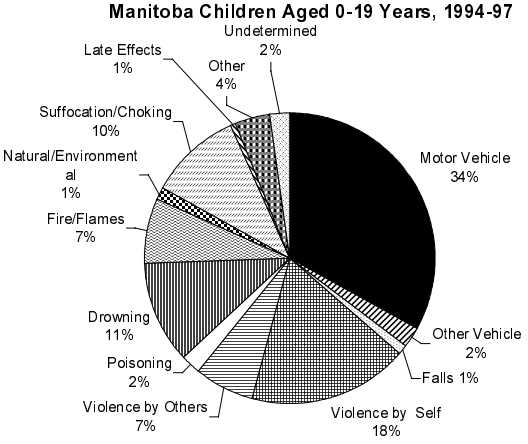
Figure 6.8: Per cent of Children Aged 0-19 Years Sustaining an Activity-Limiting Injury By Region, NPHS 1996



National MVC Statistics

Half of the deaths from Motor Vehicle Crashes (MVC) in Canada under the age of 20 years were to occupants of motor vehicles, 17.5% of those who died were pedestrians, 3.7% involved bicyclists, and 3.7% involved motorcyclists (Health Canada 1999). MVC deaths are highest for those 15 to 19 years of age (Health Canada 1999). MVC injuries and deaths for children 0 to 14 are lower than any other age group (including adults), whereas rates for those 15 to 19 years are about double the population as a whole, suggesting that the factor underlying the sudden and dramatic increase in MVCs at this age is strongly related to the acquisition of a driver's license (Health Canada 1999), as well as exposure to motor vehicles. Preliminary evidence from Ontario's Graduated Licensing System suggests graduated licensing may be an effective means of reducing MVCs for new drivers. The collision rate for novice drivers was 31% lower in 1995, after the introduction of graduated licensing than in 1993, prior to its implementation, whereas the general driving population experienced

Figure 6.9: Per cent Injury Mortality by Cause of Injury Manitoba Children Aged 0-19 Years, 1994-97



The breakdown of causes of injury changes across age groups. The main reason for injury deaths in children under one year of age is suffocation and choking, accounting for almost 60% (12.7/100,000) of the injury deaths in this age group. For children 1 to 4 years of age, the main reason for injury deaths is drowning (5.9/100,000), followed by MVCs (4.4/100,000), fire and flames (3.7/100,000), and violence by others (3.0/100,000). For the remaining age groups, MVCs are the main reason for injury mortality, increasing with each age group (5 to 9 years - 4.1/100,000; 10 to 14 years – 7.2/100,000; 15 to 19 years - 15.9/100,000). Violence to self first appears as a cause of injury mortality in the 10 to 14 year age group (2.7/100,000) and increases dramatically in the 15 to 19 years age group (14.0/100,000).

The mortality rates by cause of death are too low for detailed comparisons across RHAs and Winnipeg community areas, although Winnipeg / Non-Winnipeg comparisons can be made for some categories. For MVCs, violence to self, and drowning, the rates for Non-Winnipeg children are significantly higher than those for Winnipeg children (MVC: Non-Winnipeg -11.0/100,000, Winnipeg – 4.6/100,000; violence to self: Non-Winnipeg: 5.7/100,000, Winnipeg – 2.8/100,000; drowning: Non-Winnipeg: 4.3/100,000, Winnipeg – 1.0/100,000). For both violence to self and drowning, the rates for children from the North are significantly higher than the provincial average (violence to self, *only a 4% drop during the same time period (Boase and Tasca 1998).*

Despite estimates that the use of bicycle helmets can reduce serious head injury by 85% and brain injury by 88% (Thompson et al. 1989), there is no legislation in Manitoba requiring cyclists to wear helmets. It is perhaps not surprising, then, that Manitoba has the lowest rate of bicycle helmet use for children among the Canadian provinces (Canadian Council on Social Development 1998). An observational study of Winnipeg and nearby rural communities found that only 18.6% of cyclists less than 20 years old wore helmets, with 43.9% of the children under 8 years wearing helmets compared to only 8.6% for those 12 years or older. (Harlos et al., 1999). This same study observed significantly higher helmet use for urban children compared to rural children. The overall urban/rural difference (including adults) was highly significant with the prevalence of helmet use for urban cyclists at 22.9% compared to 8.9% for rural cyclists.

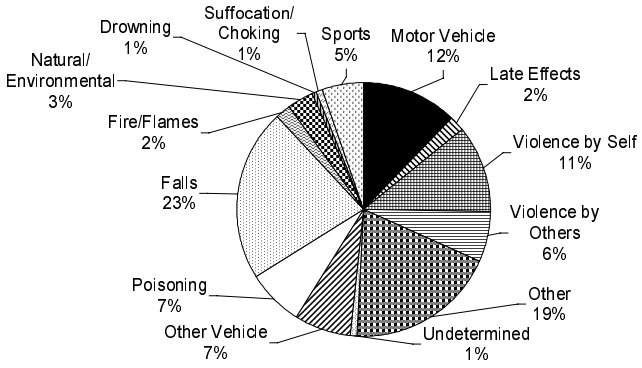
Suicide

Suicide is the second leading cause of injury mortality for Manitoba children in the 10- to 14- and 15- to 19-year-old categories, a finding that mirrors national statistics (Health Canada 1999). Whereas unintentional injury has decreased nationally over the past several years, suicide rates have increased slightly (Health Canada 1999). The rate of suicide deaths in the North is almost three times higher than the provincial average, whereas the rate of hospitalization for suicide attempts is over seven times higher in the North than the rest of the province.

North – 11.3/100,000, Manitoba – 4.2/100,000; drowning, North – 10.4/100,000, Manitoba – 2.6/100,000). For MVCs the rate for Winnipeg children (4.6/100,000) is significantly lower than the provincial average (7.7/100,000).

Figures 6.6 and 6.7 show injury hospitalization rates for causes of injury, and Tables 6.1 and 6.2 provide detailed information regarding hospitalization rates for each of the 14 categories of injury by RHA and WCA. Accounting for approximately 23% of all injury hospitalizations, falls are the leading overall cause of injury hospitalization for Manitoba children, a finding that is also consistent at the national level (Morrongiello 1998). Other leading causes of injury hospitalizations for Manitoba children include motor vehicle collisions (12%) and violence to self (11%). Figure 6.10 shows the breakdown of the cause of injury hospitalizations for all Manitoba children.

Figure 6.10: Per cent Injury Hospitalization By Cause of Injury, Manitoba Children Aged 0-19 Years, 1994/95 - 1998/99



When broken down into age groups, falls remain the leading cause of hospitalization for all age groups except the 15- to 19-year-olds. For this age category, the leading cause of hospitalization is violence to self at 22%, followed closely by MVCs at 19%. Figures showing the causes of injury hospitalization broken down by age category are available from the authors on request.

For all 14 categories of injury cause, the hospitalization rates for those children residing in northern Manitoba are significantly higher than the

The cost of injuries

Injuries exact a heavy price in health: every day Canadians are killed and disabled by injuries. Beyond the health burden, the economic burden of injuries is staggering: preventable injuries cost Canadians $8.7 billion in 1995, or $300 for every citizen in this country (Health Canada 1998).

Injuries from childhood falls cost $630 million each year in Canada. These falls can be prevented by redesigning playgrounds, safety-proofing homes, and teaching children how to fall (Health Canada 1998).

Injuries to First Nations children

Data from Health Canada and Statistics Canada indicate that injury mortality rates are much higher among First Nations children with Treaty Status,

Table 6.1: Adjusted Injury Hospitalization Rates by RHA and Cause of Injury per 10,000 Children Aged 0-19 Years, 1994/95 - 1998/99

RHA	Motor Vehicle	Late Effects	Violence by Self	Violence by Others	Other	Undeter-mined	Other Vehicle	Poisoning	Falls	Fire/ Flames	Natural/ Environments	Drowning	Suffocation/ Choking	Sports
South Eastman	10.81	0.89	4.05 *	1.00 *S	12.56	supp	5.09	2.43 *S	14.19	1.01	1.71	supp	supp	3.74
Central	12.96	2.05	4.63 *	4.11	14.75	0.57	6.13	4.34	17.71	1.57	2.55	0.57	0.91	4.30
Brandon	7.54 S	1.15	6.89	2.62	10.63 S	supp	5.16	4.74	14.85	1.17	2.61	supp	supp	2.43 S
South Westman	15.00 *	1.14	3.32 *	2.47	15.95	supp	7.82	6.09	16.30	supp	3.75	supp	1.18	8.62 *S
Winnipeg	4.92 *	1.10	4.50 *	3.82 *	8.42 *	0.35	2.51 *	2.16 *	10.32 *	0.68 *	1.30 *	0.17 *	0.35 *	2.52 *
Marquette	15.36 *	1.65	8.09	3.98	16.80	supp	4.86	6.40	17.78	2.63	4.52 *	supp	supp	6.66 *
North Eastman	11.82	1.64	12.17 *S	5.21	15.70	1.32	5.25	7.35	17.86	3.12 *	3.97	supp	supp	2.42 *S
Interlake	11.33	1.38	3.77 *	2.91 *	11.96 S	supp	6.35	2.86 *S	12.22 *S	1.37	2.23	supp	supp	4.49
Parkland	19.40 *S	2.57	9.69 S	7.43 *S	25.32 *S	0.90	10.88 *S	14.79 *S	30.99 *S	1.98	7.69 *S	supp	1.47 *	10.73 *S
Burntwood	18.24 *	3.11 *	47.35 *	16.53 *	48.33 *N	1.99 *	15.09 *	25.54 *	43.95 *	5.22 *	5.17 *	2.31 *	1.96 *	4.97
Norman	13.89 *	1.06	36.75 *	12.85 *	27.12 *N	1.08	13.49 *	14.71 *N	49.51 *	3.30 *	4.75 *	2.07	1.44	9.38 *
Churchill	supp	supp	supp	supp	supp	supp	supp	supp	supp	supp	supp	supp	supp	supp
North	16.68	2.40	43.32	15.36	41.19	1.64	14.50	21.69	45.21	4.57	4.96	2.19	1.82	6.41
Rural South	13.34	1.65	5.94	3.75	15.46	0.55	6.46	5.56	17.49	1.68	3.36	0.43	0.66	5.38
Manitoba	9.09	1.42	8.24	4.67	13.89	0.52	5.06	5.14	16.12	1.40	2.40	0.47	0.59	3.88

"supp" - where numerators are less than 5 cases, rates are suppressed. Please see glossary.

Statistical Significance
*=Manitoba N=North S=South Rural

Table 6.2: Adjusted Injury Hospitalization Rates by WCA and Cause of Injury per 10,000 Children Aged 0-19 Years, 1994/95 - 1998/99

WCA	Motor Vehicle	Late Effects	Violence by Self	Violence by Others	Other	Undeter-mined	Other Vehicle	Poisoning	Falls	Fire/ Flames	Natural/ Environments	Drowning	Suffocation/ Choking	Sports
Fort Garry	4.16 *	1.42	2.25 *W	1.43 *W	5.80 *	supp	2.27 *	0.98 *	7.69 *	0.61	1.45	supp	supp	1.90 *
Assiniboine South	2.47 *	supp	3.89 *	2.39	5.69 *	supp	2.01 *	supp	9.48 *	supp	supp	supp	supp	2.83
St. Vital	4.11 *	0.60	3.35 *	2.20 *	7.61 *	supp	2.06 *	0.95 *	8.68 *	supp	0.93	supp	supp	1.82 *
St. Boniface	2.85 *	0.85	4.07	1.66 *	4.41 *W	supp	1.77 *	0.87 *	9.51 *	supp	0.87	supp	supp	3.09
River Heights	5.56	supp	3.95 *	2.11	7.84 *	supp	2.47 *	1.76 *	8.83 *	supp	1.55	supp	supp	3.10
Seven Oaks	5.36 *	1.02	2.88 *	2.72	5.80 *	supp	1.86 *	0.82 *	10.28 *	supp	0.68	supp	supp	1.65 *
St. James-Assiniboia	5.07 *	1.13	1.67 *W	1.51 *W	5.98 *	supp	2.59 *	1.36 *	8.08 *	supp	0.84	supp	supp	3.99
River East	4.58 *	1.05	4.47 *	2.71 *	6.84 *	supp	2.60 *	1.78 *	9.26 *	supp	1.21	supp	0.58	2.48
Transcona	3.19 *	supp	4.02 *	2.61	11.22	supp	3.40	supp	7.22 *	supp	1.41	supp	supp	3.59
Inkster	4.38 *	1.38	2.81 *	6.01	7.98 *	supp	2.95	2.35	9.67 *	supp	1.52	supp	supp	1.81
Downtown	7.61 W	2.03	9.52 W	10.63 *W	15.52 W	0.88 W	3.03	6.65 W	16.35 W	1.22	1.77	supp	0.45	1.96 *
Point Douglas	8.18 W	1.69	11.78 W	10.84 *W	16.48 W	supp	3.42	5.54 W	17.35 W	3.33 *W	2.45	supp	supp	2.85
Winnipeg	4.92	1.10	4.50	3.82	8.42	0.35	2.51	2.16	10.32	0.68	1.30	0.17	0.35	2.52
Non-Winnipeg	13.53	1.76	12.17	5.59	19.83	0.70	7.76	8.41	22.45	2.18	3.60	0.81	0.85	5.31
Manitoba	9.09	1.42	8.24	4.67	13.89	0.52	5.06	5.14	16.12	1.40	2.40	0.47	0.59	3.88

"supp" - where numerators are less than 5 cases, rates are suppressed. Please see glossary.

provincial average (Table 6.1 and Figure 6.6). Comparing hospitalization rates for Northern children to those residing in the rural South, those from the north have significantly higher rates of injury hospitalizations for all categories. Injury hospitalizations due to violence to self for children from the north (43.3/10,000) are over seven times as high as those for children from the rural south (5.9/10,000) and over five times as high as the provincial average (8.2/10,000). Injury hospitalizations due to violence from others are over three times higher for children from the north (15.4/10,000) compared to the provincial average (4.7/10,000). Hospitalizations due to drowning are over five times higher in northern children (2.2/10,000) than children from the rural south (.4/10,000) and over four times greater than the provincial average (.5/10,000); hospitalizations due to poisoning are almost four times higher in children from the north (21.7/10,000) than those from the rural south (5.6/10,000) and the provincial average (5.1/10,000); hospitalizations due to falls are over two times as high in northern children (45.2/10,000) than southern rural children (17.5/10,000) and the provincial average (16.1/10,000).

Those residing in the rural south have significantly higher injury hospitalization rates than the provincial average for seven of the 14 injury cause categories: falls, MVCs, other vehicle crashes, violence to self, sports, natural/environmental factors and "other" causes. Within the rural south there are variations in injury rates by various causes, however. Children residing in Parkland have the highest rate of hospitalization for falls (31.0/10,000) in the rural south (average – 17.5/10,000). Parkland children also have significantly higher hospitalization rates than the rural south average for poisoning (14.8/10,000 vs. 5.6/10,000), sports (10.7/10,000 vs. 5.4/10,000), violence to self (9.7/10,000 vs. 5.9/10,000), violence by others (7.4/10,000 vs. 3.8/10,000), other vehicle crashes (10.9/10,000 vs. 6.5/10,000), MVCs (19.4/10,000 vs. 13.3/10,000), natural and environmental factors (7.7/10,000 vs. 3.4/10,000), and for injuries caused by "other" causes (25.3/10,000 vs. 15.5/10,000).

compared to the total population of Canadian children (Choiniere 1997). During infancy (under 1 year) the rate of death from injuries for First Nations children is almost four times greater than the general population; for preschoolers, the rate is over six times greater; for children 5 to 9 years the rate is three times greater; and for 10- to 14-year-olds the rate is over one-and-a-half times greater. First Nations teenagers aged 15 to 19 years are three-and-a-half times more likely to die due to injuries than the total population of 15- to 19-year-olds in Canada. The Manitoba Paediatric Death Review Committee (1997) reported injury mortality rates for First Nations children aged 29 days to 14 years were over nine times higher than those for non-First Nations children in Manitoba.

National data suggest that the differences in injury mortality rates between First Nations children and the overall Canadian population of children vary according to the cause of the injury. Compared to all Canadian children, the injury mortality rates for First Nations children for MVCs are over one-and-a-half times higher, for choking and suffocation, three times higher, for falls and suicide over four times higher, for homicide over five times higher, for fires and burns over seven times higher and for poisonings the rates are 12 times higher (Choiniere 1997).

Children living in Winnipeg have significantly lower overall injury hospitalization rates than are found in the rest of the province: the Winnipeg rates for each of the 14 causes of injury hospitalizations are significantly lower than the rural north, rural south and average Manitoba rates (Table 6.2 and Figure 6.7). Within Winnipeg, children living in two community areas have significantly higher overall rates of injury hospitalizations: Downtown and Point Douglas. For MVCs, violence to self and by others, falls, poisoning, and "other" causes of injury hospitalizations, the rates for children from these two areas are significantly higher than those found for other Winnipeg children. The rate for fire and flames is also significantly higher for children from Point Douglas, and the rate for underdetermined cause is higher for those from Downtown than those residing in other areas of the city. Note, however, that the injury hospitalization rates for children from these highest injury rate areas of Winnipeg are quite similar to rates for the children in the lowest injury rate areas of the rural south. Indeed, in only two categories are the rates for children from these two Winnipeg areas significantly higher than the provincial average: both Downtown (10.6/10,000) and Point Douglas (10.8/10,000) children have higher injury hospitalization rates for violence by others, than the Manitoba average (4.7/10,000), and children from Point Douglas have higher injury hospitalization rates for fire and flame (3.3/10,000) than the provincial average (1.4/10,000)

6.4 Injury and income

Both injury mortality and injury hospitalization rates for Manitoba children show a gradient with neighbourhood income level, meaning that the lower the income level, the higher the injury rate. We divided rural and urban neighbourhoods each into five different income levels referred to as quintiles. (Please see the Glossary for a discussion of income quintiles and how they are defined.) Injury mortality rates for children from the lowest income neighbourhoods in rural areas were almost two-and-half times higher than those from the highest income

Canadian data on income differences

Data from Statistics Canada show that both injury mortality and injury hospitalization rates differ across urban income quintiles (Choiniere 1997). For injury mortality in 1991, Canadian children living in the poorest neighbourhoods had a 39% higher death rate due to injuries compared to those from the wealthiest neighbourhoods. These income differences were greatest for children under 10 years of age. Whereas there was no significant impact of income on deaths due to motor vehicle collisions, poisonings or suicide, children in the lowest income group were one-and-a-half times more likely to die from drowning, twice as likely to die from falls, over four times more likely to die from homicide, and over 18 times more likely to die from fires.

neighbourhoods (Figure 6.11). For the urban areas, children from the lowest income neighbourhoods had injury mortality rates four-and-a-half times higher than those from the highest income areas (Figure 6.12). Trend tests confirmed highly significant ($p<.0001$) differences across income quintiles for both rural and urban areas.

Figure 6.11: Injury Mortality Rates For Children Aged 0-19 Years By Rural Income Quintile, 1994-97

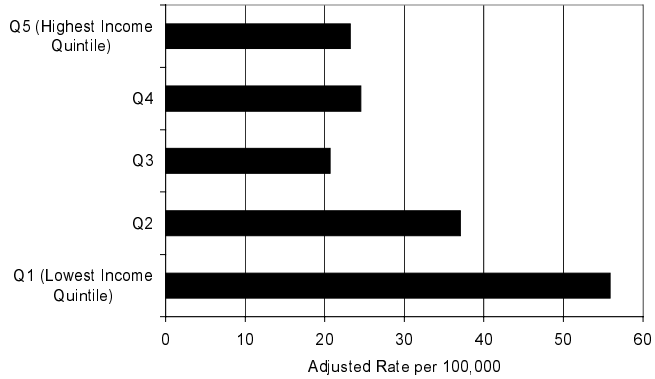
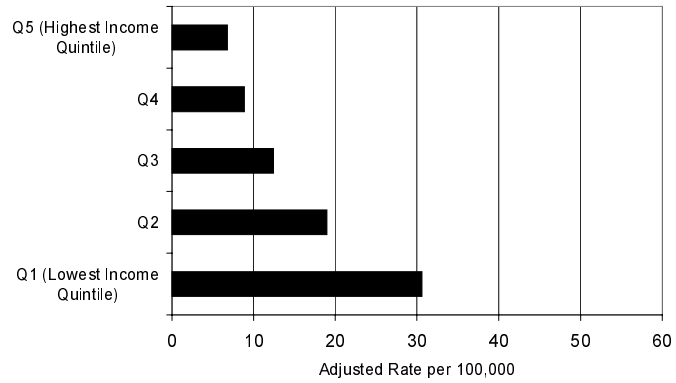


Figure 6.12: Injury Mortality Rates For Children Aged 0-19 Years By Urban Income Quintile, 1994-97

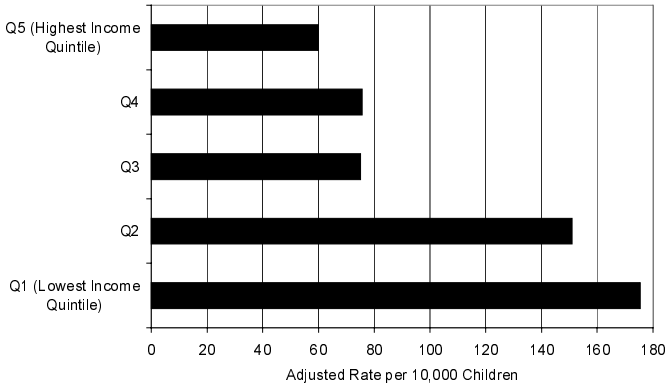


For injury hospitalizations for children from rural areas, those from the lowest income areas had injury hospitalization rates almost three times higher than those from the highest income areas (Figure 6.13). For children from urban areas, those from the lowest income areas had injury hospitalization rates two-and-a-half times higher than those from the highest income areas (Figure 6.14). Once again, trend tests confirmed a highly significant ($p<.0001$) trend of

Data from urban areas in Ontario, Manitoba, Saskatchewan and British Columbia for 1990 to 1992 indicate that children from the poorest neighbourhoods have hospitalization rates 25% higher than those from the wealthiest neighbourhoods (Choiniere 1997). As was the case with mortality rates, the income gap in hospitalization rates narrowed as children got older, and tended to vary for different injury cause categories. There was no clear trend for hospitalizations due to motor vehicle collisions or falls. Hospitalization rates for children from the poorest neighbourhoods were almost one-and-half times higher for choking and suffocation, over one-and-a-half times higher for suicide attempts, two times higher for poisonings, over two times higher for fires and burns, and almost three times higher for violence by others.

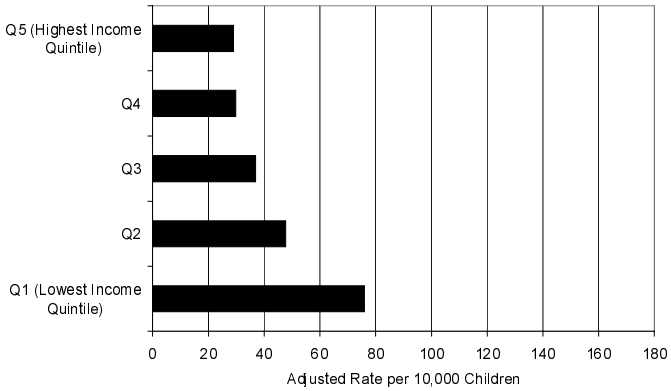
increasing injury hospitalization rates with decreasing income quintile.

Figure 6.13: Injury Hospitalizations Rates For Children Aged 0-19 Years By Rural Income Quintile, 1994/95 - 1998/99



Although small numbers precluded an examination of the relationship between income and injury for each RHA, we ran this analysis on the four largest RHAs, and found similar patterns to those found when all rural RHAs were examined together: hospitalization rates for injuries tended to increase as income quintile decreased.

Figure 6.14: Injury Hospitalization Rates For Children Aged 0-19 Years By Urban Income Quintile, 1994/95 - 1998/99



Other studies have found not only this association between decreasing SES and increasing injury rates (Roberts and Power 1996), but also that children from lower SES families tend to experience more severe and more often fatal injuries (Rivara and Mueller 1987). Why do we find higher injury rates for children from lower income families? Morrongeillo (1998) suggests that these children are more likely to live and play in more hazardous environments and their parents may have limited knowledge about parenting and child development and abilities, leading to poor parental judgement. All these factors are associated with greater risk for injury (Morrongeillo 1998). Manitoba data from the NLSCY shows that

An observational study of Manitoba cyclists found that helmet use was strongly related to income level. 30.5% of the cyclists in the highest income neighbourhoods were observed wearing helmets compared to only 7.8% in the lowest income neighbourhoods (Harlos et al. 1999).

40.6% of children from low income families (less than $20,000 per year) seldom or never wear seatbelts while driving in a motor vehicle, compared to 14.5% of children from families with higher incomes. (Caution should be exercised when interpreting results from the NLSCY as appropriate significance tests were unavailable. Please see Chapter 10: Methods for further detail.) For helmet use while bike riding, no significant difference between children from low and non-low income families was found in the NLSCY;, however an observational study of Manitoba cyclists found that helmet use was strongly related to income level (Harlos et al. 1999; please see sidebar).

6.5 Correlations of injury rates with the healthiness of populations within a region

Premature mortality rate, or PMR, is considered an indicator of the "healthiness" of a population, with higher PMR generally associated with both poorer health and lower socioeconomic status (see Chapter 2, Demographics and Conceptual Framework). To determine whether injuries were associated with the healthiness of the population within a region, both injury mortality rates and injury hospitalization rates for each region were correlated with the regions' PMRs (please see the Glossary for a description of how correlations were calculated).

Both injury deaths and injury hospitalizations are strongly related to Premature Mortality Rates. As the healthiness of the population of a region decreases, the injury death rate and injury hospitalization rate increases.

Both injury mortality rates (Spearman's r correlation coefficient=.68, p = 0.0005) and injury hospitalization rates (Spearman's r correlation coefficient=.71, p=0.0001) were correlated with PMR meaning that injury rates were higher in regions where the populations are found to be generally less healthy. (Chapter 9: Social Determinants of Health provides a summary discussion of child health indicators associated with PMR.)

Key Points in this chapter

Age and gender differences in injury (Sections 6.1 and 6.2)

- The highest rate of injury deaths is found in the oldest (15 to 19 years) age category, with the second highest death rates in the youngest (less than one year) age category, and the lowest mortality rate for those in the 5- to 9-year-old category.
- The injury mortality rate for Manitoba males 0 to 19 years is almost twice as high as that for females. The greatest gender differences occur at 15 to 19 years of age, with males having an injury mortality rate over three and a half times higher than females.
- Hospitalization rates are highest in the 15- to 19-year-old category, and males have higher hospitalization rates than females.
- The majority of injury hospitalizations for infants and preschoolers occur within the home; as children grow and develop, they are more likely to be injured in traffic and other locations such as schools and playgrounds.

Regional differences in injury (Section 6.3)

- Children residing in the north have a significantly higher injury mortality rate than those residing in the rural south, who in turn have a significantly higher rate than those children residing in Winnipeg.
- Children living in the Burntwood region have the highest injury mortality rate in the province, over three times higher than the provincial average. Children living in North Eastman also have a higher mortality rate than the provincial average. Children living in the Downtown area of Winnipeg have the highest injury mortality rate in Winnipeg, almost three times as high as the Winnipeg average, and almost two times as high as the provincial average.
- Burntwood, Norman, Parkland, North Eastman and Marquette children all had significantly higher overall rates of injury hospitalization than the Manitoba rate, whereas children living in Winnipeg, South Eastman and Brandon had

significantly lower rates than the Manitoba average.

- Children living in Downtown and Point Douglas areas had significantly higher injury hospitalization rates than the mean for Winnipeg children. Children from all Winnipeg areas except Downtown and Point Douglas had significantly lower injury hospitalization rates than the Manitoba average**,** whereas the rates for children from Point Douglas were significantly higher than the Manitoba average.

Causes of injury (Section 6.3.1)

- Motor vehicle crashes (MVCs) are the leading cause of injury death in Manitoba children, with about 34% of all injury deaths in Manitoba children over a four-year period due to MVCs. Other major causes of childhood injury deaths include violence to self, drowning, suffocation and choking, and violence by others.
- For MVCs, violence to self, and drowning, the rates for Non-Winnipeg children are significantly higher than those for Winnipeg children. For both violence to self and drowning, the rates for children from the North are significantly higher than the provincial average. For MVCs the rate for Winnipeg children is significantly lower than the provincial average.
- Accounting for approximately 23% of all injury hospitalizations, falls are the leading overall cause of injury hospitalization for Manitoba children. Other leading causes of injury hospitalizations include MVCs (12%) and violence to self (11%).
- For all 14 categories of injury cause, the hospitalization rates for those children residing in northern Manitoba are significantly higher than the provincial average.
- Those residing in the rural south have significantly higher injury hospitalization rates than the provincial average for seven of the fourteen injury cause categories: falls, MVCs, other vehicle crashes, violence to self, sports, natural/environmental factors and "other" causes.
- Children residing in Parkland have the highest rate of hospitalization in the rural south for falls, poisoning, sports, violence to self, violence by

others, other vehicle crashes, and for injuries caused by "other" causes.

- Children living in Winnipeg have a significantly lower overall injury hospitalization rate than is found in the rest of the province. Within Winnipeg, children living in Downtown and Point Douglas have significantly higher overall rates of injury hospitalizations, and higher rates for MVCs, violence to self and by others, falls, poisoning, and "other" causes. The injury hospitalization rates for children from these areas of Winnipeg are quite similar to rates for the children in the lowest injury rate areas of the rural south.

Income differences in injury (Sections 6.4 and 6.5)

- For both rural and urban areas, and for both injury mortality and hospitalizations, children living in lower income neighbourhoods have higher injury rates than those living in higher income neighbourhoods.
- Both injury mortality and hospitalization rates are higher in areas where the populations are the least healthy.

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CHAPTER 7: HEALTH SERVICE UTILIZATION

7.0 Introduction

Children's utilization of health care services has changed over the past two decades. Inpatient hospitalization rates in Canada have declined (Connors and Millar 1999, Hodge et al. 1995; Brownell et al. 1999). Many conditions previously identified as requiring hospitalization (North's criteria) are now managed at home or as day surgery (Dougherty 1998; Newacheck and Halfon 1998). According to U.S. data, children are more likely to receive ambulatory care services from paediatricians in the 1990s than in previous years (Ferris 1998). They are also more likely to be prescribed antibiotics or mental health drugs subsequent to a physician visit. There continues to be great interest in defining optimal use of health care services in children.

North's criteria for hospitalization

1. *general anaesthesia*
2. *intensive monitoring*
3. *parenteral treatment*
4. *respiratory treatment*
5. *special therapeutic modalities*
6. *removal from dangerous home situations*
7. *observation under controlled environmental conditions*
8. *suicide attempt*
9. *maternal-infant attachment*

This chapter presents regional comparisons of health service utilization in children, namely: 1) hospitalization, 2) physician utilization and 3) prescription medication use. Data were derived from Manitoba's population-based physician claims, hospitalization and prescription data. In addition to describing overall rates of health care use, data on three measures of service utilization are presented: 1) use by location of health services, 2) physician specialty, and 3) continuity of physician care. Four classes of drugs were selected to represent prescription medication use: 1) antibiotics, 2) pain-relief drugs, 3) iron supplements, and 4) psychotropic (mental health) drugs.

7.1 Health care utilization

In 1998/99, 80% of Manitoba children had at least one health care contact. Five per cent of children were hospitalized (48 hospitalizations/1000 children) and there were 3.6 physician visits per child. The most common diagnosis for hospitalization was bronchitis/ bronchiolitis and for physician consultation upper respiratory tract infection (Table 7.1). Using the Ambulatory Care Grouper

Table 7.1: The Ten Most Common Diagnoses For Health Care Visits for Children Aged 0-19 Years, 1998/99

Rank	Primary Diagnosis for Hospitalization	Primary Diagnosis for Physician Visit
1	Bronchitis/Bronchiolitis	Acute Upper Respiratory Tract Infections
2	Chronic Disease of the Tonsils, Adenoids	Suppurative Otitis Media
3	Asthma	Health Supervision of Infant/Child
4	Pneumonia	General Medical Examination
5	General Symptoms	Asthma
6	Noninfectious Gastroentero/ colitis	Acute Pharyngitis
7	Encounter for Procedures and Aftercare	Contact Dermatitis and Other Eczema
8	Early/Threatened Labour	Tonsilitis
9	Acute Appendicitis	Bronchitis, Acute/Chronic
10	Symptoms Involving the Abdomen/Pelvis	General Symptoms

classification system to define acute, recurrent and chronic conditions, (Smith and Weiner 1994) an index of morbidity burden was created, ranging from no morbidity (well child or maternal/infant care) to the highest morbidity burden on the basis of health care contact for multiple conditions. Approximately 10% of children with health care contacts had physician visits or hospitalizations for multiple morbidities, e.g. acute, recurrent and chronic conditions (Table 7.2). These children used a disproportionate number of services, especially acute care services (30% of hospitalizations and 20% of physician services). However, the majority of health care services were for children with less morbidity burden (as defined in Table 7.2).

Table 7.2: Consumption of Health Services By Morbidity Burden, Manitoba Children Aged 0-19 Years, 1998/99

Morbidity Burden Category	% Health Care Users (n=263,023)	% Hospital Admissions (n=16,374)	% Physician Visits (n=1,170,031)
Maternal/Infant Care	5.3	13.9	2.5
Lower Morbidity Burden*	85.1	56.5	77.5
Highest Morbidity Burden**	9.6	29.6	20.0

* children with at least one physician contact or hospitalization for acute or recurrent or chronic conditions, or any combination EXCEPT the presence of all 3 types of conditions.

** children with at least one physician contact or hospitalization for acute, recurrent and chronic conditions.

7.2 Hospital utilization

Hospitalization rates for children 0 to 19 years vary according to the region of residence. Hospitalization rates tend to be much higher for Non-Winnipeg than Winnipeg children. Figure 7.1 shows the hospitalization rates by RHAs. Recall that all graphs are ordered by premature mortality ratio (PMR), a population indicator of the healthiness of a group of people and their need for health care services (please see Chapter 2: Demographics and Conceptual Framework for a discussion of healthiness indicators). The hospitalization rates tend to be higher in those areas where the populations are less healthy. For children residing in South Eastman and Winnipeg, the

The hospitalization rate for Non-Winnipeg children is over twice as high as that for Winnipeg children. The hospitalization rate for Non-Winnipeg children was 68/1000 in 1998/99 compared to 30/1000 for Winnipeg children. The hospitalization rate for children from the North is almost four times as high as that for Winnipeg children, whereas the rate for children from the rural south is almost two times as high as the Winnipeg rate.

Figure 7.1: Hospitalization Rates for Children Aged 0-19 Years By Location of Hospital and RHA, 1998/99

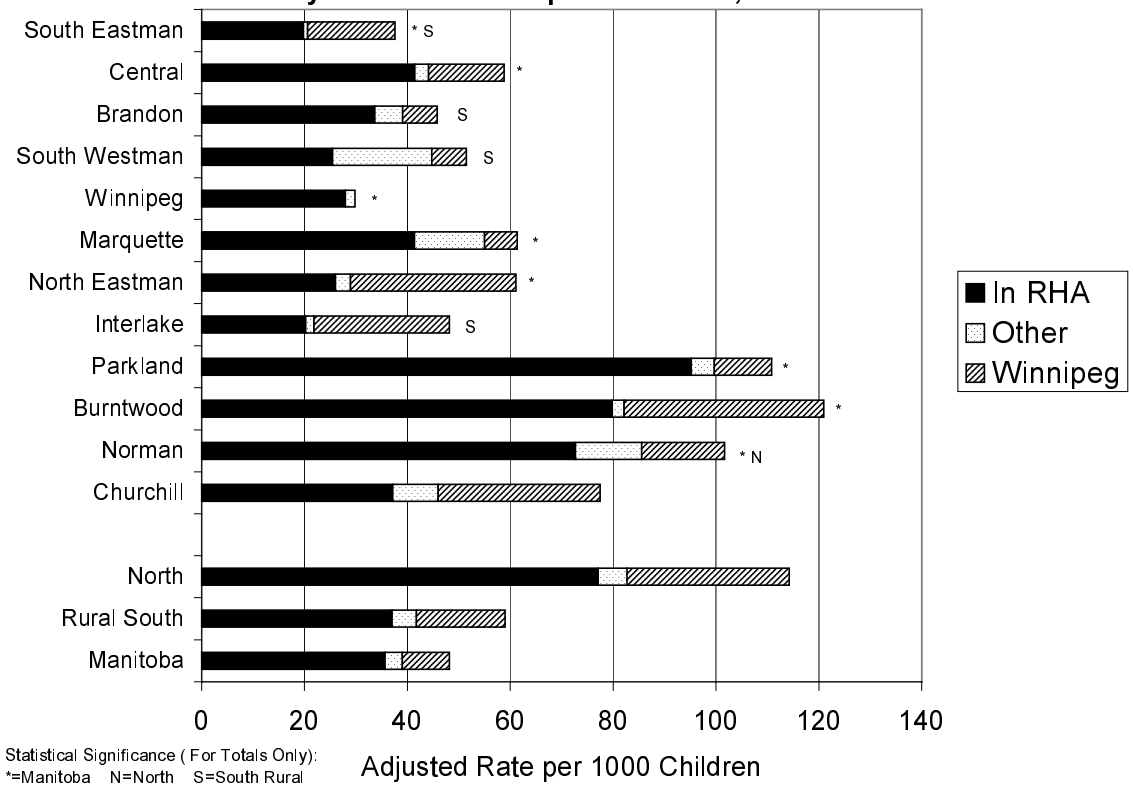
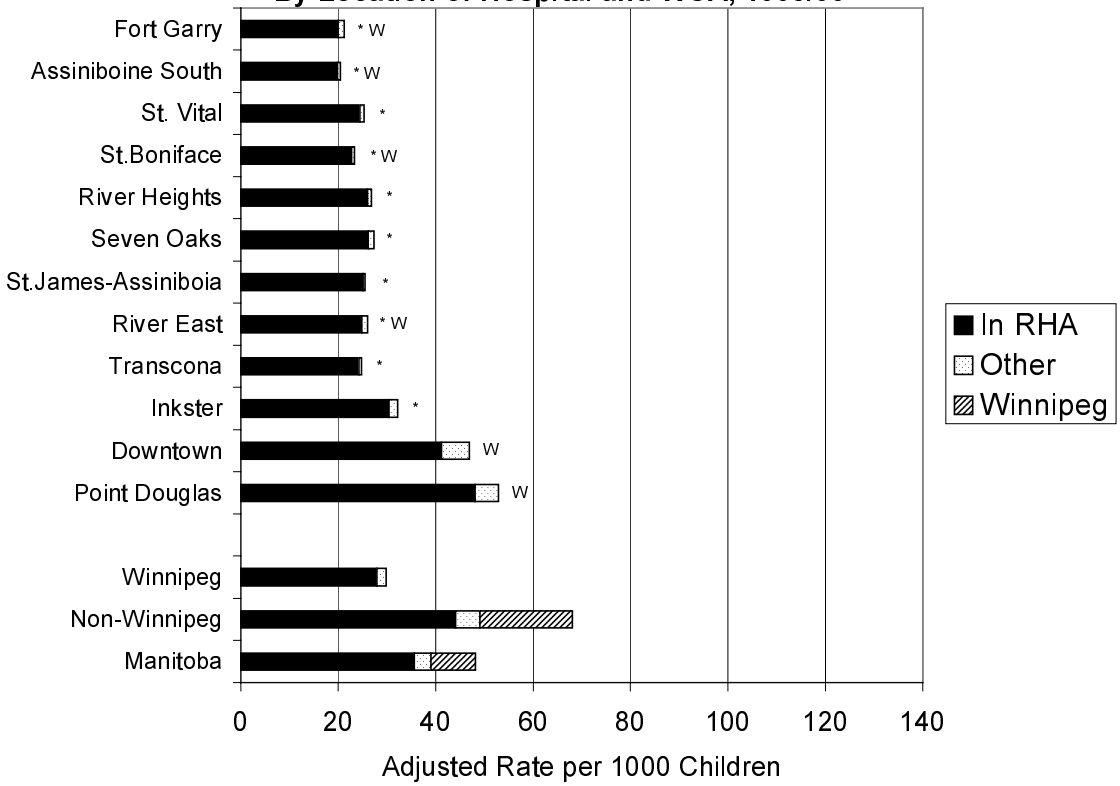


Figure 7.2: Hospitalization Rates for Children Aged 0-19 Years By Location of Hospital and WCA, 1998/99



hospitalization rates were lower than the provincial average, whereas for children residing in Central, Marquette, North Eastman, Parkland, Burntwood and Norman, the hospitalization rates were higher than the provincial average. Indeed, children from Burntwood (121/1000) were hospitalized at a rate two and one half times higher than the provincial average (48/1000).

Figure 7.1 also shows where residents were hospitalized. About 28% of northern residents and 29% of children from the rural south were hospitalized in Winnipeg; however these percentages vary across regions. Interlake, North Eastman and South Eastman had the highest percentages of children hospitalized in Winnipeg (55%, 53% and 45% respectively) whereas Parkland, Marquette, South Westman and Brandon had the lowest percentages of children hospitalized in Winnipeg (10%, 10%, 13% and 15% respectively). Parkland had the highest per cent of children hospitalized in region (86%) whereas Interlake had the lowest (42%).

Almost 65% of children residing outside of Winnipeg (including the north, rural south and Brandon) are hospitalized in their own RHA.

Figure 7.2 shows the hospitalization rates for Winnipeg community areas. As was found with the RHAs, utilization rates tend to be higher in those areas where the populations are found to be generally less healthy. For children from all areas except Downtown and Point Douglas the hospitalization rates were lower than the provincial average. For children from Fort Garry, Assiniboine South, St. Boniface and River East, the hospitalization rates were lower than the Winnipeg average. For children from Downtown and Point Douglas, the hospitalization rates were higher than the Winnipeg average, but still lower than the Non-Winnipeg average. Children from Point Douglas were hospitalized at a rate over one-and-a-half times higher than the Winnipeg average. Children from Point Douglas and Downtown were also more likely to be hospitalized outside of Winnipeg (9% and 12% respectively) than children from other areas of Winnipeg. This is probably due to First Nations children who reside in these Winnipeg areas being admitted to hospital while spending time in their home First Nations communities.

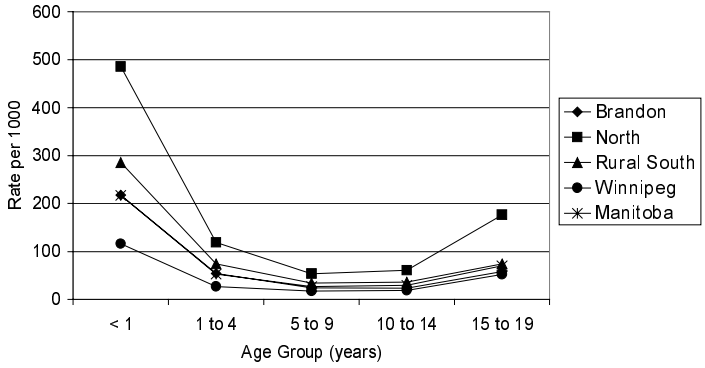
Hospitalization rates for RHAs and WCAs were related to the healthiness of the populations within regions: the less healthy the population of a region, the greater the hospitalization rate. Please see section 7.5 at the end of this chapter for further discussion of this concept.

7.2.1 Hospital utilization by age

Hospital utilization rates differ by age. The highest utilization rates are found for children under one year of age, with an average of 217 visits per 1000 (Figure 7.3). Hospital utilization decreases substantially after the first year, to 53/1000 for children 1 to 4 years, 27/1000 for 5 to 9 years, and 29/1000 Manitoba children 10 to 14 years of age. Hospital utilization rates increase in the 15- to 19-year-old age group, to 70/1000 Manitoba children. The per cent of children hospitalized within their own region or in Winnipeg varies little across age groups.

At each age level children from the north have the highest hospitalization rates and children from Winnipeg have the lowest rates. At under one year of age and 1 to 4 years the differences are over four-fold; at all other age groups the differences are over three-fold.

Figure 7.3: Hospitalization Rates for Children By Age Group and Manitoba Region, 1998/99



7.2.2 Hospital utilization by income

Significant trends were found for hospitalization rates for both rural and urban neighbourhood income levels, with higher hospitalization rates associated with lower income levels (Cochran-Armitage trend, $p<.0001$, Figures 7.4 and 7.5). Children living in the lowest neighbourhood income quintile in urban and rural areas were three times more likely to be hospitalized than children in the highest income quintile. A similar trend in hospitalization by household income in Canadian children has been reported by the Canadian Institute of Child Health (The Health of Canada's Children, 1994). Of note, are the much higher hospitalization rates in rural Manitoba.

Figure 7.4: Hospitalization Rates for Children Aged 0-19 Years By Rural Income Quintile, 1998/99

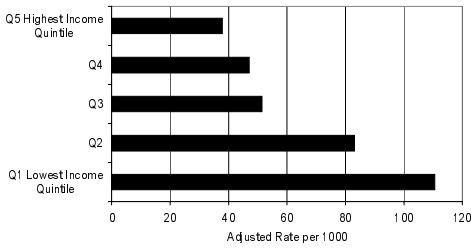
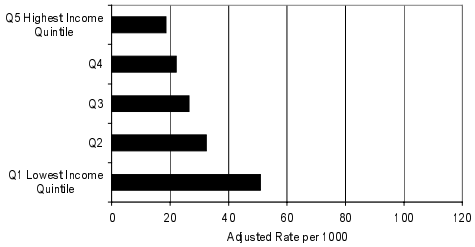


Figure 7.5: Hospitalization Rates for Children Aged 0-19 Years By Urban Income Quintile, 1998/99



7.3 Physician visits

The rate at which children visit physicians also varies across regions. Figure 7.6 shows the physician visit rates per 1000 children 0 to 19 years of age by RHA.

The significantly lower visit rates shown for children residing in the north are at least partly attributable to the higher use of nursing stations for health care services in these regions; these visits are not captured in the data. Physician visit rates for children from Norman were significantly higher than the northern average, whereas rates for children from Burntwood were significantly lower than the northern average. (Once again, absence of data on visits to nursing stations may account for at least part of these differences.) Those residing in the rural south have significantly lower visit rates than the Manitoba average, which is strongly influenced by the higher Winnipeg rates. Children from Brandon, Marquette, North Eastman, Interlake and Parkland had significantly higher physician visit rates than the rural south average, whereas children from South Eastman, Central and South Westman all had lower rates.

The substantially lower physician visit rates for children residing in northern Manitoba are at least partly attributable to the higher use of nursing stations, which are not captured in the utilization date. According to the 1996 National Population Health Survey (NPHS), 18% of residents of northern Manitoba had at least one contact with a nurse or nurse practitioner for health consultation, compared to 12% for the rural south and 6% for urban (Winnipeg and Brandon) Manitoba.

Figure 7.7 shows the physician visit rates for children from the Winnipeg community areas. The visit rates for Winnipeg children were significantly higher than those for Non-Winnipeg children. Children residing in Fort Garry, River East, Transcona, Assiniboine South and St. Vital had lower visit rates than the average for Winnipeg children, whereas those residing in Seven Oaks, Inkster, Downtown and Point Douglas had higher physician visit rates than the average for the city.

Physician visit rates for Winnipeg children were 26% higher than those found for Non-Winnipeg (including north, rural south and Brandon) children.

7.3.1 Physician visits by specialty

Figures 7.6 and 7.7 also show the types of physicians accessed by children living in different areas. Children residing in Winnipeg are far more likely to access specialists (paediatricians and other specialists) than those residing outside of the city, with Seven Oaks having the highest specialist visit rate in the city and Point Douglas and Transcona the lowest. Interlake had the highest specialist visit rate for RHAs, whereas Norman and Parkland had the lowest. Winnipeg children made over three and half times

Physician visit rates show different patterns in RHAs and WCAs: in RHAs, the healthier the population within a region, the more physician visits; in WCAs, the healthier the population within a region the fewer physician visits. Correlations between physician visit rates and Premature Mortality Rate were significant for WCAs but not RHAs (see section 7.5, this chapter). Once again, lack of nursing station visit data for rural areas may have influenced the findings for the RHA analysis.

Figure 7.6: Physician Visit Rates for Children Aged 0-19 Years By Physician Specialty and RHA, 1998/99

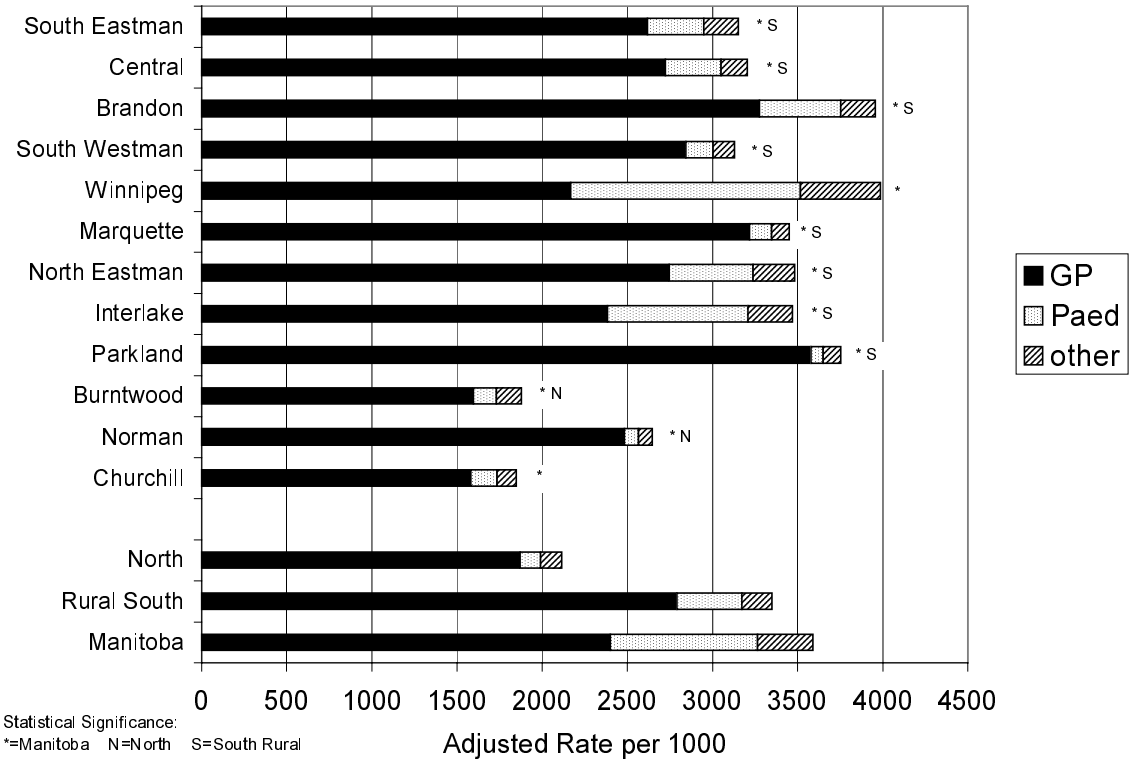
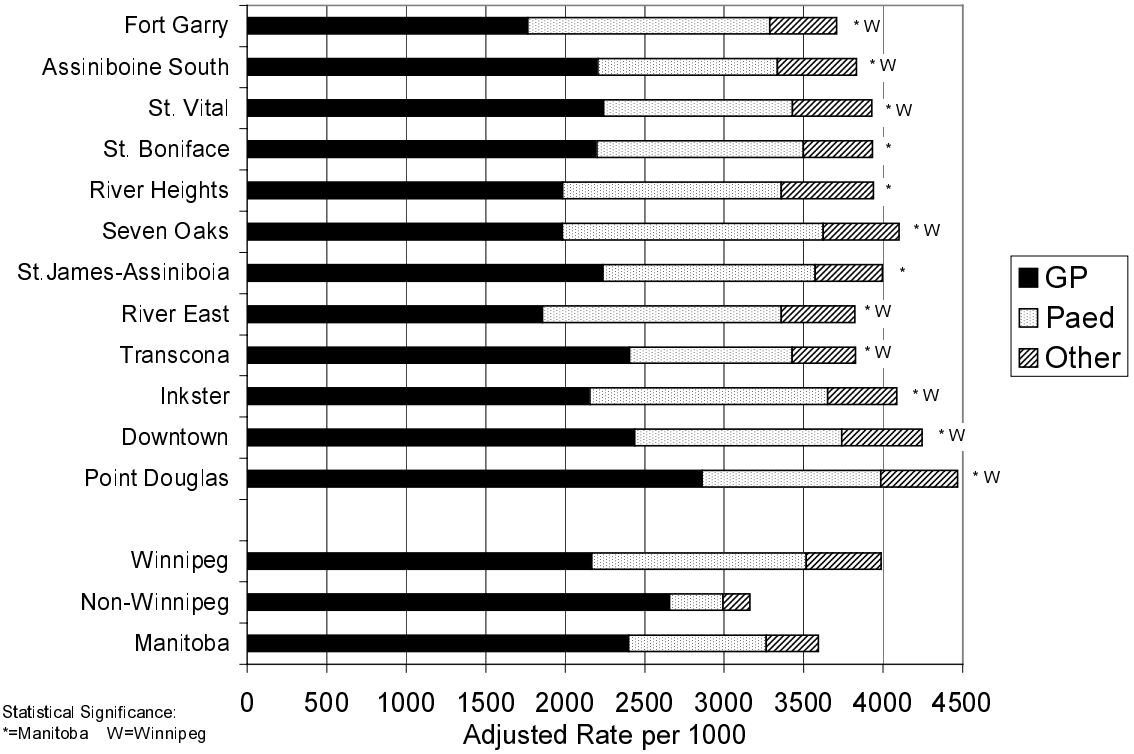


Figure 7.7: Physician Visit Rates for Children Aged 0-19 Years By Physician Specialty and WCA, 1998/99



more visits to specialists than their Non-Winnipeg counterparts. The majority of paediatricians in the province practice in Winnipeg.

Although the use of specialists varies across areas, correlation analyses found that it was not related to the healthiness of the populations within regions in either the RHAs (p=.11) or the WCAs (p=.62).

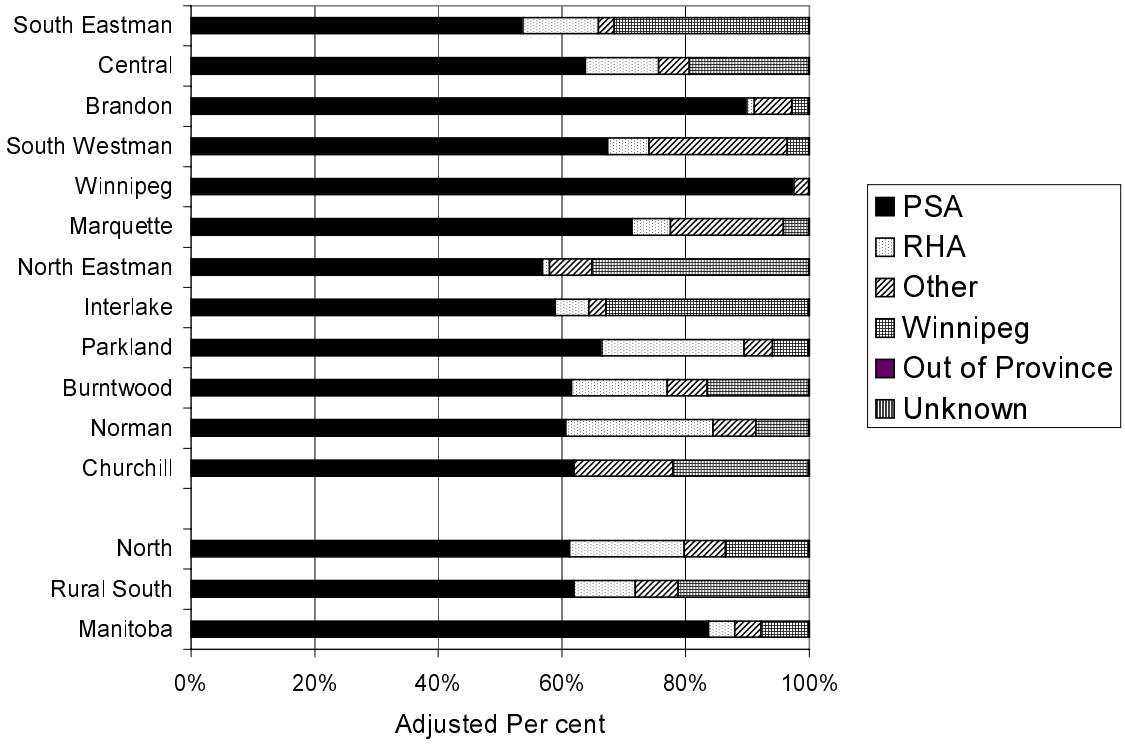
Figure 7.8 shows where children residing in each of the RHAs accessed physicians, as a per cent of total visits. Because the physician service areas (PSA) are within the RHAs, the per cent of visits within a child's RHA is taken by adding the PSA and RHA per cent. Almost 80% of the physician visits for children in the north and over 75% of the visits for those in the south were provided within the child's own RHA. The per cent of visits provided within the RHA varies by region. Besides Winnipeg children, where almost all visits are provided within Winnipeg, Brandon children had the highest per cent visits within RHA, at about 90%, whereas children residing in North Eastman had the lowest per cent visits within region, at less than 60%. For all RHAs except Winnipeg and Brandon, the majority of visits to paediatricians and other specialists took place outside the child's own RHA, most often in Winnipeg (not shown on graph). For visits to paediatricians, close to 95% of these visits for Brandon children took place within their RHA, over 40% of visits for Interlake and Central children took place within their RHAs, and close to 40% of these visits for Burntwood children took place within their own RHA. For all other RHAs, the per cent of visits to paediatricians within RHA ranged from 0 to less than 10%. For visits to other specialists, over 70% of these visits for Brandon children took place within the child's RHA, whereas this value was under 20% for Parkland children and just over 10% for Central children. For all other RHAs, the per cent of visits to other specialists within RHA ranged from 0 to less than 10%.

Over 65% of visits to paediatricians made by children from the north were provided in Winnipeg. Over 60% of visits to paediatricians made by children from the rural south were provided in Winnipeg. Over 90% of visits to other specialists made by children from the north were provided in Winnipeg. Almost 90% of visits to other specialists made by children from the rural south were provided in Winnipeg.

7.3.2 Physician visits by continuity of care

Identification of a physician as a single or usual source of ambulatory care has been linked to better health outcomes in children, such as fewer hospitalizations and higher immunization rates (O'Malley and Forrest 1996; Halfon and Newacheck 1993). On average and in most regions, 70% of ambulatory care visits by children were to a usual provider, defined as the most frequently seen physician. Variation in the proportion of visits to a

Figure 7.8: Per cent Physician Visits, Children Aged 0-19 Years By Location of Visit and RHA, 1998/99



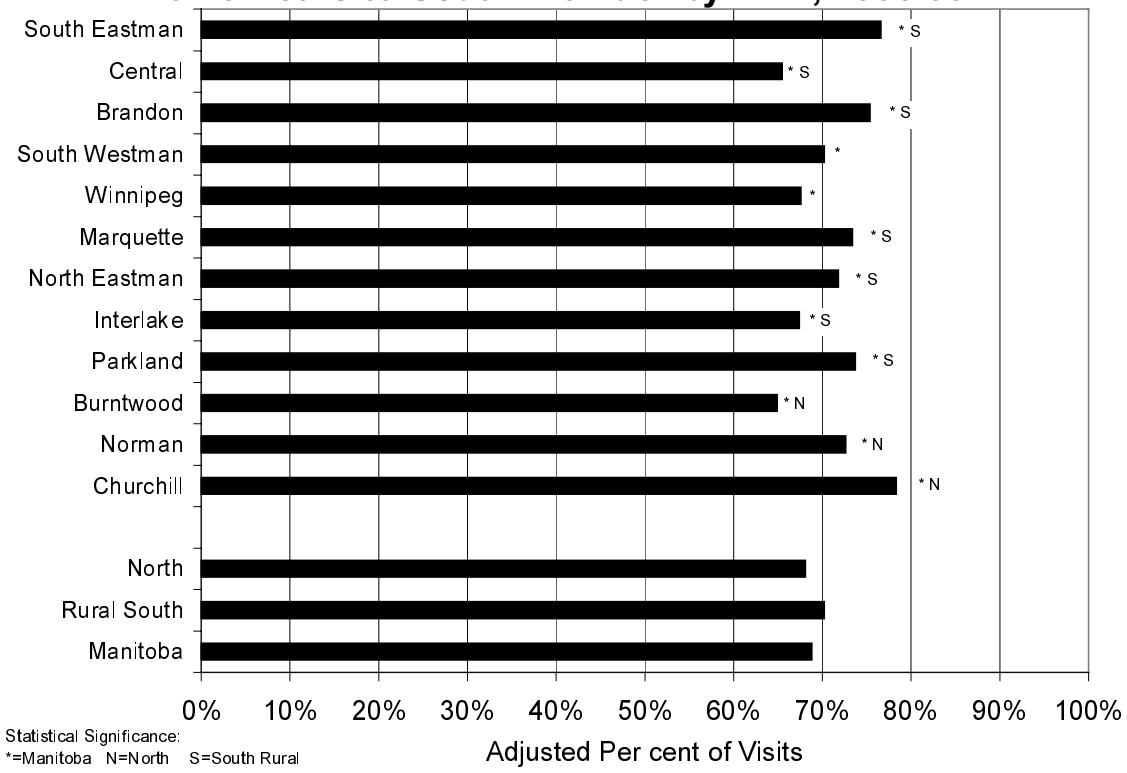
usual provider was observed among RHAs, but it was not substantial and did not coincide with the healthiness of the populations within the regions (Figure 7.9). For example, the proportion of usual provider visits was significantly lower in the Central, Winnipeg and Interlake RHAs than the southern average. In Winnipeg however (Figure 7.10), the proportion of visits to a usual provider was lower in the areas with the least healthy populations, Point Douglas and Downtown, than in the communities with the healthiest populations, Fort Garry and Assiniboine South. A significantly lower proportion of usual provider visits was documented in the Point Douglas, Downtown and Inkster areas than the Winnipeg average. However, significantly lower proportions were also observed in communities with healthier populations such as St. Boniface and St. Vital.

7.3.3 Physician visits by age

Physician visits also vary by the age of the child, with substantially more visits in the first year of life. The mean visits for Manitoba children under one year of age in 1998/99 was 7.5 per child per year, with Winnipeg and Brandon children having significantly more visits and children from rural south and the north having significantly fewer visits than the Manitoba average (Figure 7.11). Visits decline fairly steadily after the first year of age, with a mean of just over 5 visits per Manitoba child per year in the 1- to 4-year-old category, about 3 visits per child per year in the 5- to 9-year-old category, and about two-and-a-half visits per child per year in the 10- to 14-year-old category. Visits then tend to go up slightly, to a mean of over 3 visits per Manitoba child per year in the 15- to 19-year-old category. The geographic pattern observed for the youngest age group persists in all age categories, with Brandon and Winnipeg children having significantly more visits and rural south and north children having significantly fewer visits than the Manitoba average. Keep in mind that nursing station visits are not captured leading to substantial undercounting of ambulatory services in rural areas, especially the north.

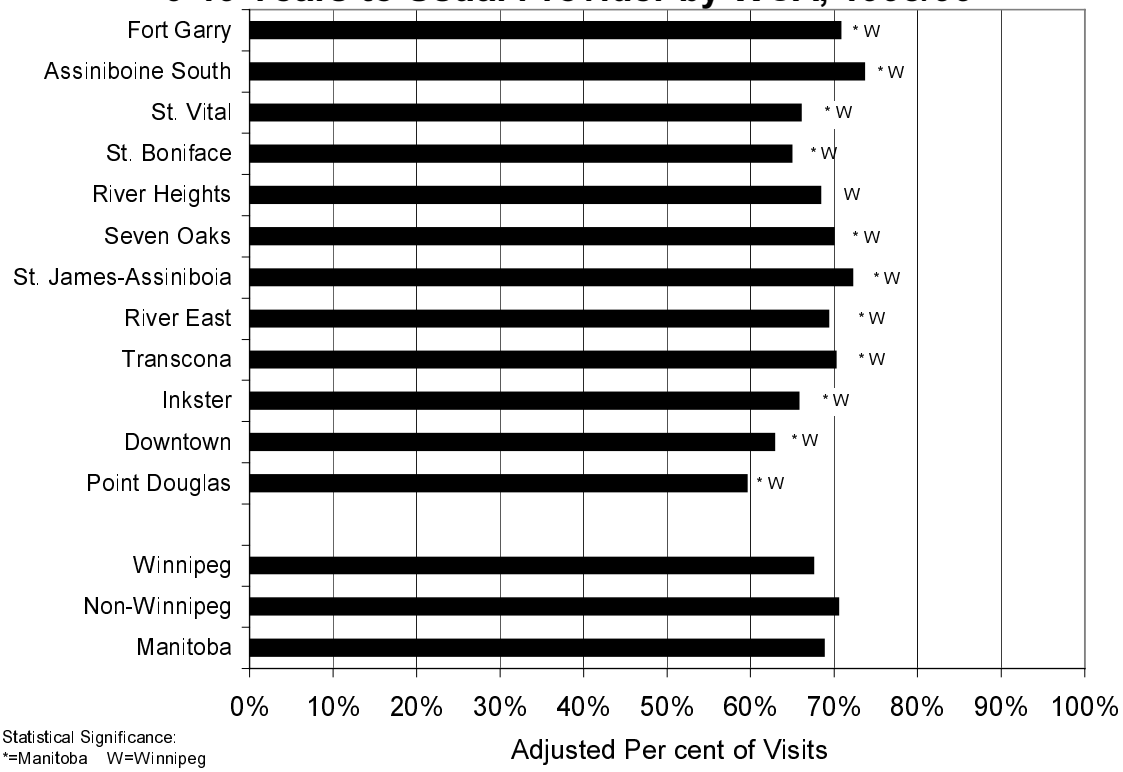
Physician visit rates are highest in the first year of life, with an average of 7.5 visits per Manitoba child this age.

Figure 7.9: Per cent of Visits by Children Aged 0-19 Years to Usual Provider by RHA, 1998/99



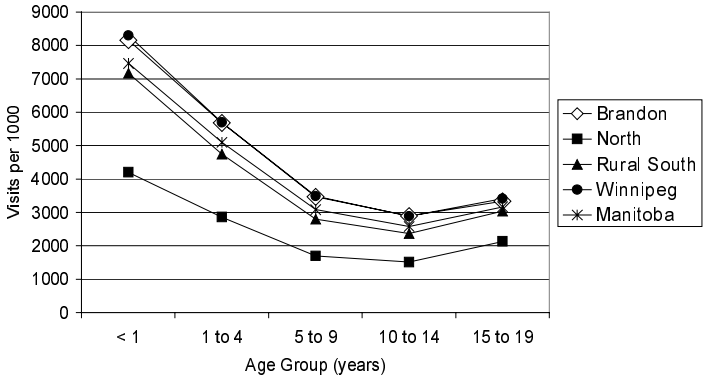
Statistical Significance:
*=Manitoba N=North S=South Rural

Figure 7.10: Per cent of Visits by Children Aged 0-19 Years to Usual Provider by WCA, 1998/99



Statistical Significance:
*=Manitoba W=Winnipeg

Figure 7.11: Physician Visit Rates for Children By Age Group and Manitoba Region, 1998/99



Ten per cent of the physician visits for northern children under one year of age were to paediatricians, compared to 54% for Winnipeg children. At 1 to 4 years of age, 8% of the physician visits for northern children were to paediatricians, compared to 45% for Winnipeg children.

Use of specialists also changes according to a child's age. The per cent of visits to paediatricians is highest for children under one year at 38% for Manitoba children, and drops steadily with each age group; 32% at 1 to 4 years, 28% at 5 to 9 years, 20% at 10 to 14 years, and 6% at 15 to 19 years (Figures available from the authors on request). Visits to other specialists show a different pattern with the youngest three age categories each at around 7%, but then an increase starting at 10 to 14 years. Patterns vary according to where children live, however at all ages, visits to paediatricians and other specialists are considerably higher for Winnipeg children than those from other geographic regions (age breakdowns for specialist visits by region are available from the authors on request).

7.3.4 Physician visits by income

Significant trends were found for physician visit rates across income quintiles; however the trends went in opposite directions for rural and urban income levels (Figures 7.12 and 7.13). For children living in rural areas, lower income levels were associated with decreasing physician visits, potentially an outcome of missing data from northern regions (Cochran-Armitage $p<.0001$, Figure 7.12). For children living in urban areas physician visits increased as neighbourhood income level decreased (Cochran-Armitage trend $p<.001$, Figure 7.13). For both rural and urban children the likelihood of visiting a specialist (paediatrician or other specialist) increased as neighbourhood income level increased (Cochran-Armitage $p<.0001$ for both rural and urban quintiles). In terms of continuity of

Figure 7.12: Physician Visits for Children Aged 0-19 Years By Rural Income Quintile, 1998/99

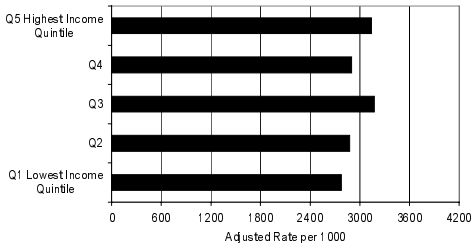


Figure 7.13: Physician Visits for Children Aged 0-19 Years By Urban Income Quintile, 1998/99

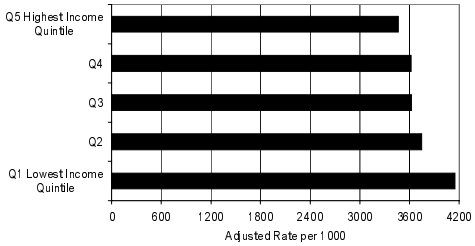


Figure 7.14: Proportion of Physician Visits by Children Aged 0-19 Years to Usual Provider By Rural Income Quintile, 1998/99

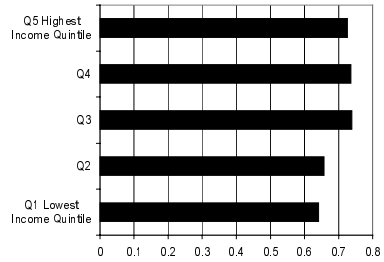
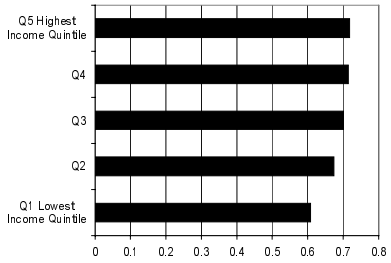


Figure 7.15: Proportion of Physician Visits by Children Aged 0-19 Years to Usual Provider By Urban Income Quintile, 1998/99

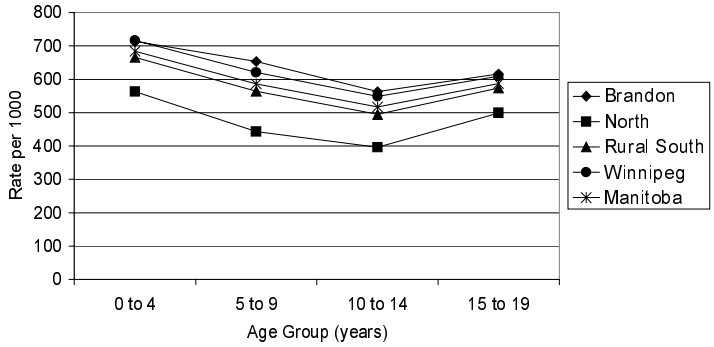


physician care, the proportion of visits to a usual provider was also associated with income level, rising with increasing income in both rural and urban areas (Figures 7.14 and 7.15, Cochran-Armitage trend p<.0001 for both).

7.4 Prescription drug utilization

Almost 60% of Manitoba children received at least one prescription for a medication in 1998/99. This rate is identical to the prevalence of prescription drug use reported in a population-based study of children in the U.S. (Hong and Shepherd 1996). Prescription use followed a U-shaped pattern by age, similar to an earlier report of age-specific prescription utilization in Manitoba in 1996 (Metge et al. 1999). Highest use was observed in children 0 to 4 years old (68%), the lowest use was among children 10 to 14 years (52%), and usage rose thereafter to 59% among adolescents (Figure 7.16).

Figure 7.16: Rate of Children With at Least One Prescription By Age and Manitoba Region, 1998/99



Children living in Winnipeg and Brandon were significantly more likely, and children living in the rural south and northern Manitoba were significantly less likely to receive a prescription medication than the Manitoba average (Figure 7.16). Differences in utilization between the North and Manitoba were substantial. Medications dispensed to First Nations children receiving health care services from northern nursing stations are not recorded in the prescription database. As the age-specific prevalence of prescription drug use is similar among First Nations and all Manitoban children, it is important to consider the following when interpreting prescription data in

Percentage of Manitoba First Nations Children with treaty status with one or more prescription medications, 1998/99 (Non-Insured Health Benefits Program, Annual Report 1998/99).

0-4yr	*86%*
5-9yr	*61%*
10-14yr	*56%*
15-19yr	*61%*

this report: 1) lower prescription rates in northern regions and low income, rural areas may represent missing data, and 2) higher prescription rates in northern and low income, rural areas may underestimate the true rate of prescription use.

By far, the most commonly dispensed drugs were systemic antibiotics (36% of all prescriptions). The 10 most common prescription drug categories are listed in the side column. Antibiotics, antiasthmatics, topical steroids, analgesics, ophthalmic products and anxiolytics are also commonly used by children in other developed countries (Straand et al. 1998). For the remainder of this section, data are presented on four classes of drugs, which were selected to illustrate regional differences in the burden of illness and physician prescribing habits: 1) antibiotics; 2) pain-relief drugs; 3) iron supplements; and, 4) psychotropics (mental health drugs).

Top 10 categories of prescription drugs in Manitoba children, 1998/99

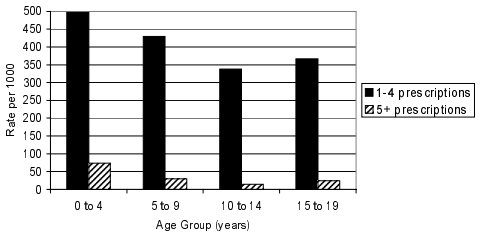
Rank	Drug Category
1	*systemic antibacterials*
2	*antiasthmatics*
3	*analgesics, antipyretics*
4	*topical steroids*
5	*antidepressants, stimulants*
6	*oral contraceptives*
7	*ophthalmic preparations*
8	*antiacne products*
9	*anxiolytics, antipsychotics*
10	*NSAIDs (nonsteroidal anti-inflammatory drugs)*

"The development and use of antimicrobial agents was one of the most important measures leading to the control of bacterial diseases in the 20th century. Despite this half-century of success, periodic warnings have recurred: the introduction of a new drug was almost always followed by resistance. But there were always newer drugs. The emergence of multi-drug resistance to…has made many currently available drugs ineffective." (Cohen 1992).

7.4.1 Antibiotics

Forty-four per cent of Manitoba children received one or more prescriptions for a systemic antibiotic in 1998/99. As long-term use of antibiotics poses a greater risk of antimicrobial resistance (Cohen 1992), we identified separately, children receiving 5 or more antibiotic prescriptions per year (3.5% of children), and children receiving 4 prescriptions or less (41% of children). Close to 60% of children less than 5 years old had received one or more antibiotic prescriptions; this proportion declined to 40% in adolescence. Young children were three times as likely than adolescents to receive 5 or more antibiotic prescriptions (Figure 7.17). Others have also reported that very young children are much more likely to receive multiple courses of antibiotics (Finkelstein et al. 2000).

Figure 7.17: Rate of Children With One or More Antibiotic Prescriptions By Age and Number of Prescriptions, 1998/99



Regional utilization of antibiotics is reported as age-standardized rates, but similar patterns across regions were observed for all ages (data not shown). Our data show that children living in northern RHAs were the least likely to receive antibiotic prescriptions (Figure 7.18), but this finding is likely the outcome of missing prescription data, as these areas have much higher respiratory infection rates than other regions (see Chapter 5, Health Status: Childhood Acute Chronic

Figure 7.18: Rate of Children Aged 0-19 Years With One or More Antibiotic Prescriptions By RHA, 1998/99

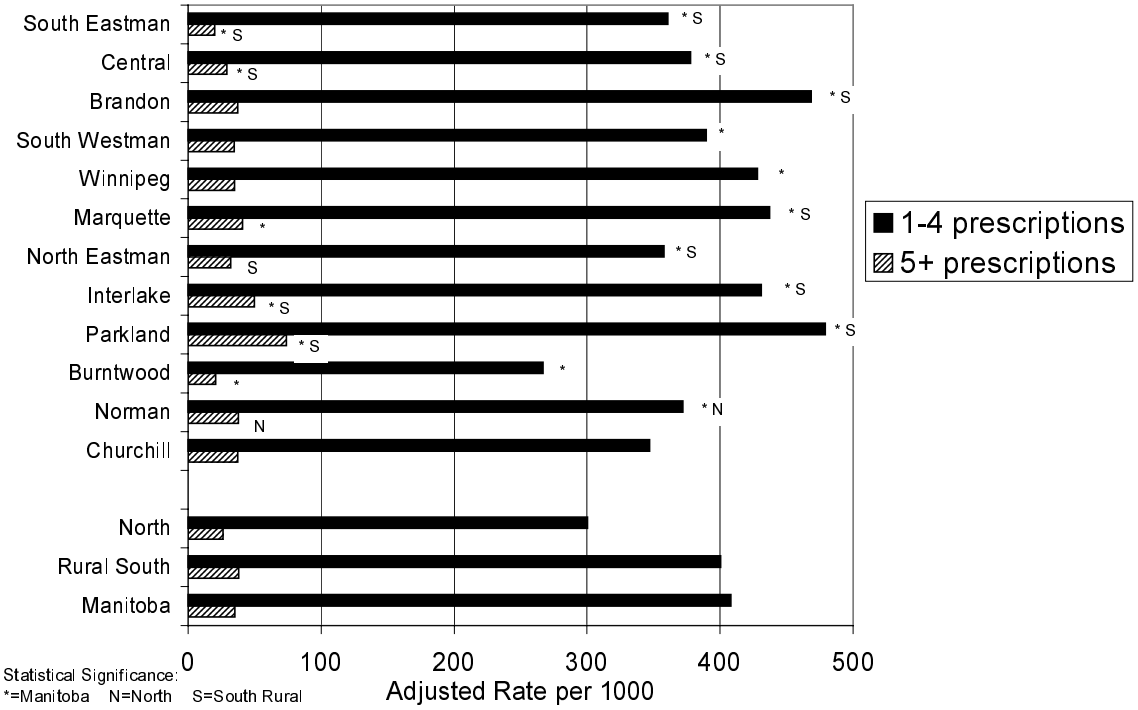
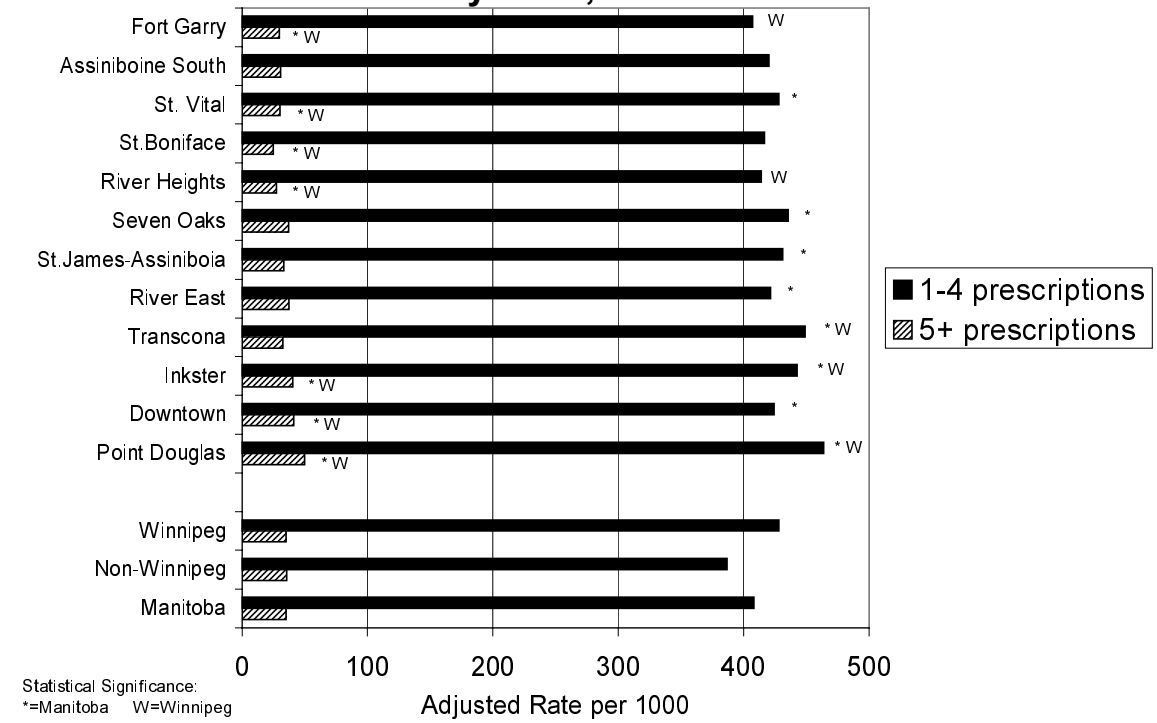


Figure 7.19: Rate of Children Aged 0-19 Years With One or More Antibiotic Prescriptions By WCA, 1998/99

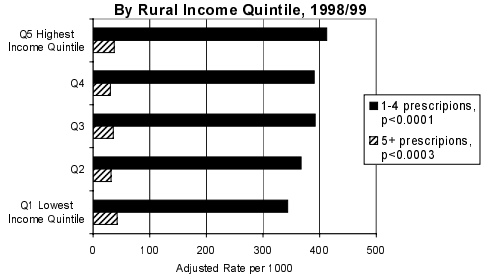


Conditions). In comparison to the average utilization of antibiotics in southern rural regions, the regions with the least healthy populations (Parkland, Interlake) were the most likely and the regions with the healthiest populations (Central, South Eastman) were the least likely to have children with 5 or more antibiotic prescriptions. In addition, children living in Winnipeg, Brandon and Marquette were more likely to receive 4 or less antibiotic prescriptions than the southern rural average.

Within the city of Winnipeg, (Figure 7.19) children living in the areas with the least healthy populations were more likely to receive 5 or more prescriptions for antibiotics, than children in areas where the populations are generally healthier. A similar trend was observed for children receiving fewer antibiotics. Close to 5% of children living in the Point Douglas and Downtown areas received more than 5 or more prescriptions for an antibiotic in 1998/99, significantly higher than the overall rate for Winnipeg. Antibiotics are frequently prescribed for respiratory tract and ear infections in preschool children (Arnold et al. 1999). Chapter 5: Health Status: Childhood Acute and Chronic Conditions tells us that children living the Winnipeg areas with the least healthy populations were more likely to be hospitalized for lower respiratory tract infections. However, concern has been raised over the inappropriate prescribing of antibiotics in viral respiratory tract infections, and over long courses of antibiotics in ear infections (Kozyrskyj et al. 1998).

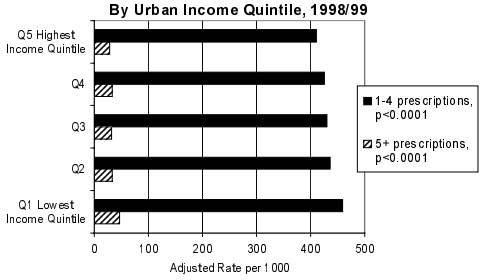
Significant trends were found for antibiotic prescription use across income levels, with different trend directions depending on rural or urban residence and number of prescriptions. In rural areas, antibiotic prescription use decreased as neighbourhood income level decreased for children receiving 1 to 4 prescriptions (Figure 7.20, Cochran-Armitage trend test, $p<0.0001$). As proposed at the beginning of the prescription utilization section, lower antibiotic utilization in low income rural areas could be due to missing data from northern regions. Greater antibiotic use among children living in higher socioeconomic status areas has been reported, and our

Figure 7.20: Rate of Children Aged 0-19 Years With One or More Antibiotic Prescriptions By Rural Income Quintile, 1998/99



findings could also be interpreted as the outcome of greater physician utilization in higher income, rural areas (Henricson et al. 1998). For those children receiving 5 or more prescriptions, antibiotic prescription use increased with decreasing income level (p<.0003). In urban areas, antibiotic prescription utilization increased with decreasing neighbourhood income (Figure 7.21, Cochran-Armitage trend test, p<0.0001). This fits with the finding that children living in lower socioeconomic status households are more likely to see physicians for respiratory tract infections and receive antibiotic prescriptions (Petersson et al. 1996; Henricson et al. 1998).

Figure 7.21: Rate of Children Aged 0-19 Years With One or More Antibiotic Prescriptions By Urban Income Quintile, 1998/99

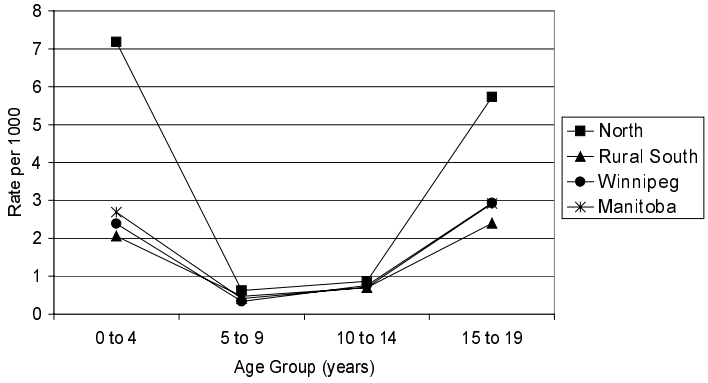


The effects of iron deficiency in children under 5 years have been widely reported. Effects on psychomotor development are well recognised and there is evidence that these adverse consequences may not be fully reversible with treatment (Childs et al. 1997).

7.4.2 Iron supplements

Approximately 540 Manitoba children received treatment for iron deficiency anaemia in 1998/99, a condition which left untreated in early childhood can be associated with developmental delay (Booth and Aukett 1997). Iron treatment was most frequent among 0 to 4 year olds and 15 to 19 year olds (especially among children living in northern RHAs), (Figure 7.22). In addition to children living in the northern RHAs, those living in Parkland and North Eastman were at greater risk of being treated for iron deficiency anaemia (Figure 7.23). Iron prescription rates in northern areas may underestimate the extent of iron deficiency anaemia in First Nations children, which has been estimated to be 50% in some aboriginal populations (Moffatt 1995).

Figure 7.22: Rate of Children with One or More Prescriptions for Iron Supplements By Age and Manitoba Region, 1998/99



Per cent of population which has immigrated from Asia [Statistics Canada 1996]

Point Douglas	*8%*
Downtown	*15%*
Inkster	*17%*
Transcona	*2%*
River East	*3%*
St. James Assiniboia	*1%*
Seven Oaks	*9%*
River Heights	*2%*
St. Boniface	*3%*
St. Vital	*2%*
Assiniboine South	*2%*
Fort Garry	*8%*

Figure 7.23: Rate of Children Aged 0-19 Years With One or More Prescriptions For Iron Supplements by RHA, 1998/99

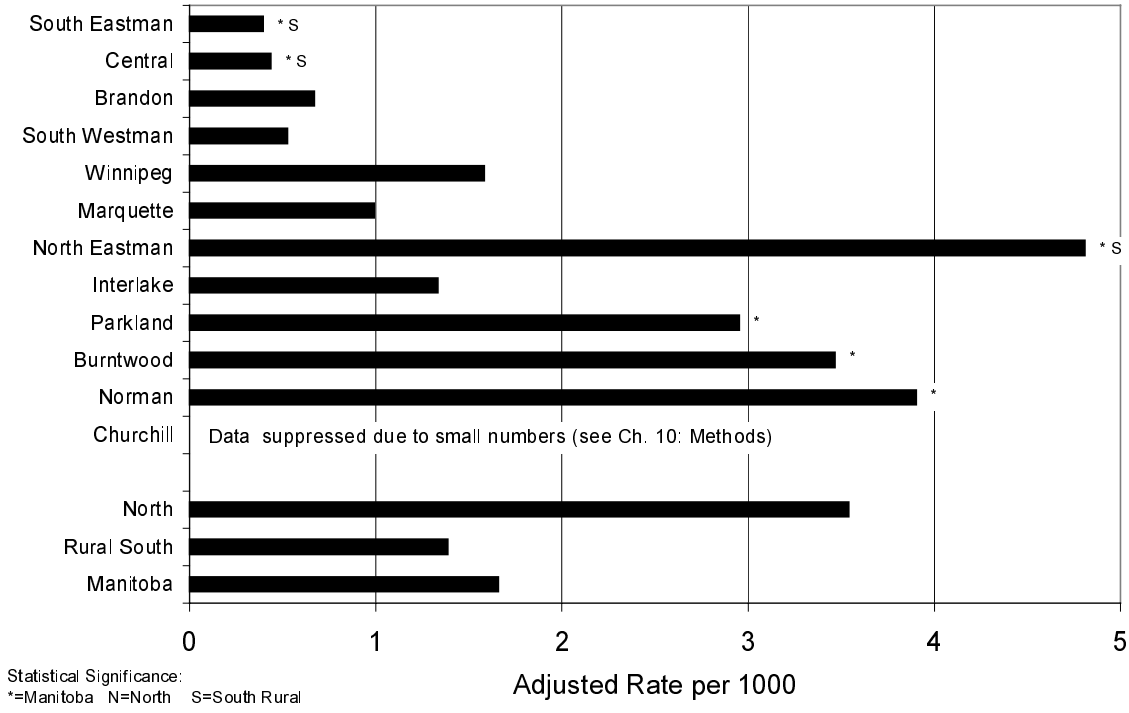
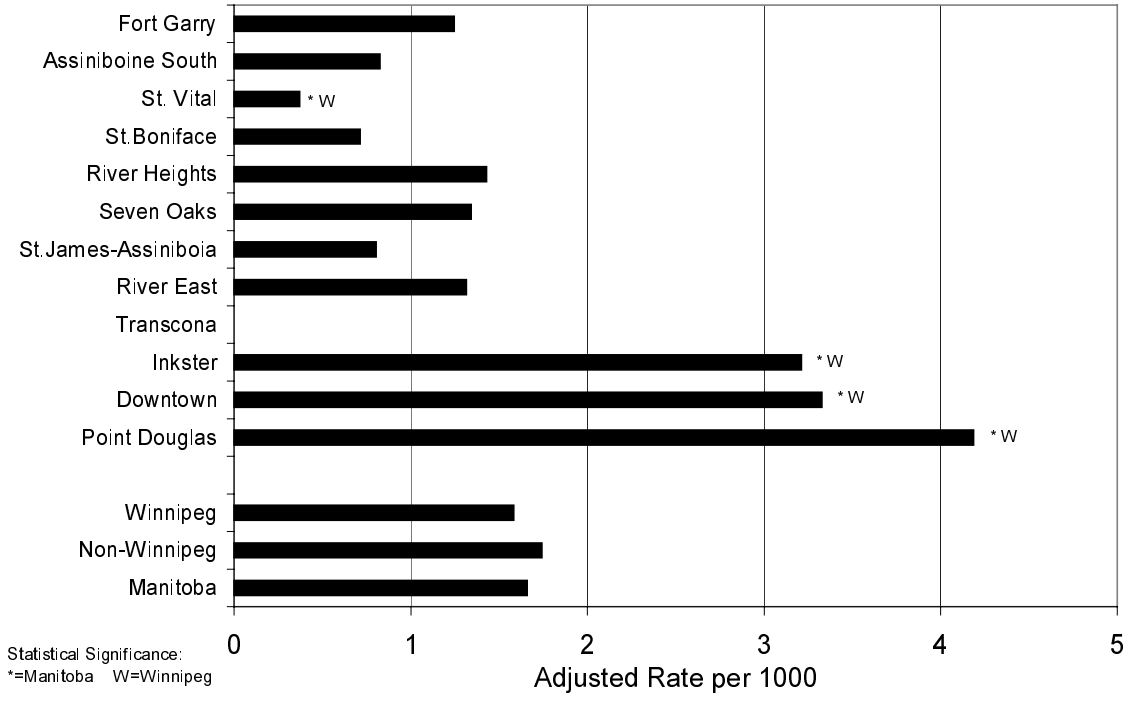


Figure 7.24: Rate of Children Aged 0-19 Years With One or More Prescriptions For Iron Supplements by WCA, 1998/99



Within Winnipeg, (Figure 7.24) iron supplement use in children was highest in the Point Douglas, Downtown and Inkster areas. In addition to having a higher population of First Nations children, these areas also have a large concentration of new immigrants from Asia, among whom a higher prevalence of iron deficiency anaemia has been reported (Childs et al. 1997). Treatment for iron deficiency anaemia was significantly associated with neighbourhood income levels for both rural and urban areas (Figures 7.25 and 7.26, Cochran-Armitage trend p<.0001 for both). As income level decreased the rate of treatment for iron deficiency anaemia increased, with the highest rate of treatment in the lowest rural income level areas. Young children living in low income households are exposed to myriad risk factors for poor school performance (Aber and Bennett 1997). Iron deficiency anaemia is a preventable condition, and our finding has policy relevance in terms of nutrition counselling of parents, and accessibility and affordability of iron-rich foods in low income areas (Childs et al. 1997; Sooman et al. 1993).

Figure 7.25: Rate of Children Aged 0-19 Years With One or More Prescriptions for Iron Supplements By Rural Income Quintile, 1998/99

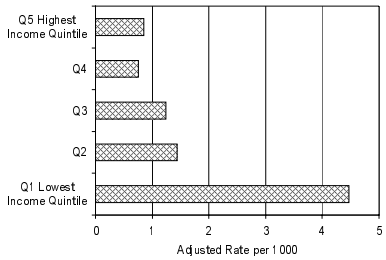
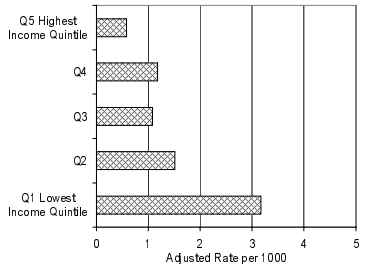


Figure 7.26: Rate of Children Aged 0-19 Years With One or More Prescriptions for Iron Supplements By Urban Income Quintile, 1998/99



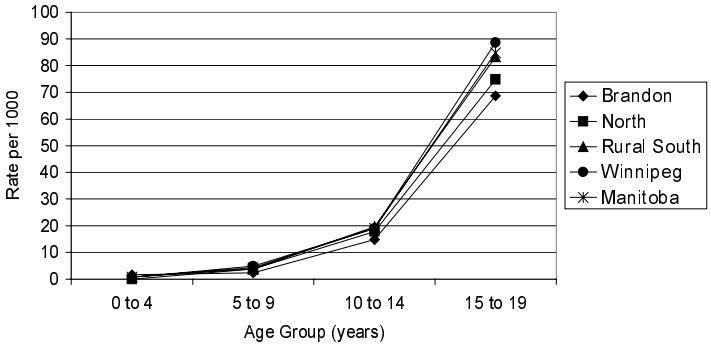
"One revolutionary change over the past decade has been the belated realization that children feel pain as keenly as adults do – and that their pain should be treated." (Nichols 2000).

"Little is known about the epidemiology of pain in children...findings indicate that chronic pain is a common complaint in childhood and adolescence." (Perquin et al. 2000).

7.4.3 Pain-relief drugs

Narcotic analgesics and NSAIDS (nonsteroidal anti-inflammatory drugs), which are prescribed to manage acute pain (i.e., headache, injury, sickle cell anaemia, menstrual cramps) and chronic pain (i.e., arthritis, cancer), were most often dispensed to older children (Figure 7.27 and 7.28). With the exception of lower narcotic analgesic use among adolescents living in Brandon, no regional differences in use were observed. NSAIDs were dispensed more frequently in northern Manitoba than the Manitoba average, and less frequently in Winnipeg among children 5 years of age and older.

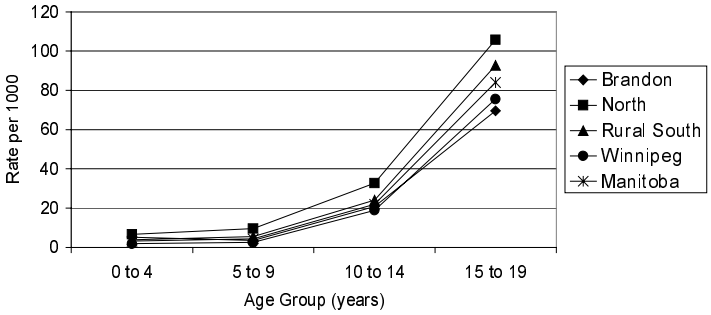
Figure 7.27: Rate of Children with One or More Prescriptions for Narcotic Analgesics By Age and Manitoba Region, 1998/99



Children with one or more prescriptions for narcotic analgesics per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*0.5*	*1.0*
Age 5-9	*3.7*	*4.8*
Age 10-14	*19.9*	*18.1*
Age 15-19	*98.5*	*71.9*

Figure 7.28: Rate of Children with One or More Prescriptions for Nonsteroidal Anti-inflammatory Drugs By Age and Manitoba Region, 1998/99



Children with one or more prescriptions for NSAIDs per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*2.6*	*3.7*
Age 5-9	*4.7*	*3.9*
Age 10-14	*27.4*	*16.9*
Age 15-19	*107.2*	*62.1*

Children living in Brandon, South Westman and Norman (missing data issue) had lower prescription rates for narcotic analgesics than the southern rural average, while Interlake had significantly higher rates (Figure 7.29). Children from the Point Douglas area had the highest rate of narcotic analgesic prescription in Winnipeg (Figure 7.30). The use of NSAID drugs was associated with the general healthiness of population within the RHAs. Regions with less healthy populations, Burntwood and Parkland, had significantly higher rates of NSAID use in children, and regions with healthier populations, Brandon and South Eastman, had significantly lower rates of use than the southern rural average. In Winnipeg, the areas with the least healthy populations, Point Douglas and Downtown, had higher rates of NSAID use than the Winnipeg average, although Assiniboine South, an area with a generally healthier population

Figure 7.31: Rate of Children Aged 0-19 Years With One or More Prescriptions for Pain Relief Drugs by Rural Income Quintile, 1998/99

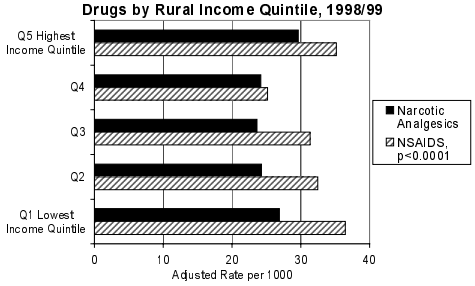


Figure 7.32: Rate of Children Aged 0-19 Years With One or More Prescriptions for Pain Relief Drugs by Urban Income Quintile, 1998/99

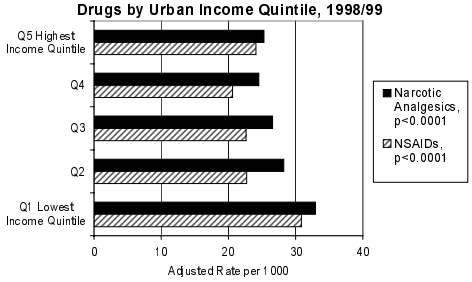


Figure 7.29: Rate of Children Aged 0-19 Years With One or More Prescriptions For Pain Relief Drugs by RHA, 1998/99

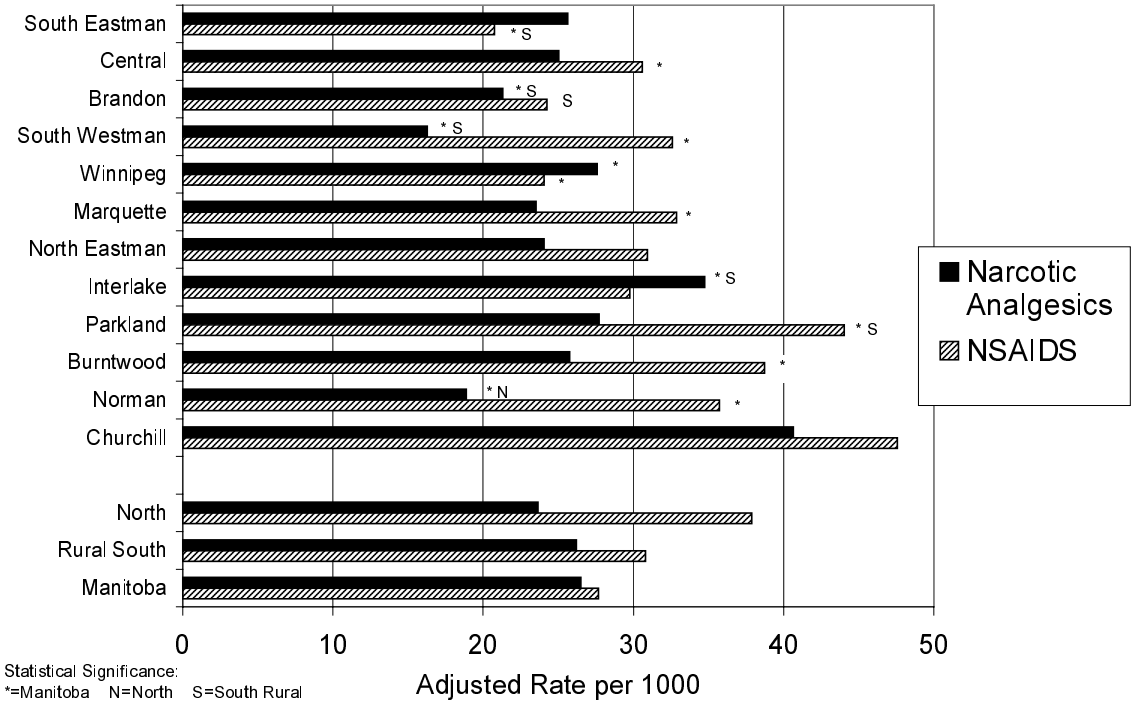
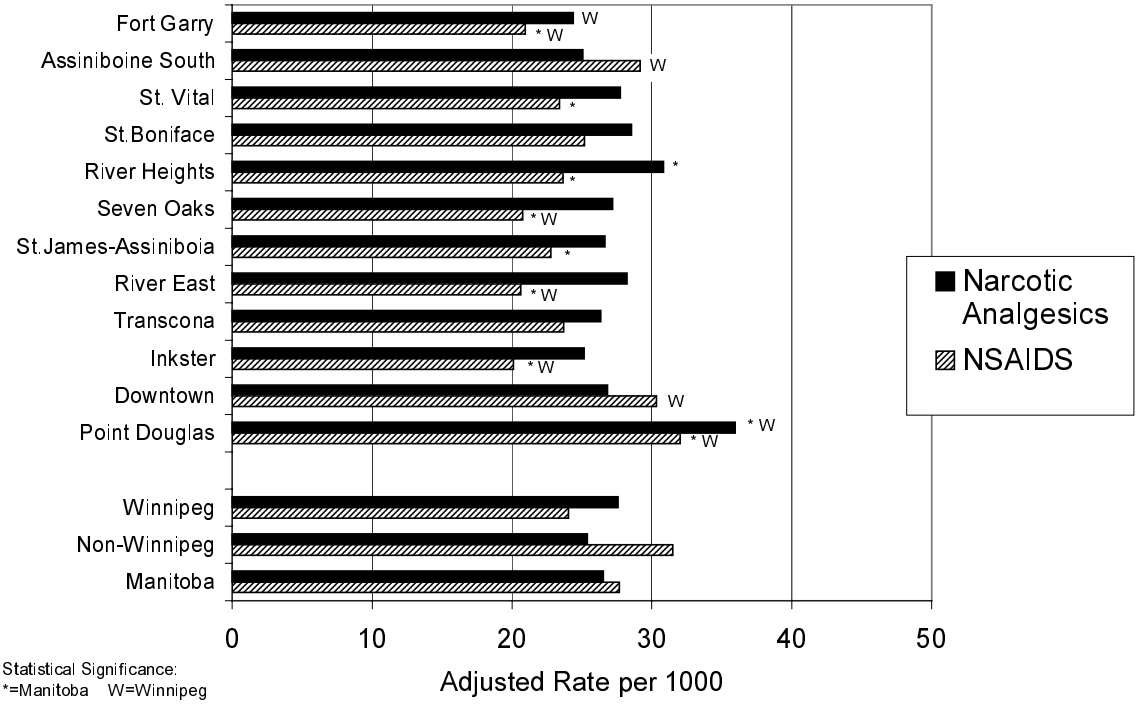


Figure 7.30: Rate of Children Aged 0-19 Years With One or More Prescriptions For Pain Relief Drugs by WCA, 1998/99



also had higher rates of use.

Higher use of NSAIDs was found with decreasing income level in both rural and urban areas, whereas the prescription of narcotic analgesics showed this same significant trend for urban areas only (Figures 7.31 and 7.32). These drugs are frequently prescribed to children presenting to emergency with injury (Friedland et al. 1997). The pattern of analgesic use paralleled the neighbourhood income association with injury hospitalization (see Chapter 6: Injury), but unlike male dominance of injury rates, we found that females were more likely to receive NSAIDs than male children. Potentially, male children with injury are less likely to receive analgesic prescriptions, or analgesics are being prescribed to female children for other reasons. It has been recently recognized that chronic pain such as headache and abdominal pain, is more common in female adolescents, and there are calls for further investigation into the psycho-social causes of this female predominance (Perquin et al. 2000).

"There are still pockets of resistance among physician...particularly about using the powerful narcotic drugs known as opioids." (Nichols 2000).

"The Ritalin figures are startling. In 1994…. Pharmacists dispensed just under 27 million pills…Four years later, the number had more than doubled..."(Nichols 2000).

7.4.4 Psychotropic drugs (mental health drugs)

Over one per cent of children had received a prescription for a psychostimulant such as Ritalin, which is used in the treatment of attention-deficit hyperactivity disorder (ADHD). Almost one per cent of children had received a prescription for an antidepressant (used to treat depression, obsessive-compulsive disorders, ADHD, bed-wetting), 0.5% had received anxiolytics (used to treat sleep disorders, anxiety, seizures), and 0.2% had received prescription for major psychiatric conditions such as schizophrenia.

i) psychostimulants

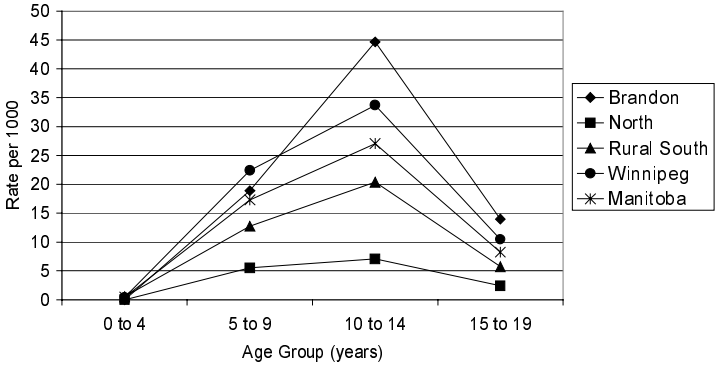
Rates of psychostimulant prescription use in Manitoba children have increased over the past three years. A study done using 1995/96 data found 0.89% of Manitoba children age 0 to 19 years were prescribed psychostimulants (Brownell and Yogendran, 2000); 1998/99 data indicate that 1.35% of Manitoba children were prescribed psychostimulants, representing an increase of over 50%. In 1998/99, psychostimulants were used most

Children with one or more prescriptions for psychostimulants per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*0.2*	*0.6*
Age 5-9	*6.4*	*27.7*
Age 10-14	*9.6*	*43.6*
Age 15-19	*3.2*	*13.0*

often in children between the ages of 10 and 14, at a treatment prevalence of 2.7%. Usage was 3 to 4 times higher among males across all age groups. Similar age-gender patterns of psychostimulant use have been reported by others (Zito et al. 1997; Rappley et al. 1995). The dispensation of psychostimulants was significantly higher in Winnipeg and Brandon than the Manitoba average, notably in the 10 to 14 year age group (Figure 7.33). Psychostimulants were used significantly less frequently among children in the rural south and the north. Children aged 10 to 14 years living in Brandon were twice as likely to receive psychostimulant prescriptions than the southern rural average.

Figure 7.33: Rate of Children with One or More Prescriptions for Psychostimulants By Age and Manitoba Region, 1998/99



In addition to Brandon and Winnipeg, age-standardized rates of psychostimulant use revealed that Marquette and Interlake children were also more likely to be exposed to these drugs, than the southern rural average (Figure 7.34). Within Winnipeg, the highest rates of psychostimulant use were observed in the St. James-Assiniboine and Assiniboine South regions. Geographical variations in psychostimulant use, the magnitude of which has ranged from 5- to 10-fold differences in treatment prevalence, have been documented by others (Figure 7.35) (Zito et al. 1997; Rappley et al. 1995). This variation has not been explained by socioeconomic or ethnic composition. As reported in an earlier Manitoba study (Brownell and Yogendran, 2000) children living in higher income rural neighbourhoods were more likely to receive psychostimulants, (Figure 7.36) but no trend in psychostimulant prescription use was observed

Figure 7.36: Rate of Children Aged 0-19 Years With One or More Prescriptions For Psychostimulants and Antidepressants By Rural Income Quintile, 1998/99

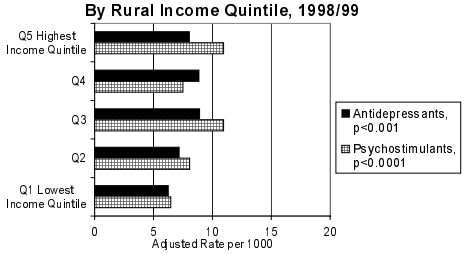
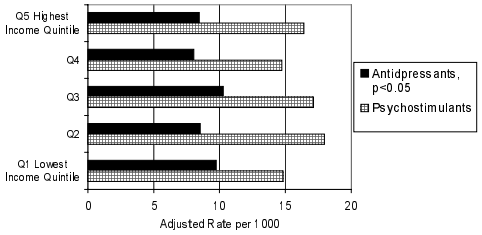
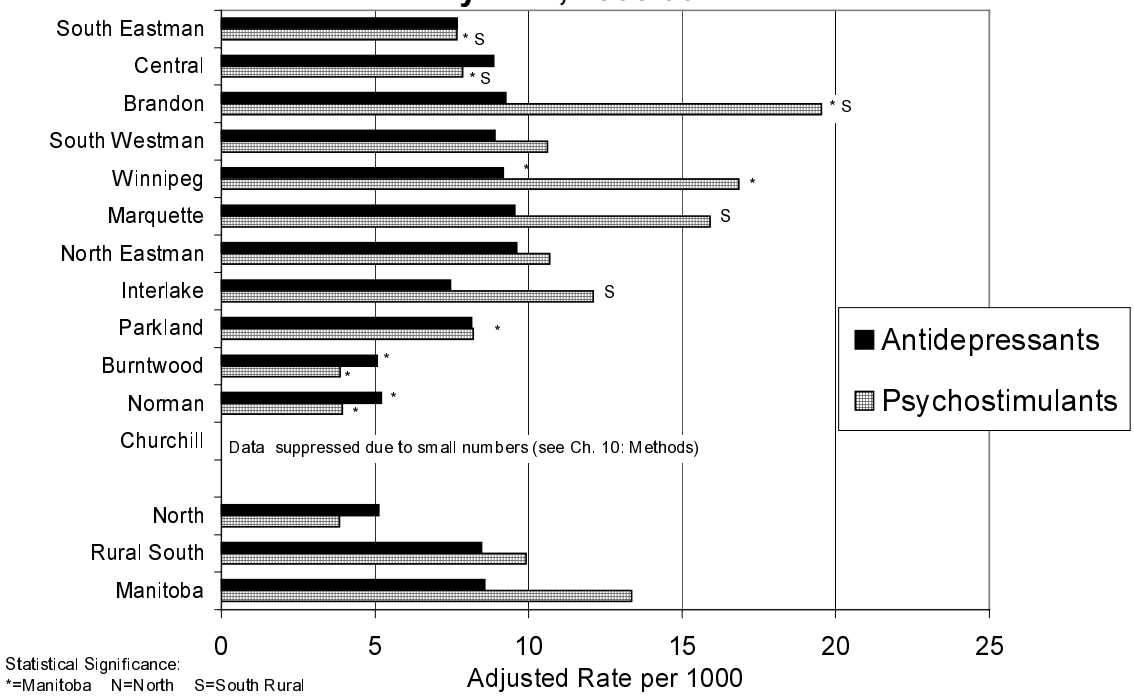


Figure 7.37: Rate of Children Aged 0-19 Years With One or More Prescriptions For Psychostimulants and Antidepressants By Urban Income Quintile, 1998/99



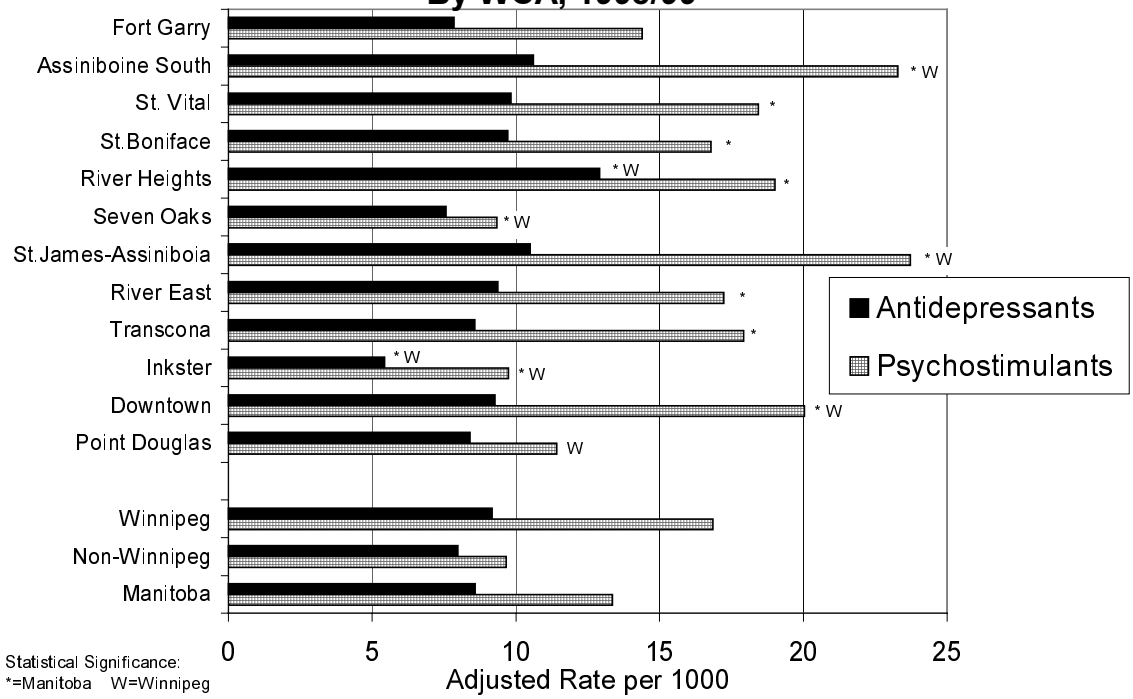
"In the last few years, several developments have focused renewed attention on patterns of antidepressant use. First, the armamentarium of antidepressant has continued to expand…Second, there has been a surge in public interest in antidepressants…the topic of lead articles in national news magazines, best-selling books…" (Olfson et al. 1998).

Figure 7.34: Rate of Children Aged 0-19 Years With One or More Prescriptions For Psychostimulants and Antidepressants By RHA, 1998/99



Statistical Significance:
*=Manitoba N=North S=South Rural

Figure 7.35: Rate of Children Aged 0-19 Years With One or More Prescriptions For Psychostimulants and Antidepressants By WCA, 1998/99



Statistical Significance:
*=Manitoba W=Winnipeg

across urban neighbourhood incomes (Figure 7.37).

ii) antidepressants

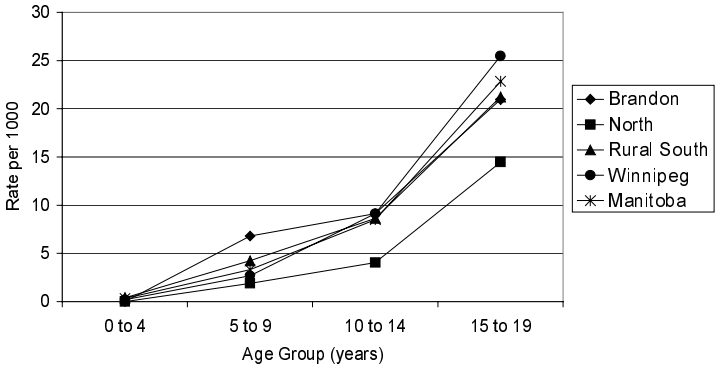
The prescription of antidepressants has increased in children, along with concerns over their long-term safety in children (Jensen et al. 1997). In the United States, children were 6 times as likely in 1993/94 to receive a prescription for an antidepressant then in 1985 (Olfson et al. 1998). Our data showed that 3% of adolescent females received prescriptions for antidepressants in 1998/99. Significantly higher use was reported for 10 to 14 year old males, likely representing antidepressant treatment of nocturnal enuresis (bed-wetting), which is more prevalent in boys (Foxman et al. 1986). Antidepressant use was less likely in northern areas (possibly the result of missing data), and children aged 5-9 years old living in Brandon were significantly more likely to receive these agents (Figure 7.38).

"..many psychotropic medications are used in youth with insufficient evidence of safety and efficacy" (Jensen PS et al. 1999).

Children with one or more prescriptions for antidepressants per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*0.2*	*0.4*
Age 5-9	*2.4*	*4.2*
Age 10-14	*7.3*	*9.7*
Age 15-19	*32.4*	*13.9*

Figure 7.38: Rate of Children with One or More Prescriptions for Antidepressants By Age and Manitoba Region, 1998/99



With the exception of North-South differences, no appreciable variations in age-standardized use of antidepressants was observed between RHAs (Figure 7.34). However, children living in River Heights were more likely than the Winnipeg average to receive antidepressants, while Inkster area children were less likely to be treated with them (Figure 7.35). It has been postulated that geographic variation in the use of psychotropics is related to prevalence of mental disorders, drug insurance policies, school referral programs, physician specialty training and family cultural values (Zito et al. 2000). Physician

identification of mental health problems in children has been tied closely to parental disclosure of problems in their children, which may vary by culture (Wildman et al. 1999). There was a trend in decreased use of antidepressants in lower income areas (Figure 7.36, Cochran-Armitage, $p<.001$), potentially a function of missing data. There was however, a trend in increased utilization of antidepressants in lower income levels in urban areas (Figure 7.37, Cochran-Armitage trend test, $p<0.05$), which parallels reports of increased depression/emotional-disorder anxiety among children from lower income households (Ross and Roberts 1999).

"…devastating impact on the lives of children and their parents. Schizophrenia is most commonly associated with adults, and usually appears after the age of 15. But in a few rare cases…the disorder appears before age 12, almost invariably causing a tremendous deterioration of the personality." (Nichols 2000).

iii) antipsychotics

Antipsychotics have traditionally been used to treat acute psychosis such as schizophrenia, which is diagnosed later in childhood. In our data, adolescents were much more likely to receive these agents than children at other ages (Figure 7.39). However, some of the newer antipsychotics (i.e., Risperidone) are beginning to be utilized in younger children for the treatment of aggressive behaviour (Schreier 1998). This may be why we observed that males, aged 10 to 14 years, were more likely to receive prescriptions for antipsychotic drugs than females. It is noteworthy that some children 0 to 4 years old were treated with these agents. A trend towards increased use of psychotropic drugs in preschoolers has been reported by others. Although serious behavioural and emotional problems are beginning to be identified in preschoolers (Keenan et al. 1997), the use of antipsychotics in this age group raises concerns about the potential for adverse effects on the developing brain (Zito et al. 2000).

Children with one or more prescriptions for antipsychotics per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*0.3*	*0.2*
Age 5-9	*0.6*	*1.8*
Age 10-14	*1.2*	*3.5*
Age 15-19	*4.5*	*5.3*

Figure 7.39: Rate of Children with One or More Prescriptions for Antipsychotic Drugs By Age and Manitoba Region, 1998/99

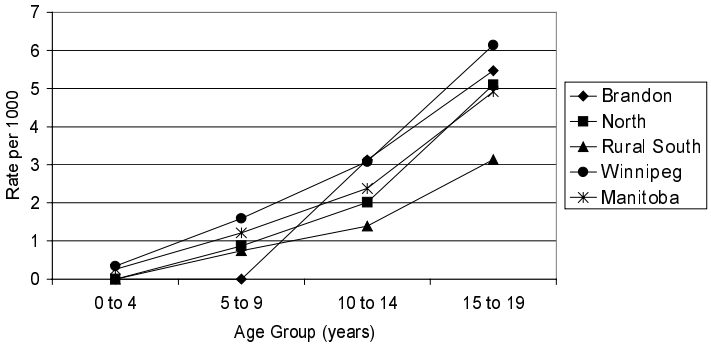


Figure 7.42: Rate of Children Aged 0-19 Years With One or More Prescriptions For Antipsychotics and Anxiolytics By Rural Income Quintile, 1998/99

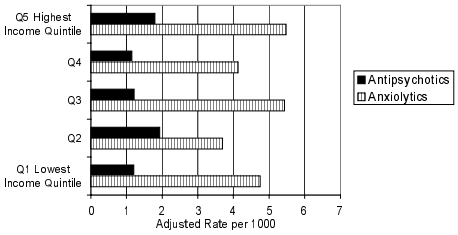
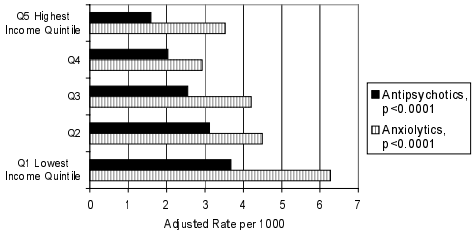


Figure 7.43: Rate of Children Aged 0-19 Years With One or More Prescriptions For Antipsychotics and Anxiolytics By Urban Income Quintile, 1998/99



The age-standardized prevalence of antipsychotic drug treatment was significantly higher in Winnipeg, Brandon and Burntwood than the southern rural average (Figure 7.40) On an age-specific basis, antipsychotic prescriptions were received less frequently by adolescents in rural south areas, than any other region (Figure 7.39). Within Winnipeg, the utilization of antipsychotics in children living the Downtown area was twice as high as the Winnipeg average.(Figure 7.41) This finding is likely the outcome of a greater concentration of overnight treatment facilities such as the Manitoba Adolescence Treatment Centre, in this area. Whereas no significant trend was evident for antipsychotic prescriptions across income quintiles in rural areas (Figure 7.42), the rate of antipsychotic prescriptions increased with decreasing neighbourhood income level in urban areas (Figure 7.43, Cochran-Armitage trend test, $p<0.0001$).

iv) anxiolytics

We found that adolescent females were twice as likely to receive prescriptions for anxiolytics than males. This finding is compatible with literature which shows higher rates of anxiety and depression in teenage females than males (Casper et al. 1996). However, the over-prescription of anxiolytics, such as benzodiazepines, in women has long been criticized (van der Waals et al. 1993). RHAs with less healthy populations such as Norman, had significantly higher age-standardized prescription rates of anxiolytics than the rural South, while healthier populations such as

Children with one or more prescriptions for anxiolytics per 1000 by age and gender, 1998/99:

	Female	*Male*
Age 0-4	*2.5*	*1.7*
Age 5-9	*2.7*	*2.4*
Age 10-14	*2.8*	*2.7*
Age 15-19	*14.2*	*7.2*

Figure 7.40: Rate of Children Aged 0-19 Years With One or More Prescriptions for Antipsychotics and Anxiolytics by RHA, 1998/99

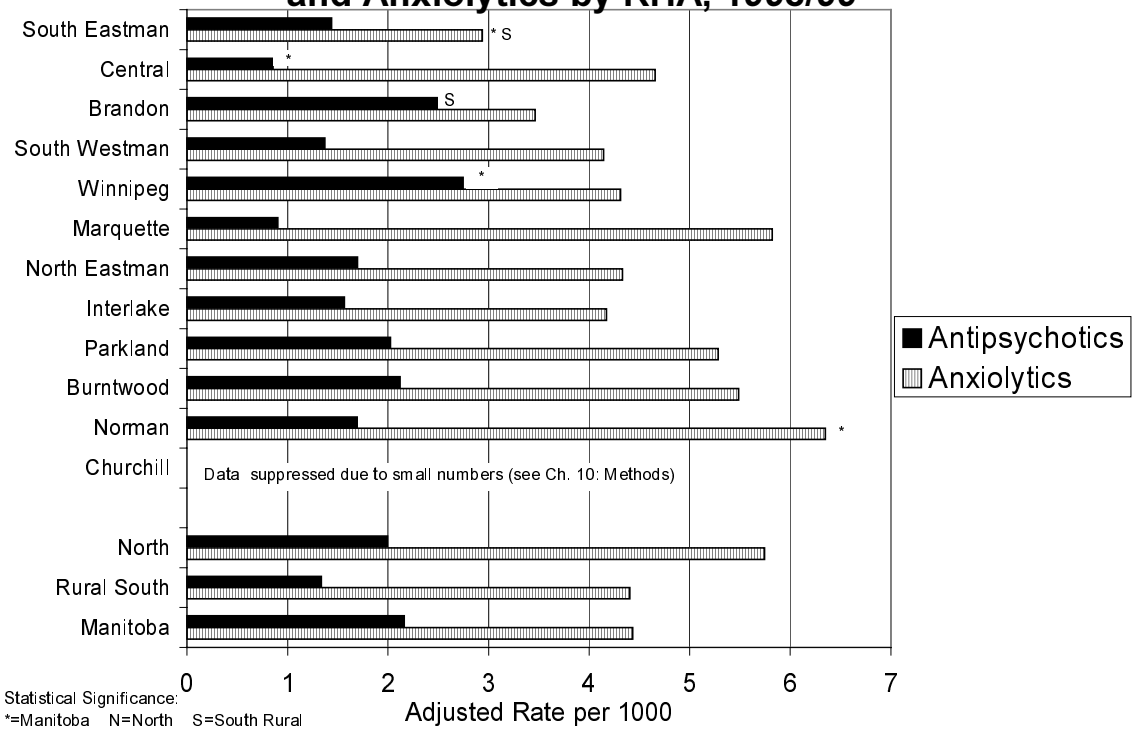
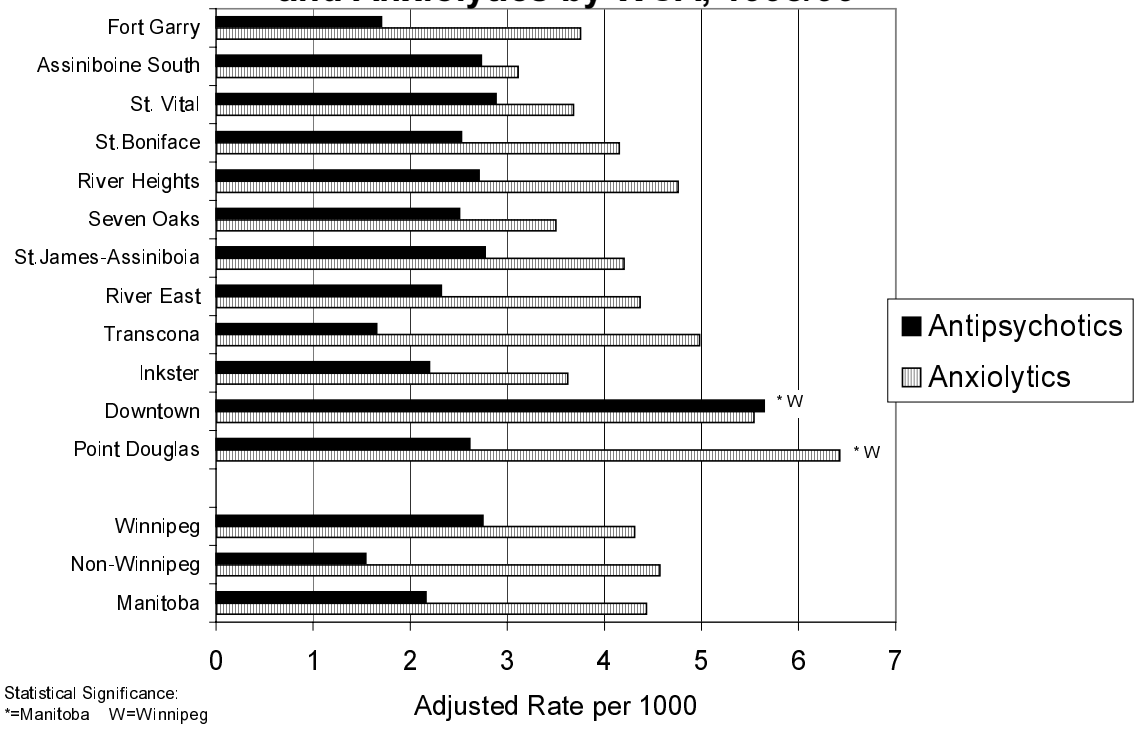
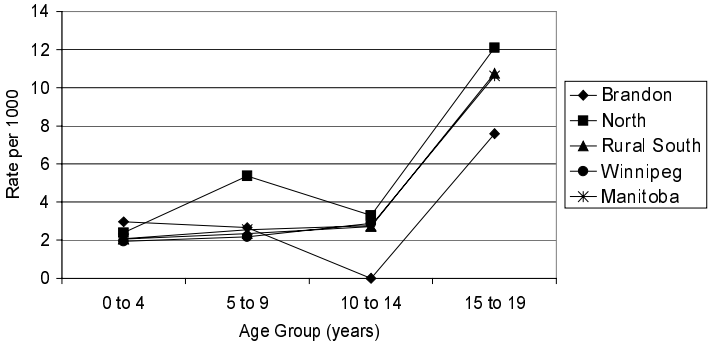


Figure 7.41: Rate of Children Aged 0-19 Years With One or More Prescriptions for Antipsychotics and Anxiolytics by WCA, 1998/99



South Eastman, had significantly lower rates. (Figure 7.40). Many southern RHAs had much lower rates of anxiolytic prescription use than the northern average. The higher prescription utilization rates of anxiolytics in northern Manitoba appeared to be concentrated in children 5-9 years (Figure 7.44). Use of anxiolytics in younger children likely represents benzodiazepine treatment of febrile seizures (Hauser 1994).

Figure 7.44: Rate of Children with One or More Prescriptions for Anxiolytics By Age and Manitoba Region, 1998/99



Benzodiazepines are considered safe and effective in short-term therapy, but long-term use is far from recommended therapy and a clear risk factor for abuse and dependency (Groenewegen et al. 1999).

The Point Douglas area in Winnipeg had the highest age-standardized prescription rate for anxiolytics, a rate which was almost significantly higher than the Winnipeg average (Figure 7.41). Winnipeg areas with generally less healthy populations tended to have a higher rate of prescription for anxiolytics. Further, although no association was found in rural areas (Figure 7.42), anxiolytic prescription utilization increased with decreasing income level in urban areas (Figure 7.43, Cochran-Armitage trend test, $p<0.0001$). Neighbourhood variation in benzodiazepine use has been reported, with greater use found in neighbourhoods with a higher proportion of lone-parent families (Groenewegen et al. 1999). Schoolchildren living in low income households may be at risk of receiving a benzodiazepine prescription because they are more likely to have emotional-disorder anxiety, than children living in higher income households (Ross and Roberts 1999).

7.5 Correlations of health care utilization with the healthiness of populations within a region

Premature mortality rate, or PMR, is considered an indicator of the "healthiness" of a population, with higher PMR generally associated with both poorer health and lower socioeconomic status (see Chapter 2, Demographics and Conceptual Framework). To determine whether health care utilization was associated with the healthiness of the population within a region, the utilization measures discussed in this chapter were correlated with PMR (please see the Glossary for a description of how correlations were calculated). PMR correlated significantly with hospitalization rates for RHAs and WCAs ($p<.0001$), with regions with less healthy populations having higher hospitalization rates. A significant association was found between PMR and physician visit rates only for WCAs, with WCAs with less healthy populations having higher physician visit rates ($p<0.03$). The lack of relationship in RHAs could potentially be due to the lack of data on nursing station visits. Continuity of care was also significantly associated with PMR for WCAs with regions with healthier populations having a higher proportion of visits to a usual provider ($p<0.05$). There were few correlations between the healthiness of populations within the RHAs and prevalence of prescription use (NSAIDs, $p<0.002$). However, the healthiness of populations within the WCAs was correlated with use of antibiotics ($p<0.0008$), iron supplements ($p<0.07$) and anxiolytics ($p<0.03$).

Key Points in this chapter

Hospital utilization (section 7.2)

- Hospitalization rates tend to be much higher for Non-Winnipeg than Winnipeg children.
- Hospitalization rates tend to be higher in those RHAs and WCAs with less healthy populations.
- Hospitalization rates were lower for children from South Eastman and Winnipeg and higher for children from Burntwood, Central, Marquette, North Eastman, Parkland, and Norman, compared to the provincial average.
- About 28% of northern residents and 29% of children from the rural south were hospitalized in

Winnipeg.

- Downtown and Point Douglas children had higher hospitalization rates than the Winnipeg average, but they did not differ from the Manitoba average. Children from Point Douglas were hospitalized at a rate over one-and-a-half times higher than the Winnipeg average.
- Hospitalization utilization is highest in the first year of life
- Hospital utilization is higher for children from lower income neighbourhoods

Physician utilization (section 7.3)

- Children living in Norman had higher physician visit rates and those living in Burntwood had lower rates than the northern average.
- Children living in Brandon, Marquette, North Eastman, Interlake, Parkland had higher visit rates and those living in South Eastman, Central and South Westman had lower physician visit rates than the rural south average.
- Children residing in Seven Oaks, Inkster, Downtown and Point Douglas had higher physician visit rates than the Winnipeg average.
- Children residing in Winnipeg were over three-and-a-half times more likely to access specialists (paediatricians and other specialists) than those residing outside of the city.
- Almost 80% of the physician visits for children in the north and over 75% of the visits for those in the south were provided within the child's own RHA.
- For all RHAs except Winnipeg and Brandon, the majority of visits to paediatricians and other specialists took place outside the child's own RHA, most often in Winnipeg
- Physician visits are highest in the first year of life. The per cent of visits to paediatricians is highest for children under one year, whereas visits to other specialists are higher in the older age categories.
- For children from urban areas, physician visit rates are highest for children from lowest income neighbourhoods; the reverse is true for rural areas possibly due to the effects of missing data.
- In terms of continuity of physician care, the

proportion of visits to a usual provider rose with increasing income in urban and rural areas.

Prescription utilization (section 7.4)

- Almost 60% of children less than 5 years old received one or more prescriptions for antibiotics.
- RHAs with less healthy populations - Parkland and Interlake - had higher rates of multiple antibiotic prescription than the southern rural average.
- In comparison to the Winnipeg average, the receipt of multiple prescriptions for antibiotics was more common in children living in the areas of Winnipeg with less healthy populations, Point Douglas and Downtown.
- Children were far more likely to receive iron supplements if they lived in northern RHAs, Parkland and North Eastman than in any other region of Manitoba.
- Point Douglas, Downtown and Inkster areas had iron supplementation rates which were at least twice as high as the Winnipeg average.
- The prescription rate of nonsteroidal anti-inflammatory analgesics was highest in northern Manitoba and Parkland than the southern rural average.
- Over one per cent of children received prescriptions for psychostimulants; antidepressants, antipsychotics and anxiolytics were used in less than one per cent of children.
- Adolescents were most likely to use psychotropic drugs, with the exception of psychostimulants which had higher use in children 10-14 years. Noteworthy is the prescription of antipsychotics in younger children.
- Prescription rates of psychostimulants were highest in Winnipeg and Brandon, than the southern rural average.
- Psychostimulant use was more common in children living in the St. James-Assiniboine and Assiniboine South areas, than the Winnipeg average.
- Children living in River Heights were the most likely and those living in Inkster were the least likely to receive a prescription for an antidepressant, than all Winnipeg children

combined.

- Adolescent females were the most likely recipients of antidepressants and anxiolytics. A negative gradient in the use of antidepressants and anxiolytics was observed with increasing neighbourhood income in urban areas.
- Children living in Winnipeg, especially those in the Downtown area, had higher prescription rates for antipsychotics, than the southern rural average.

Utilization and health of the population (section 7.5)

- For several utilization measures we found greater utilization in areas where the populations are found to be generally less healthy.

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CHAPTER 8: QUALITY OF CARE

8.0 Introduction

Poor quality care can be too much care (e.g. unnecessary procedures, medications), too little care (e.g. not providing necessary preventative care), or the wrong care (Schuster et al. 1998). Assessing the quality of health care for children involves challenges not encountered with quality of care assessments in the adult population (Mangione-Smith and McGlynn 1998). Firstly, children have developmental trajectories that change health outcomes over time, making it difficult to establish what is a normal outcome for quality of care assessment. Secondly, a minority of children suffer from chronic diseases, making it problematic to conduct assessments of the quality of chronic disease care.

A key emphasis of quality of health care measurement for children has been on preventive care, such as prenatal care and immunization (Mangione-Smith and McGlynn 1998). In this section we report on the extent of "too little care," by describing adherence to the recommended childhood immunization schedule, and the outcome of too little care, in terms of avoidable hospitalization due to immunizable and preventable infections. We also report findings on three measures of "too much care" – two related to the birthing of children, and the third on a subsequent surgical procedure: 1) Caesarean section rate; 2) Vaginal Birth After Caesarean Section, or VBAC rate; and 3) tonsillectomy/adenoidectomy procedure rates for children.

8.1 Immunization rates

Immunization rates of Manitoba children born 1994 to 1997

About 84% of Manitoba children born 1994 to 1997 had a complete schedule of immunizations at one year of age, about 71% at two years of age, and 83% at 7 years of age.

Manitoba rates fall far short of Canadian target immunization rates.

Primary health care is a key instrument in the World Health Organization's "Health for All by the Year 2000" (Young, 1998). Organizations like UNICEF have targeted specific strategies for achieving optimum gain for minimal cost, and these include promotion of immunization programs throughout the world. Canadian targets for immunization are

available on the Health Canada website (http://www.hc-sc.gc.ca/hpb/lcdc/) – most categories of immunization have targets of 95% or higher. For example, the targets for poliomyelitis are listed as:

- Achieve and maintain 97% immunization with three doses of polio vaccine by the second birthday by the year 1997.
- Achieve and maintain up-to-date poliomyelitis immunization by the seventh birthday in 99% of children by the year 1997.

Provincial and regional immunizations fall far short of Canadian target immunization rates. Figures 8.1 and 8.2 give the immunization rates for one-year olds, two-year olds and seven-year olds. This is for the complete immunization schedules, and the analysis only includes children enrolled with Manitoba Health at birth and continuously enrolled through to the birthday of the analysis. See the Glossary for information on complete immunization schedules by age. For Manitoba, 83.7% of children had complete immunizations at one year of age, 71.5% at two years of age, and 83.2% at seven years of age. By RHA, the highest rates of immunization occurred in the regions of South Westman (91.6% at one year; 83.4% at two years; 89.9% at seven years), South Eastman (89.3%; 77.8%; 86.3%), and Churchill (85.7%; 80.9%; 82.2%). The lowest rates occurred in Burntwood (57.9%; 41.4%; 47.8%), but this may be due to missing data from First Nations communities.

Overall, Winnipeg RHA's immunization rates (87.0% at one year; 75.0% at two years; 86.9% at 7 years) were higher than the provincial averages. Many sub-regions of Winnipeg had very high rates around 90% for one-year olds and 7-year olds, and 80% for two-year olds. Core areas of Winnipeg (Inkster, Downtown and Point Douglas) had lower rates, with Point Douglas the lowest in Winnipeg at 77.3% for one year, 62.2% for two year, and 74.0% for seven year olds.

Immunization Reports for Manitoba

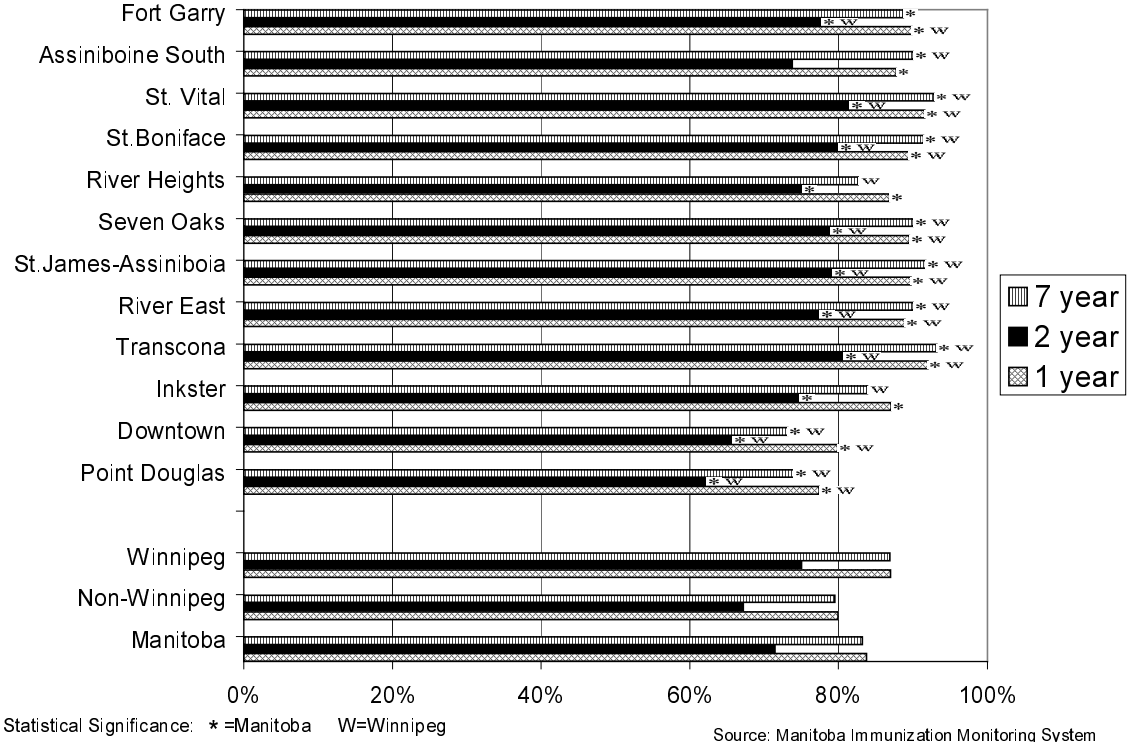
Extensive reports on immunization in Manitoba are available from Manitoba Health Public Health Branch CDC, entitled Manitoba Immunization Monitoring System (MIMS) Annual Review. Many limitations of the MIMS data are noted, including the possibility of undercounting due to incorrect coding, unentered data, and children moving into Manitoba whose early records may not be captured.

Figure 8.1: Percentage of Children with Complete Immunization Schedules at 1 Year (born 1994-97), 2 Years (born 1994-96) and 7 years (born 1989-91) by RHA

Statistical Significance: *=Manitoba N=North S= South Rural

Source: Manitoba Immunization Monitoring System

Figure 8.2: Percentage of Children with Complete Immunization Schedules at 1 Year (born 1994-97), 2 Years (born 1994-96) and 7 years (born (1989-91) by WCA



Statistical Significance: * =Manitoba W=Winnipeg

Source: Manitoba Immunization Monitoring System

8.2 Avoidable hospitalization due to immunizable and preventable infections

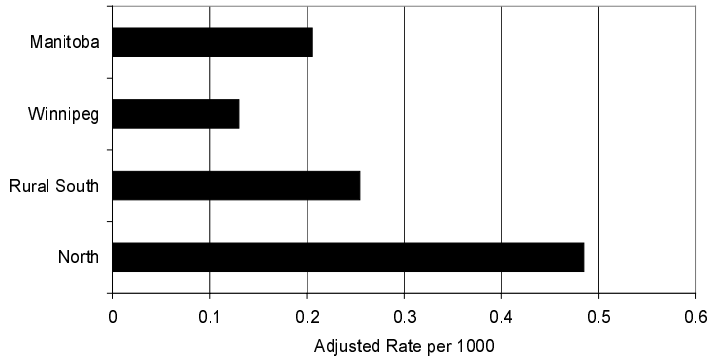
Avoidable or ambulatory care sensitive hospitalization has been defined as hospitalization for a condition which can be prevented, controlled or managed by primary care. This measure has been used as an indicator of the quality of primary care in children (Casanova and Starfield 1995). We focus our analysis on avoidable hospitalization due to immunizable and preventable infections. These infections include: congenital syphilis, measles, mumps, rubella, whooping cough (pertussis), diphtheria, tetanus, polio, Haemophilus influenza meningitis and epiglottitis, rheumatic fever, and tuberculosis (Irvine 1998).

From 1994 to 1998 there were 338 hospitalizations for preventable infections, the majority of which (75%) were in children less than 5 years old. Age-standardized rates for hospitalization due to immunizable-preventable infections were significantly higher in northern Manitoba than Winnipeg, the rural south and the whole of Manitoba (Figure 8.3). Hospitalization due to preventable infection was also significantly higher in the rural south than Winnipeg. Regional differences in avoidable hospitalizations due to immunizable-preventable infections in children have been documented in Saskatchewan; highest hospitalization rates were observed in Treaty First Nations children living in southern and northern areas (Irvine 1998).

Distribution of hospitalization due to immunizable- preventable infections by age and cause, 1994-1998:

	Pertussis	*Tuberculosis*	*Other*
Age 0-4	*85%*	*2.4%*	*13%*
Age 5-9	*60%*	*4.0%*	*36%*
Age 10-14	*56%*	*7.4%*	*37%*
Age 15-19	*21%*	*55%*	*24%*

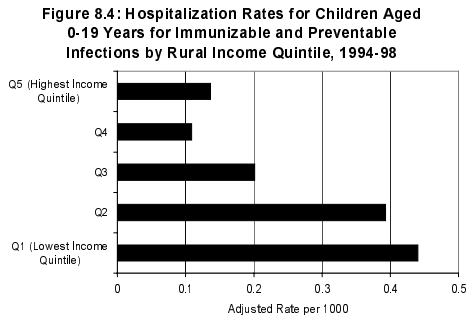
Figure 8.3: Hospitalization Rates for Children Aged 0-19 Years for Immunizable and Preventable Infections by Manitoba Region, 1994/95-1998/99

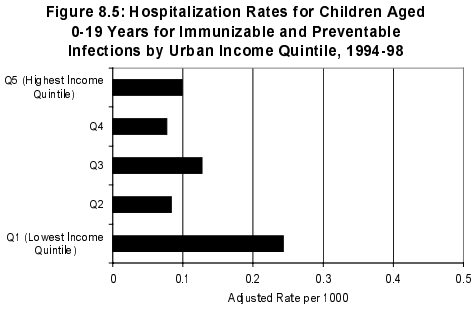


Hospitalization for pertussis was most common in children less than 5 years old, and hospitalization for tuberculosis appeared more often in adolescents. Adolescents accounted for 42% of new active cases of tuberculosis in Manitoba children in 1999, the majority of which were Aboriginal in descent (Manitoba Tuberculosis Registry Report 1999). Noteworthy was the occurrence of pertussis in adolescents. Pertussis in adolescents has been described as an emerging public health problem, the result of waning immunity among individuals immunized in childhood (Schabas 2000). Further, subsequent to low prevalence rates in North America, pertussis has been reported to be under-diagnosed by physicians (Deeks et al. 1999).

Children living in low-income neighbourhoods were much more likely to be hospitalized for immunizable-preventable infections, especially in rural areas. A negative gradient in the avoidable hospitalization rate was observed with increasing neighbourhood income (Cochran-Armitage trend tests, rural-p<.0001, urban-p<.001). Non-existent or nominal differences in avoidable hospitalizations (due to immunizable, acute and chronic conditions) among children have been observed between low and high income neighbourhoods in other jurisdictions with universal health care insurance (Casanova and Starfield 1995; Billings et al. 1996).

Hospitalization of Manitoba children for immunizable-preventable infections, by income quintile





8.3 Birthing issues

8.3.1 Caesarean section rates

Various "benchmarks" for the population-based rate of Caesarean section births have been proposed in the literature. In 1985, the World Health Organization stated that no more than 10-15% of women and infants could benefit from Caesarean sections (Canadian Institute for Health Information 2000). The United States' "Healthy People 2000" goals included attainment of a 15% overall Caesarean section rate, and a 12% primary section rate, by the year 2000 (Weinstein and Trussell 1998; Rooney et al. 1996; Public Health Service 1991). The USA national rate was 23.5% in 1992. One Wisconsin hospital with rates ranging from 10% to 15%, and averaging 12.5%

Benchmarking Caesarean Section rates

The World Health Organization stated in 1985 that no more than 10 to 15% of women and infants could benefit from Caesarean section delivery (Canadian Institute for Health Information 2000). The USA national goals for the year 2000 included attainment of a 15% overall, and 12% primary Caesarean section rate.

over 10 years, found that the maternal and fetal outcomes were comparable (Rooney et al. 1996). They concluded that the lowest safe Caesarean Section rate is unknown, and will vary with location and patient mix. But a rate of half the USA national rate was safe for both mothers and babies. As with any debate, others voice concern over mandated targets for reducing national Caesarean section rates. Sachs and his colleagues (1999) underscore the importance of concentrating at reducing primary Caesarean section rates separately from repeat rates, since previous patterns of practice with high primary rates will influence future overall rates due to elevated risk after an initial Caesarean section.

Why be concerned about Caesarean section deliveries? One recent paper from the USA looked at the association between method of delivery and maternal rehospitalization (Lydon-Rochelle et al. 2000). The authors concluded that women with Caesarean section deliveries had an 80% increase for rehospitalization, after adjusting for maternal age (RR=1.8, 95% CI 1.6-1.9) compared to women with spontaneous vaginal deliveries. The rehospitalization diagnoses included: uterine infection, wound complications, cardiopulmonary and thromboembolic conditions.

Recent Canadian statistics indicate a national Caesarean section rate of 18.7% in 1997/98, which had risen from the 17.7% rate 5 years previous (Canadian Institute for Health Information 2000). Rates vary substantially across Canada, from below 15% to above 25%. Some of this variation can be explained by practice patterns of medical staff, or by taking into consideration the per cent of area women who have had previous Caesarean sections knowing they are at a greater risk of a repeat Caesarean (Weinstein and Trussell 1998; Canadian Institute for Health Information 2000)

Caesarean Section rates: Canada and Manitoba
1997/98: Canada 18.7%
1992/93: Canada 17.7%

1994/95 – 1998/99: Manitoba 16.2% age-adjusted Caesarean section rate

It is important to point out that maternal age has a dramatic effect on rate of Caesarean section delivery. The five-year C-Section rate for Manitoba from 1994/95 to 1998/99 was 16.2%. But comparing the crude rates in each age bracket, this varies from a low

of 9.3% for women aged 19 years or younger, to a high of 26.1% for women aged 40 years or older. *Knowing that the age at first birth may be increasing in Manitoba, and that the age distribution of women giving birth varies from region to region, it is essential to use a fair comparison.* The C-Section rates are "adjusted" rates, that is, the rates are adjusted to reflect the overall age distribution of all Manitoba women who gave birth in 1996.

The effect of maternal age on the rate of Caesarean section deliveries in Manitoba

The five-year Caesarean section rates for Manitoba, 1994/95 to 1998/99, by maternal age, show an increase with increased age:

19 years old or less (n=7,601): 9.29%
20-29 years (n=39,776): 14.69%
30-39 years (n=26,260): 20.08%
40 or older (n=1,033): 26.14%

Figures 8.6 and 8.7 illustrate the variation in *adjusted* Caesarean section rates by RHA and by Winnipeg sub-regions – these are adjusted to reflect the same maternal age distribution and make the comparisons fair. The overall Manitoba rate for the five-year period from 1994/95 to 1998/99 was 16.2%, with not much difference between Winnipeg (16.3%), Brandon (16.8%), North (16.7%) and South Rural (15.9%) women giving birth. But great variation is seen by RHA. Burntwood (13.8%), Interlake (14.6%) and South Eastman (14.1%) had significantly lower C-Section rates. Norman (22.8%) and Marquette (19.5%) had significantly higher rates. Churchill (20.7%) also had a high rate, but not significantly different than the Manitoba rate since Churchill's numbers are small and the rate can vary widely. In Winnipeg, there were no significant differences by the twelve sub-regions.

Variation in Caesarean section rates by region of Manitoba

The Manitoba five-year adjusted Caesarean section rate for 1994/95 to 1998/99 was 16.2% of all deliveries.

Burntwood and South Eastman RHAs had the lowest five-year adjusted Caesarean section rates, at 13.8% and 14.1% respectively. Norman RHA had the highest rate at 22.8%.

Looking at differences in Caesarean section rates by income quintile in Figures 8.8 and 8.9 reinforces the importance of maternal age adjustment. The crude rates give the impression that rates increase with increasing income level ($p<0.001$), with women in the highest level more likely to have a Caesarean section both in urban (Q5:Q1 = 1.14), and rural (Q5:Q1 = 1.13) regions of Manitoba. But when the rates are adjusted to the same maternal age distribution, the differences disappear. There were no significant differences in adjusted rates of Caesarean sections for *any income group* in either urban or rural Manitoba, indicating that the trends observed in the crude rates were probably a reflection of higher maternal age in higher income groups.

Manitoba Perinatal Surveillance Reports

For extensive information on Caesarean section deliveries in Manitoba (including elective, emergency), refer to the Manitoba Perinatal Surveillance Reports (1999, 2000).

Figure 8.6: Caesarean Section Adjusted Rates By RHA, 1994/95-1998/99

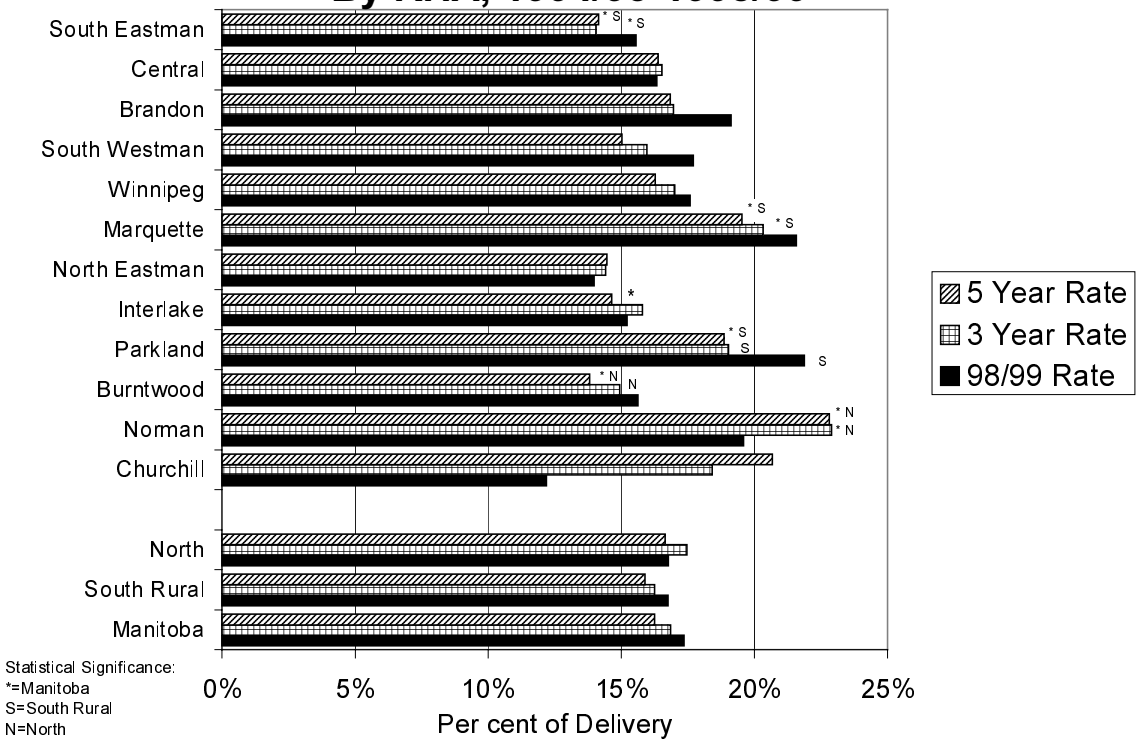
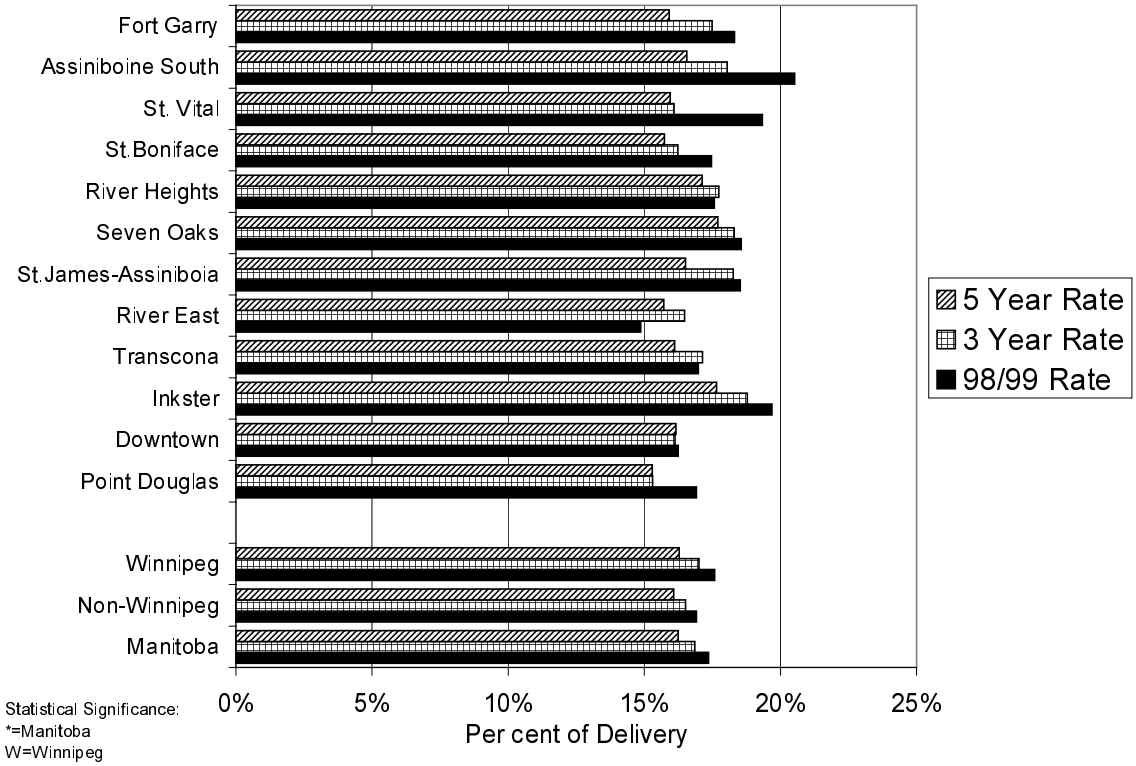


Figure 8.7: Caesarean Section Adjusted Rates By WCA, 1994/95-1998/99



Overall Manitoba trends over the five years from 1994/95 to 1998/99 indicate increasing Caesarean section rates, adjusted for maternal age (see Table 8.1). Winnipeg and South Rural areas reflect this increase, but Brandon and the North both show fluctuating but not necessarily increasing rates.

Table 8.1: Adjusted Caesarean Section Rate (% of deliveries) By Year and Region of Manitoba, 1994/95-1998/99

Region (trend test p-value)	1994/95	1995/96	1996/97	1997/98	1998/99
North (p=0.09)	15.8	15.2	17.2	18.3	16.8
South Rural (p=0.01)*	15.2	15.6	15.3	16.7	16.8
Winnipeg (p<0.00001)*	15.0	15.6	16.9	16.6	17.6
Brandon (p=0.52)	17.5	15.6	15.8	16.2	19.1
Manitoba (p<0.00001)*	15.3	15.6	16.4	16.8	17.4

* significantly increasing trend over time (Cochran-Armitage trend test, two-tailed)

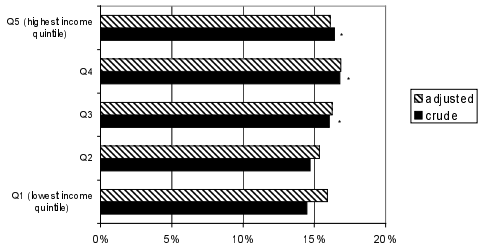
8.3.2 Vaginal birth after Caesarean, VBAC

The Society of Obstetricians and Gynaecologists of Canada have written VBAC guidelines in 1997, concerning vaginal birth after previous Caesarean-section birth (all practice guidelines are available at SOGC's website: http://www.sogc.org). These guidelines indicate that the success rate for labour and vaginal delivery following previous Caesarean section should vary from 50% to 80%, dependent upon the knowledge and attitudes of both the clients and the care providers. Vaginal births after C-sections may carry lower health risks and require shorter hospital stays (Canadian Institute for Health Information 2000). Throughout Canada, there are wide regional variations in the rate of VBAC, from 8% in Eastern Newfoundland to 51% in Quebec's Eastern Townships.

Manitoba VBAC rates also vary by region, but all regions show substantially lower rates than the 50-80% suggested by the SOGC. Figures 8.10 and 8.11 show the rates by RHA and Winnipeg sub-regions. The Manitoba average over the five years from

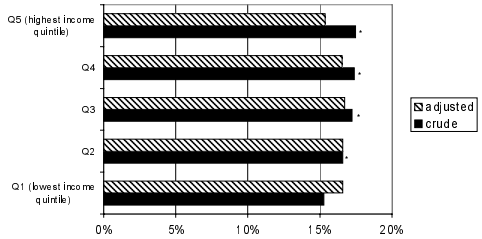
C-Section rates by income quintile groups for Manitoba 1994/95 to 1998/99

Figure 8.8: C-Section Rates Crude and Adjusted By Rural Income Quintile, 1994-98



* indicates statistically significantly different than Q1 for the corresponding rate, i.e., either crude or adjusted

Figure 8.9: C-Section Rates Crude and Adjusted By Urban Income Quintile, 1994-98



* indicates statistically significantly different than Q1 for the corresponding rate, i.e., either crude or adjusted

Manitoba trends in Caesarean section rates over time, 1994/95 to 1998/99

The Manitoba C-Section rate shows a significantly increasing trend over the five-year period, from a low of 15.3% in 1994/95 to a high of 17.4% in 1998/99. This has been adjusted for possible differences in maternal age.

Figure 8.10: Per cent Vaginal Birth after Caesarean Section, Adjusted, by RHA, 1994/95-1998/99

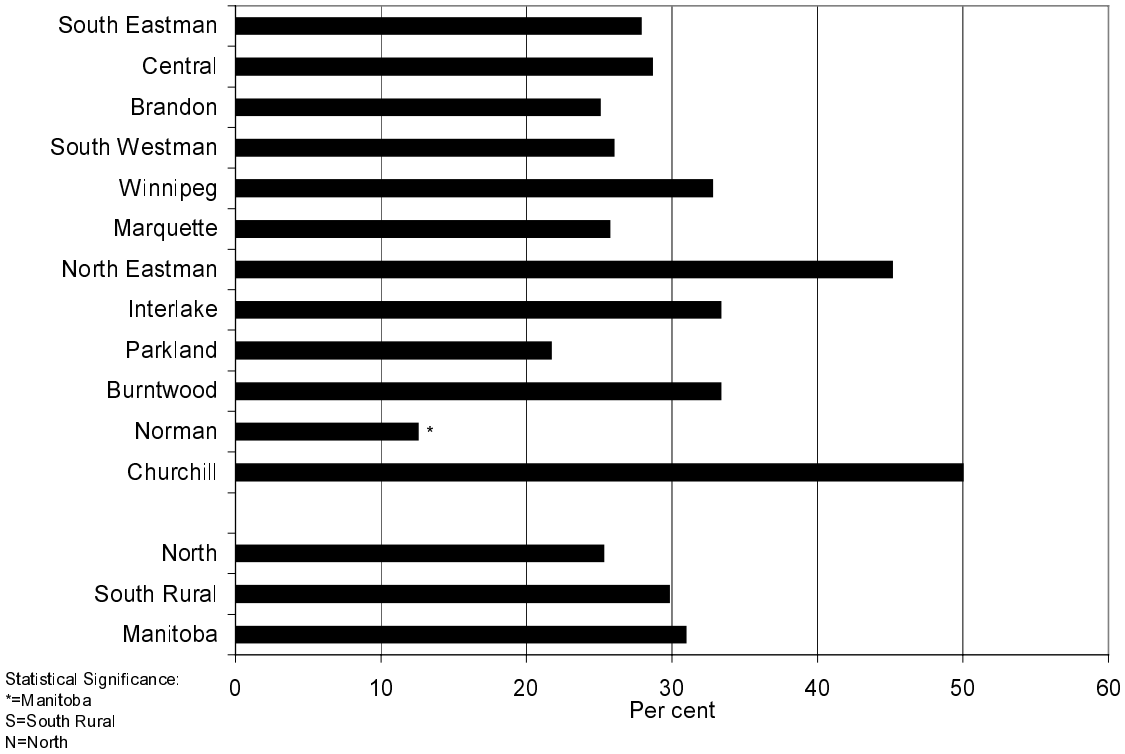
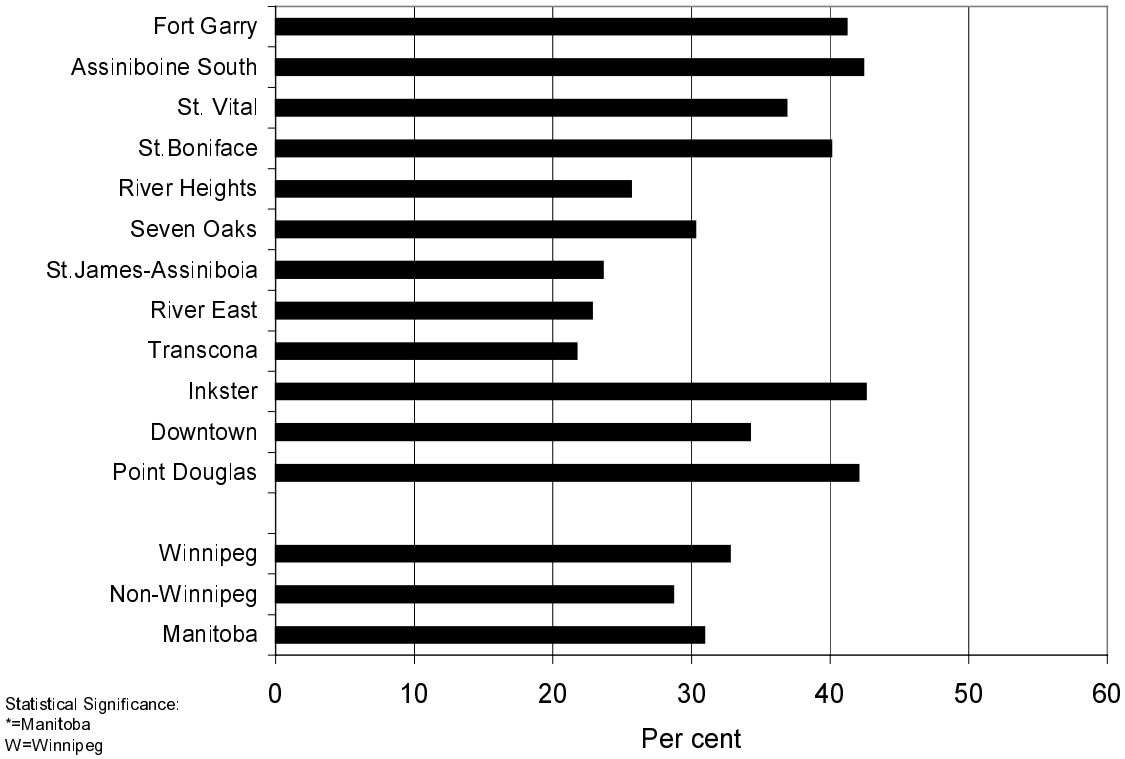


Figure 8.11: Per cent Vaginal Birth After Caesarean Section, Adjusted, by WCA, 1994/95-1998/99



1994/95 to 1998/99 was 30.9%. Winnipeg (32.8%) and South Rural women (29.8%) were more likely to have a VBAC than Brandon (25.1%) and North (25.3%) residents. However, the only RHA with a statistically lower rate than the Manitoba average was Norman, at 12.5%.

VBAC rates within Winnipeg vary from a low of 21.7% in Transcona to a high of 42.6% in Inkster, but "statistically speaking", there were no differences that could not be explained by random variation. There does not seem to be any relationship between the "healthiness" of a region's population (see Chapter 2 for a discussion of PMR and healthiness) and the VBAC rate. Rate fluctuations could be due to differences in health care provider practice patterns – the rates in more affluent, more healthy regions tend towards 40%, but those areas in the core of Winnipeg also experienced high VBAC rates in comparison to provincial rates.

Vaginal Birth after Caesarean-section (VBAC)
According to the Society of Obstetricians and Gynaecologists of Canada, success of having a vaginal birth after a Caesarean section birth will vary from 50% to 80%.

Manitoba VBAC rates are substantially lower than this, varying from a regional low of 12.5% to a high of 50.0%, with an overall Manitoba average of 30.9%.

8.4 Tonsillectomy/Adenoidectomy

Based on information from the College of Physicians and Surgeons and the Child Health Strategy Committee, as well as data on significant regional variations in tonsillectomy procedures in Manitoba, the Clinical Guidelines and Analysis Program (Black et al. 1996) determined that issues relating to quality of care existed for tonsillectomy and the procedure was reviewed. The report "*Patterns of Tonsillectomy in Manitoba 1989-1993: Analyses to Support the Tonsillectomy Review Panel of the Clinical Guidelines and Analysis Program*" found that tonsillectomy rates for residents of Manitoba varied markedly by region (Black et al. 1996). After publication of clinical guidelines for this procedure, rates dropped dramatically for children residing in Winnipeg (Black et al. 1999a; Brownell et al. 1999) and those residing elsewhere in the province (Black et al. 1999b).

Procedure codes for tonsillectomy and adenoidectomy
The ICD-9-CM procedure codes used to identify children undergoing these procedures were: 282-2829 tonsillectomy without adenoidectomy, 283-2839 tonsillectomy with adenoidectomy, and 286-2869 adenoidectomy without tonsillectomy.

Figure 8.12 shows the rates of tonsillectomy or adenoidectomy for 1994/95, 1996/97 and 1998/99 for the RHAs. Regional variation in rates is apparent regardless of which year is examined, although

Figure 8.12: T&A Rates for Children Aged 0 to 19 Years By RHA, 1994/95, 1996/97, 1998/99

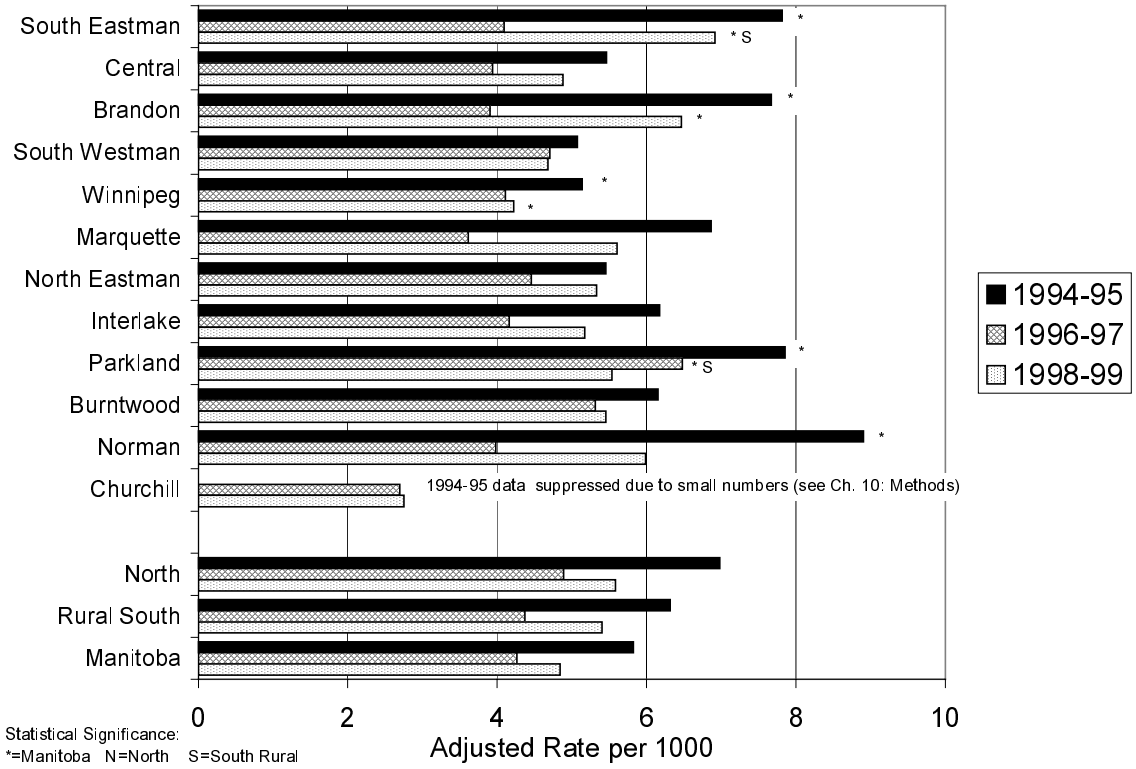
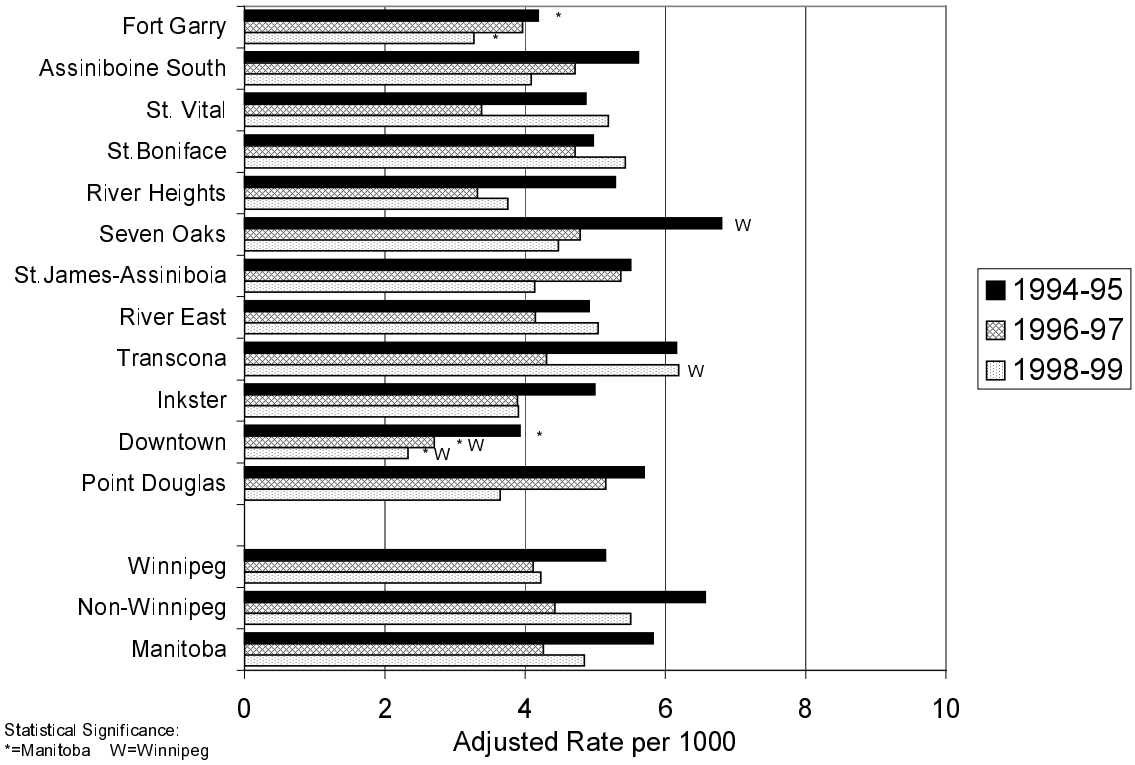


Figure 8.13: T&A Rates for Children Aged 0 to 19 Years By WCA, 1994/95, 1996/97, 1998/99



patterns for some RHAs have changed. As was found for tonsillectomy in 1989 to 1993 (Black et al. 1996) Winnipeg children continue to have significantly lower rates of tonsillectomy/adenoidectomy than children residing in the other RHAs. The trends observed across years suggest that the rate of this procedure dropped in most regions in response to the clinical guidelines but that they have increased since that time. For the rural south, the north, Winnipeg and Manitoba overall, the 1996/97 rates were significantly lower than the rates found in 1994/95 (Cochran Armitage test for both Winnipeg and Non-Winnipeg, p=.001). By 1998/99, however, the rates for the rural south and the north were significantly higher than those found in 1996/97 (Cochran Armitage, p=.001), and no different statistically from the 1994/95 rates. For Winnipeg, the 1998/99 rates did not increase significantly between 1996/97 and 1998/99, and the 1998/99 rates remained significantly lower than the 1994/95 rates (Cochran Armitage, p=.001).

Rates for tonsillectomy/adenoidectomy in this report are not directly comparable to those found in the report "Comparative Indicators of Population Health and Health Care Use for Manitoba's Regional Health Authorities" (Black et al. 1999b) because of different ages included. The current report included all children aged 0 to 19 years, whereas the Black et al. report included only those children aged 0 to 14 years.

Looking at the most recent year of data (1998/99), South Eastman and Brandon children had significantly more tonsillectomy/adenoidectomy procedures than the average Manitoba child, with the rate for South Eastman being significantly higher than the rural south mean as well. Three- and five-year rates show similar results, except that children residing in Parkland were included with those regions having significantly higher rates than the provincial or rural south means.

Variation in rates of tonsillectomy/adenoidectomy procedures is also evident among children residing in the different Winnipeg community areas (Figure 8.13). In 1998/99, the rate of procedures for children residing in Transcona was significantly higher than the Winnipeg mean, whereas those children from the Downtown area received significantly fewer procedures than the rest of the city. The rates for children from both Fort Garry and Downtown were significantly lower than the provincial average.

As mentioned above, the pattern across years for most RHAs was a decrease in tonsillectomy/adenoidectomy rates coinciding with the new clinical guidelines, and

then an increase in rates in the most recent year of data. The pattern for Winnipeg residents also showed a drop in tonsillectomy/adenoidectomy rates coincident with the guidelines, however no subsequent increase occurred. The pattern of rates across years for some Winnipeg community areas (i.e., St. Vital, St. Boniface, River East and Transcona) more closely resembles that found in the rural RHAs than the rest of Winnipeg.

The tonsillectomy/adenoidectomy rates shown in the graphs in this section represent rates for children ***residing*** in each of the RHAs, but give no indication where the procedure was performed. Whereas almost all procedures performed on Winnipeg children occur in Winnipeg hospitals, Non-Winnipeg children sometimes travel to Winnipeg for their procedures and sometimes have their procedures performed in their own or another RHA. For Non-Winnipeg children the per cent of tonsillectomy/adenoidectomy procedures performed in these different locations changed over the five-year period, 1994/95 to 1998/99. For example, in 1994/95, 51% of all tonsillectomy/ adenoidectomy procedures performed on Non-Winnipeg children were performed in the child's own RHA; in 1998/99 this dropped to 38%. Likewise, in 1994/95 40% of all tonsillectomy/adenoidectomy procedures on Non-Winnipeg children were performed in Winnipeg hospitals, however this value rose to 54% in 1998/99. Figures 8.14 and 8.15 break down the rates of tonsillectomy/adenoidectomy procedures for Non-Winnipeg children by whether the procedure was performed within the child's own RHA (Figure 8.14) or in Winnipeg (Figure 8.15). The increase in procedures for Non-Winnipeg children observed in 1998/99 was greater in Winnipeg than in Non-Winnipeg hospitals.

Patterns in rates and locations of tonsillectomy/adenoidectomy procedures
Tonsillectomy/adenoidectomy rates have increased since 1996/97 for Non-Winnipeg children, but not for Winnipeg children. Interestingly, the increased procedures for Non-Winnipeg children appear to have occurred in Winnipeg hospitals (see Figures 8.14 and 8.15).

8.5 Correlations of quality of care indicators with the healthiness of populations within a region

The relationship of the healthiness of the population within a region (as measured by PMR – see Chapter 2 discussion) with the quality of care indicators was

Figure 8.14: Rates of T&A Procedures for Non-Winnipeg Children Aged 0-19 Years, Performed within RHA, 1994/95, 1996/97, 1998/99

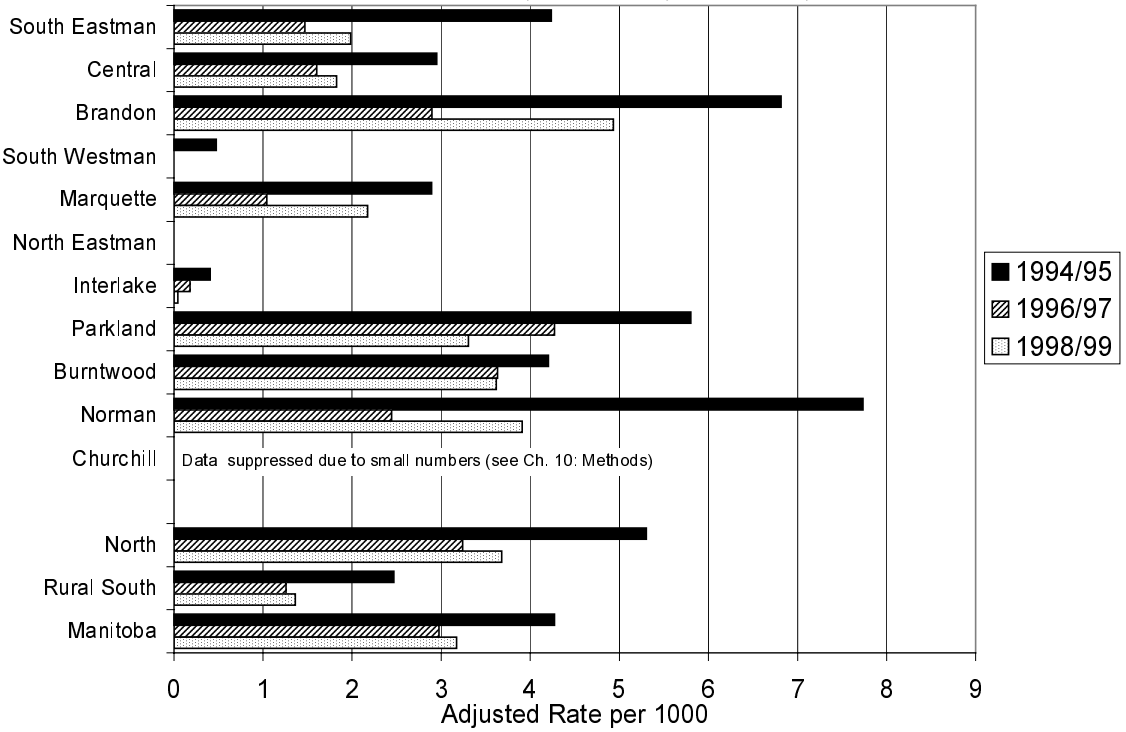
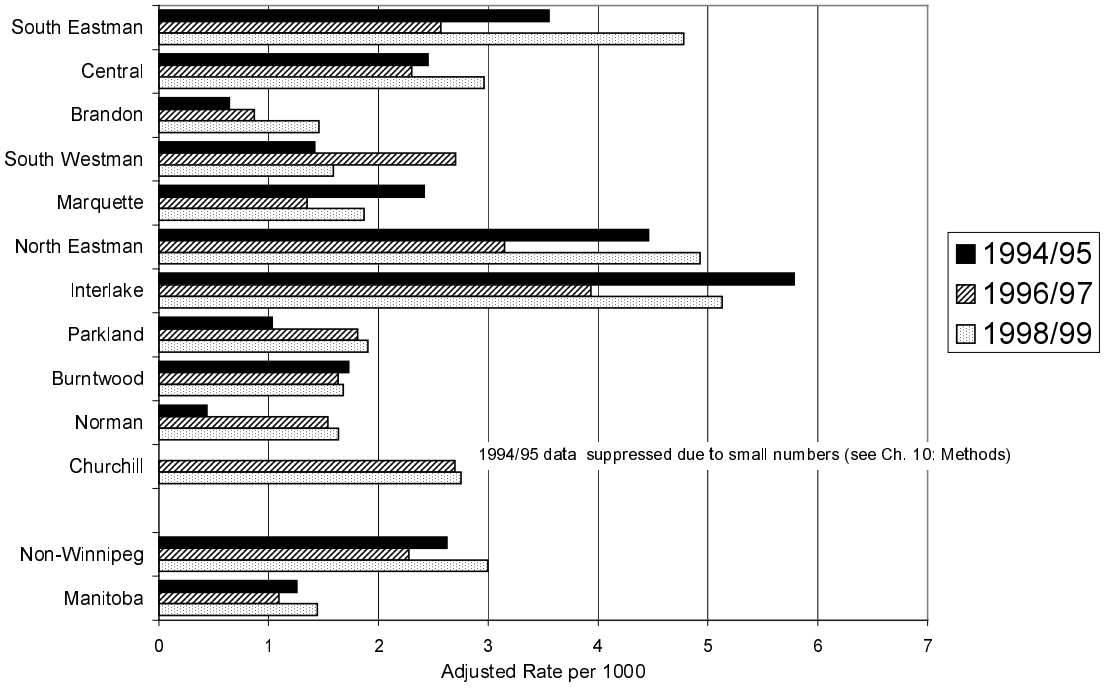


Figure 8.15: Rates of T&A Procedures for Non-Winnipeg Children Aged 0-19 Years Performed in Winnipeg, by RHA 1994/95, 1996/97, 1998/99



examined.

Those quality of care indicators around issues of birthing (rate of maternal age-adjusted Caesarean section birth, and rate of Vaginal Birth after Caesarean Section or VBAC) were not correlated with the healthiness of the population within a region. The rate of tonsillectomy/adenoidectomy procedures was also not significantly correlated with PMR.

Relationship of PMR, or Premature Mortality Rate, the "healthiness" of populations within regions, and the quality of care indicators

In Manitoba, there was no correlation between Caesarean-section rate, Vaginal Birth After Caesarean (VBAC) rate, or tonsillectomy/adenoidectomy rates with the healthiness of a region's population regions.

There was a strong relationship between complete immunization rates and the PMR of regions.

However, immunization rates were correlated. Those RHAs and sub-regions of Winnipeg having higher PMR, that is, less healthy populations, also had lower immunization rates (1-year rates: Spearman's $r=-0.61$, $p<0.01$; 2-year rates: $r=-0.42$, $p<0.05$). The complete listing of correlations is given in Chapter 9, Social Determinants of Health.

Knowing that PMR is highly correlated to socioeconomic risk indicators, this indicates a relationship between under-immunization and high socioeconomic risk. One American study (Strobino et al. 1996) also concludes that parental socioeconomic characteristics had a larger effect upon immunization rates than parental beliefs and attitudes. The only belief that was associated with under-immunization was the belief that the *timing of immunizations was not important*.

Key Points in this chapter

Immunization rates (Section 8.1)

- About 84% of Manitoba children born 1994-1997 had a complete schedule of immunizations at one year of age, about 71% at two years of age, and 83% at seven years of age. These rates are well below the Canadian immunization targets of at least 95%. There was a strong correlation between the healthiness of a region's population and the immunization rates of the children living in that region.

Avoidable hospitalizations due to immunization and preventable infections (Section 8.2)

- Age-standardized rates for hospitalization due to immunizable-preventable infections were significantly higher in northern Manitoba than Winnipeg, the rural south and the whole of Manitoba.
- Hospitalization due to immunizable-preventable infection was significantly higher in the rural south than Winnipeg.

Birthing issues (Section 8.3) including Caesarean sections and VBACs

- Knowing that the benchmark for Caesarean section rates is 10 to 15%, the Manitoba overall rate of 16.2% from 1994/95 to 1998/99 was above this. However, the Manitoba rate in 1997/98 at 16.8% was lower than that for Canada, at 18.7%. Manitoba RHA rates vary from the lowest five-year rates in Burntwood (13.8%) and South Eastman (14.1%), and the highest in Norman (22.8%).
- Maternal age had a dramatic effect on the rate of Caesarean section deliveries, with 19 year olds and less experiencing a 9.3% rate, 20-29 year olds a 14.7% rate, 30-39 year olds a 20.1% rate, and 40 or older experiencing a 26.1% rate.
- After adjusting for maternal age, there were no differences in Caesarean section rates by income group.
- Manitoba trends over five years (1994/95 to 1998/99) indicate increasing age-adjusted Caesarean section rates, from 15.3% to 17.4%. This trend is most evident in Winnipeg and South Rural areas.
- Knowing that the benchmark for Vaginal Birth After Caesarean section (VBAC) rates is 50% to 80% according to the Society of Obstetricians and Gynaecologists of Canada, Manitoba VBAC rates overall (30.9%) are substantially lower. VBAC rates vary from a regional low of 12.5% in Norman to a high of 50% in Churchill and 45% in North Eastman

Tonsillectomy/adenoidectomy (Section 8.4)

- Between 1994/95 and 1996/97 tonsillectomy/adenoidectomy rates dropped significantly, coinciding with the publication of clinical guidelines for the procedure. Between 1996/97 and 1998/99, however, the rates for children living in the rural south and the north increased significantly and were no different from the 1994/95 rates. For Winnipeg children, the 1998/99 rates remained significantly lower than the 1994/95 rates.
- South Eastman and Brandon children have significantly more tonsillectomy/adenoidectomy procedures than the average Manitoba child, whereas Winnipeg children have significantly lower rates of tonsillectomy/adenoidectomy than children residing in the rest of the province.
- Transcona children have significantly higher tonsillectomy/adenoidectomy rates than the Winnipeg mean, whereas those children from the Downtown area received significantly fewer procedures than the rest of the city.
- The location of tonsillectomy/adenoidectomy procedures has changed: whereas in 1994/95, 51% of the procedures performed on Non-Winnipeg children were performed in the child's own RHA, by 1998/99 this dropped to 38%. Likewise, in 1994/95, 40% of the procedures performed on Non-Winnipeg children were done in Winnipeg, and by 1998/99, this rose to 54%.

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CHAPTER 9: SOCIAL DETERMINANTS OF HEALTH

9.0 The relationship between socioeconomic factors and health status

Medical care is only one of myriad factors that have an impact on our health. This chapter focuses on determinants of child health other than medical care.

A large body of research evidence supports what has been observed for centuries: at the population level, there is an association between socioeconomic status and health. Socioeconomic status is based on variables such as income level, level of education, and occupational status. Lower socioeconomic status is associated with poorer health outcomes, and there is a graded effect of this relationship such that with each increase in level of socioeconomic status there is an increase in health status (Hertzman 1999). This relationship between socioeconomic status and health is referred to as the socioeconomic gradient in health status. Socioeconomic status in childhood is related not only to child health (Aber et al. 1997; Gissler et al. 1998; Nelson 1992; Roberts and Power 1996) but to long-term health outcomes (Davey Smith et al. 1998; Lundberg 1993; Marmot 1997; Rahkonen et al. 1997; van de Mheen 1997). An assessment of the social conditions in which children live is thus an essential component of understanding the factors that have an impact on child health and well-being.

Hertzman (1999) suggests that "threats to health" differ with developmental level and that those indicators which are the greatest threat to health at each level will also show the strongest socioeconomic gradient with health. "Early in life there is a gradient in infant mortality and low birth weight; during childhood and adolescence there is a gradient in injurious deaths, as well as in cognitive and socioemotional development; in early adulthood the gradient is found among deaths from injuries and mental health problems; in late middle age early chronic disease mortality and morbidity show a gradient; and in late life a similar pattern is seen for dementia and other degenerative conditions." (p. 26, Hertzman 1999)

Social conditions in which children live can be assessed at various levels. Although these levels are overlapping we have divided them into three sections for discussion in this chapter: 1) regional; 2) community; and, 3) household. Following these sections we provide a section summarizing the relation between socioeconomic indicators and the various child health indicators discussed throughout the entire report.

Using Statistics Canada Low Income Cut-Off (LICO) definition, which takes into consideration family income and expenditure patterns, 30.4% of Winnipeg children under the age of 15 and 30.0% of children aged 15 to 24 years lived in poverty in 1995 (Lee 2000).

9.1 Regional profiles

9.1.1 Income

Not only do the number and per cent of children living in different regions differ across the province (please see Figures 2.5 and 2.6 in Chapter 2 Demographics and Conceptual Framework) but the social, economic and psychosocial conditions in which these children live also differ. Figures 9.1 and 9.2 show the per cent children living in families residing in low income neighbourhoods by RHA and by WCA. Low income neighbourhood is defined as those where residents are among the lowest 20% of the population in terms of household income. We observe considerable regional variation in the per cent of children living in low income neighbourhoods. Across RHAs per cents ranged from less than 10% for South Eastman and Norman to over 50% for those children residing in Parkland. Across WCAs per cents range from less than 10% for Assiniboine South, Seven Oaks, St. James Assiniboia and Transcona to over 50% for those children living in Downtown and Point Douglas. There was also a tendency for those areas with a higher per cent of children in families from the lowest income group to have populations in poorer health (as measured by premature mortality ratio (PMR), (please see Chapter 2: Demographics and Conceptual Framework), but this was not statistically significant (p=0.07). Heterogeneity of income levels within WCAs and particularly RHAs may have attenuated the relationship between per cent low income and PMR.

*"Poor children are beset with a variety of material, environment, and social burdens. I believe that this amounts to a policy of what can be called 'compound dis*interest'*... a cumulative and accelerating societal deficit in health, well-being, and productivity based on underinvestment in children...Thus, the provision of the basic necessities for healthy human growth and development, in addition to being a basic human right, lays the foundation for the reduction of inequalities in health."*
George A. Kaplan, Karolinska Research Lecture at the Nobel Forum, April 8, 1999.

9.1.2 Lone-parent families

Lone-parent families tend to be associated with lower socioeconomic status. Whereas the average poverty rate for all city residents in Canada was 24.5% in 1995, among lone-parent households this rate was 59.2% (Lee 2000). Approximately 14% of Manitoba families have only one parent, most often the mother, in the home.[1] Lipman, Offord and Dooley (1996) found that Canadian children from lone-mother families are at higher risk for emotional and behavioural problems, and academic and social difficulties, regardless of the income level of the family. Although most children living in lone-parent families do *not* develop any of these problems, and

A forth-coming Canadian study by Chao and Willms (Fine 1999) has found that parental child-rearing skills have a more pronounced effect on child development and well-being than parental income or social-class background. Parents with a tendency to be "authoritative" are those that establish warm, nurturing relationships with their children, while setting firm limits for their behaviour. Although parents with these skills had slightly higher than average income and education levels, families from all backgrounds are found in this group. Chao and Willms (1998) found that the children of these parents do better in school and suffer fewer social problems, regardless of social class.

[1] The Census Canada definition of lone-parent family includes families where the "children" are never-married sons or daughters of any age. Please see Glossary for more details.

Figure 9.1: Per cent Children Aged 0-19 Years In Families from Low Income Neighbourhoods (Lowest Income Quintile) by RHA, 1998/99

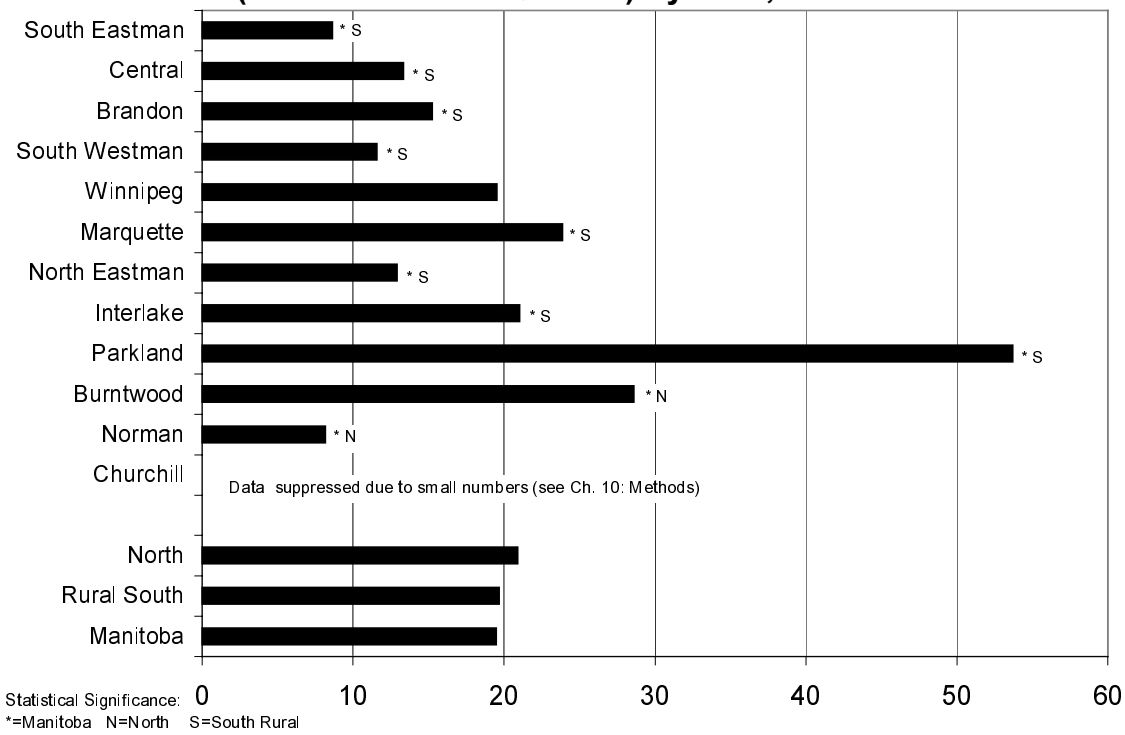
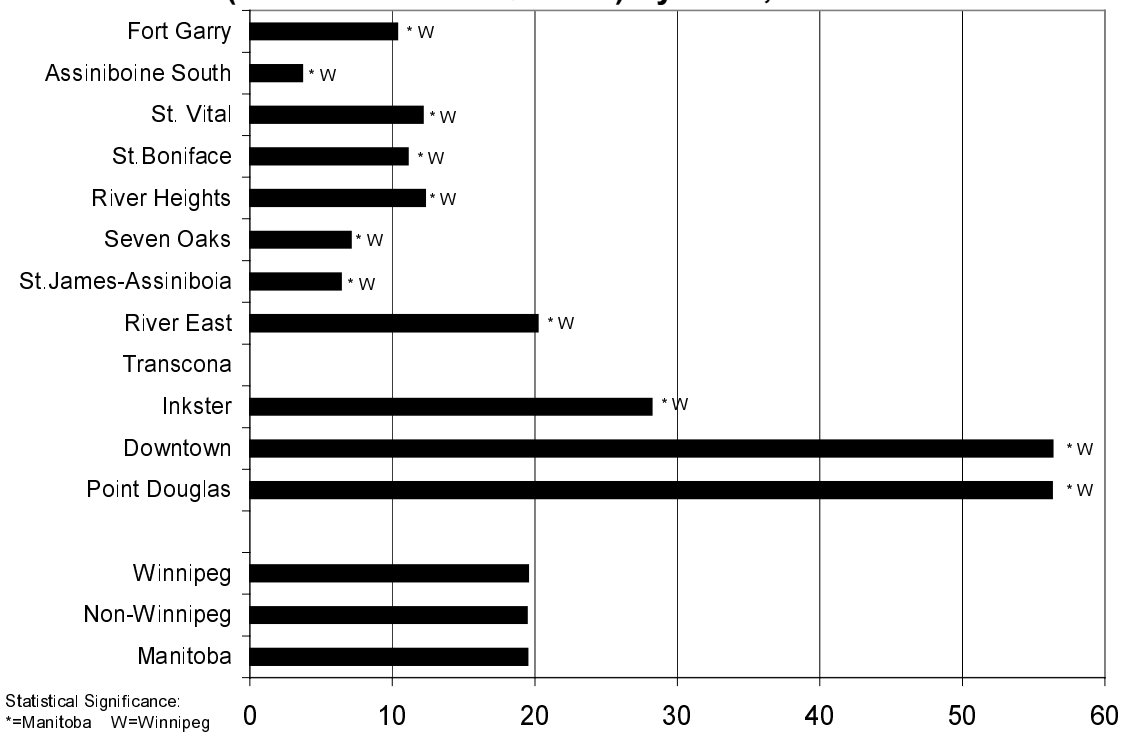


Figure 9.2: Per cent Children Aged 0-19 Years In Families from Low-Income Neighbourhoods (Lowest Income Quintile) by WCA, 1998/99



most children with these problems come from two-parent families, it is clear that living in a lone-parent family increases the risks to children of these and other problems. Figures 9.3 and 9.4 show the per cent of children living in lone-parent families by RHA and WCA. The per cent of lone-parent families tended to be higher in the North (18.5%) and Winnipeg (16.3%) than in the rural South (9.1%). Once again, regional variations were evident. The per cent of children living in lone-parent families ranged from about 5.6% in South Westman to 19% in Burntwood, across the RHAs, and from almost 11% in Assiniboine South to 27.6% in Point Douglas. Areas with populations with poorer overall health, as measured by PMR, had higher percentages of lone-parent families.

9.1.3 Education and health

Increasingly, education is being viewed as playing a central role in understanding the relationship between income and health outcomes. The chances of living in poverty tend to decrease as education levels and employment activities increase (Lee 2000).

Figures 9.5, 9.6, 9.7 and 9.8 show the per cent of the population aged 25 to 44 who are unemployed and without high school education, respectively, by RHAs and Winnipeg community areas (WCAs). These two measures have both been found to correlate with poor health (Frohlich and Mustard 1994, 1996; Mustard and Frohlich 1995). Unemployment for this segment of the population ranged from less than 3% in South Westman to almost 20% in Churchill, and from less than 4% in Assiniboine South, St. Vital and Transcona to over 14% in Point Douglas. The per cent of those not finishing high school was lower in Winnipeg than the other RHAs, but within Winnipeg the percentages ranged from 11% in Fort Garry to over 40% in Point Douglas.

Research suggests that education influences health through a number of indirect variables including conditions associated with work (e.g., being employed, fewer economic burdens, more satisfying occupations), social-psychological factors (e.g., sense of control and self-efficacy with regard to life generally and health) and health lifestyle factors (e.g., smoking, exercise) (Ross and Wu 1995).

The various research findings documenting the relation between income, education and health have become the impetus for drawing our attention away from income per se to the social context and educational environment that *children* experience over the course of development. Documenting

Figure 9.3: Per cent Families with Lone-Parents by RHA, 1996 Census

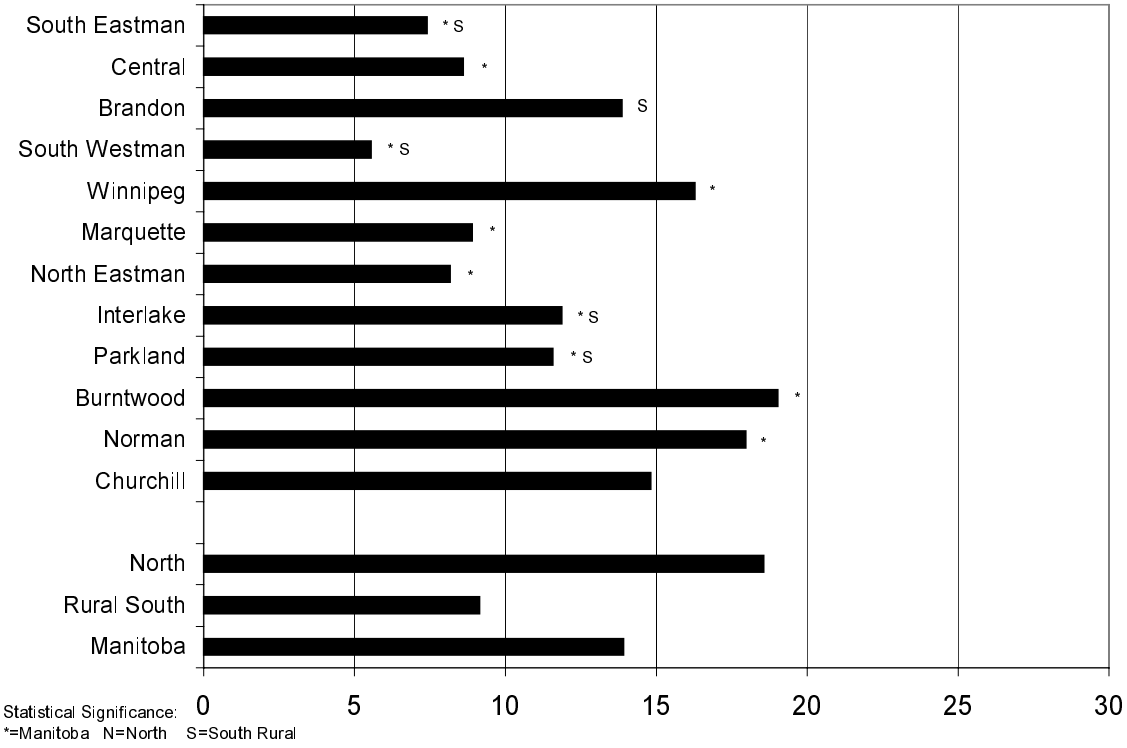


Figure 9.4: Per cent Families with Lone-Parents by WCA, 1996 Census

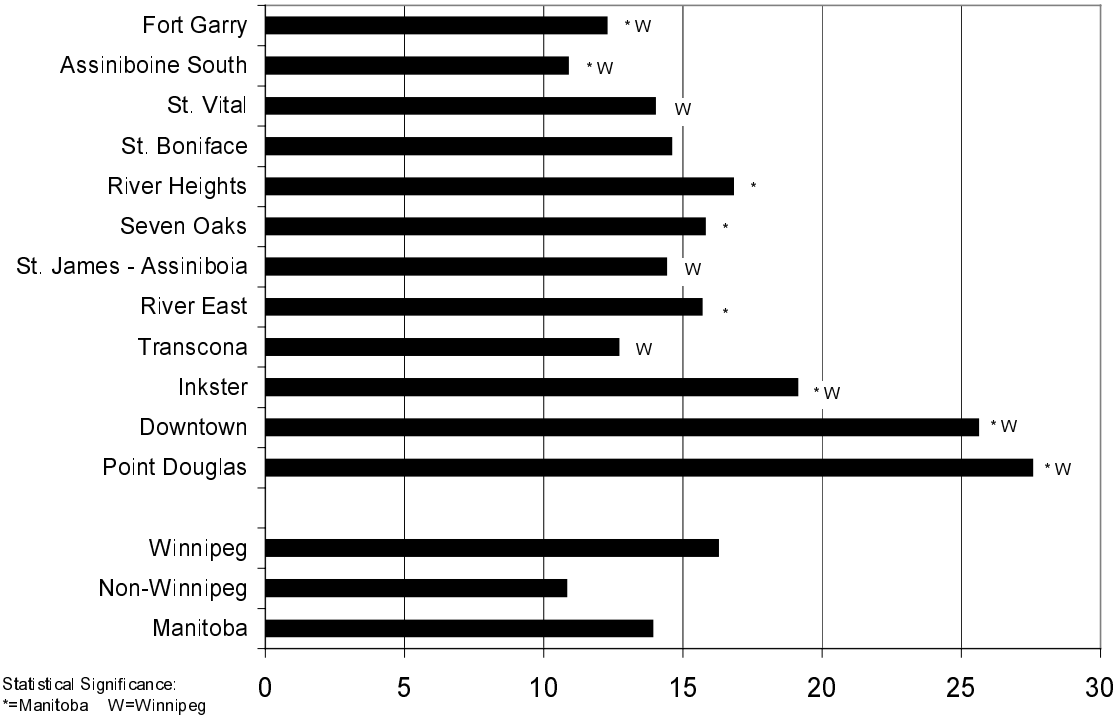
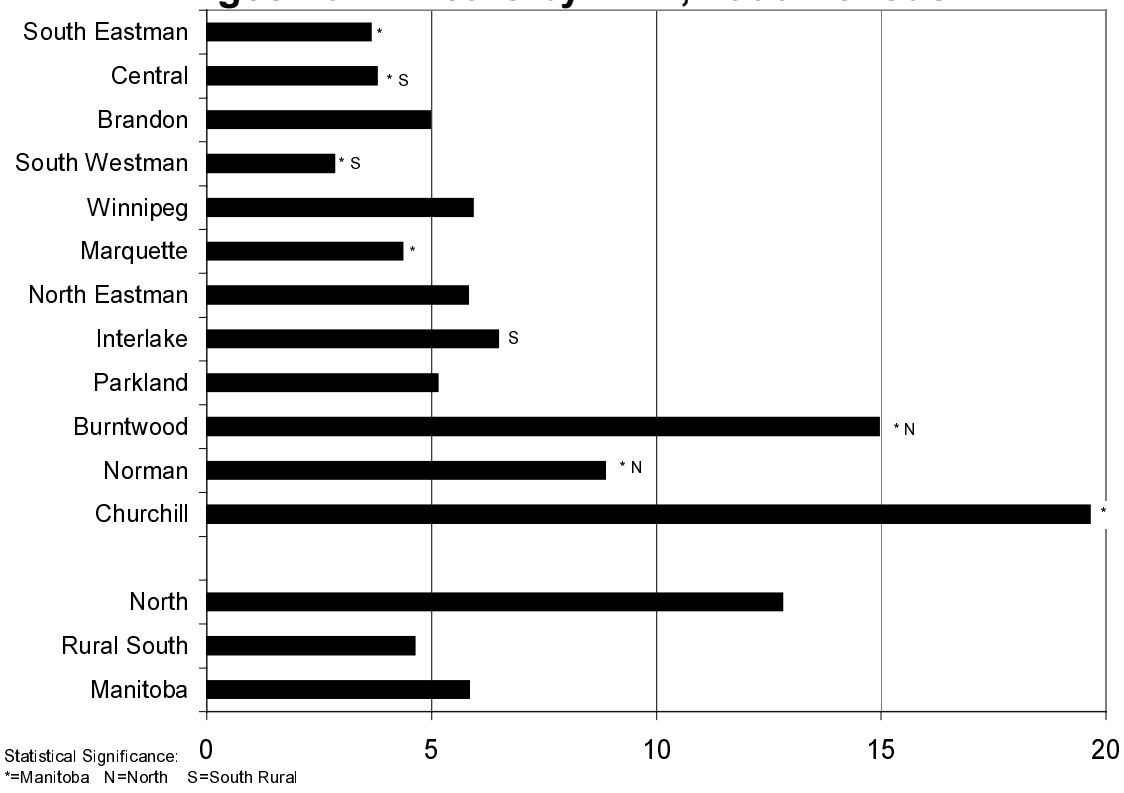
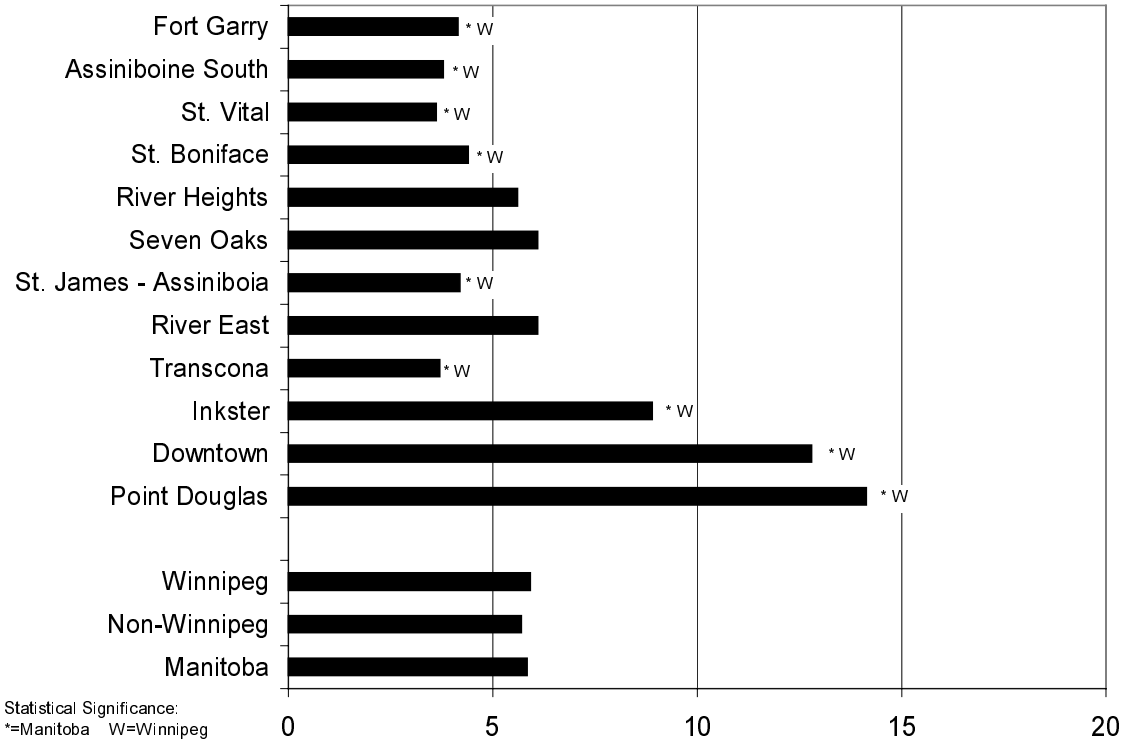


Figure 9.5: Per cent Unemployment Ages 25-44 Years by RHA, 1996 Census



Statistical Significance:
*=Manitoba N=North S=South Rural

Figure 9.6: Per cent Unemployment Ages 25-44 Years by WCA, 1996 Census



Statistical Significance:
*=Manitoba W=Winnipeg

Figure 9.7: Per cent No High School Ages 25-44 Years by RHA 1996 Census

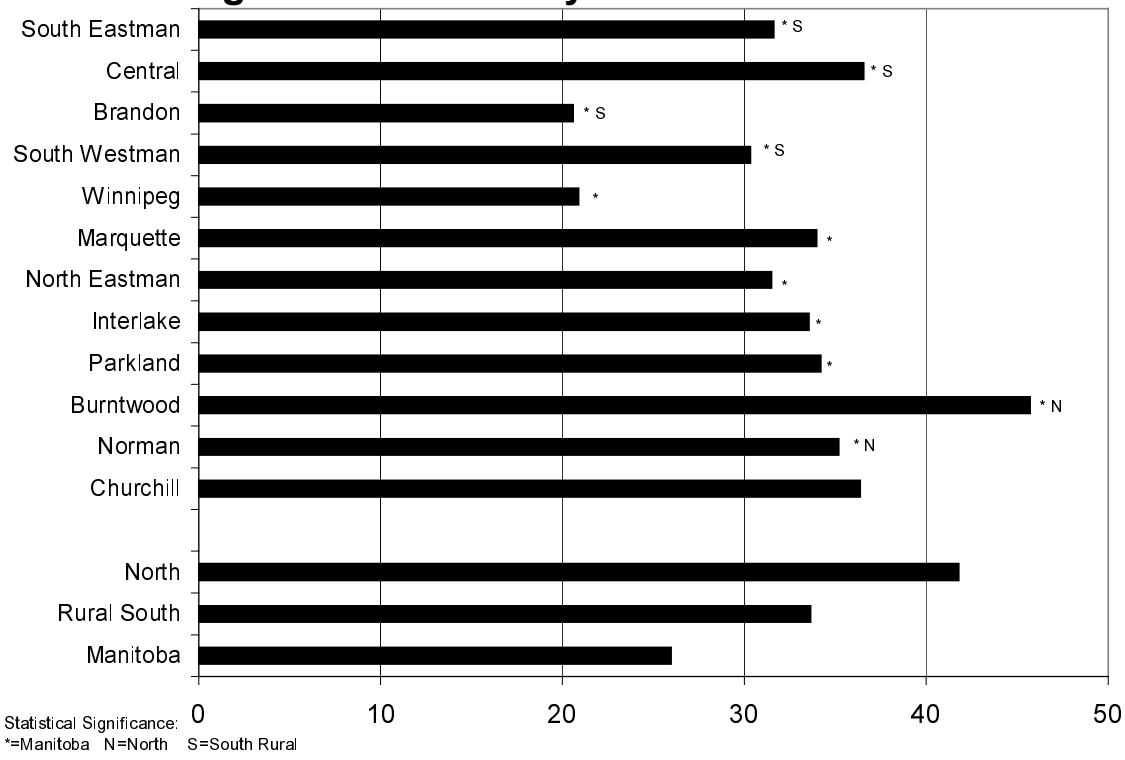
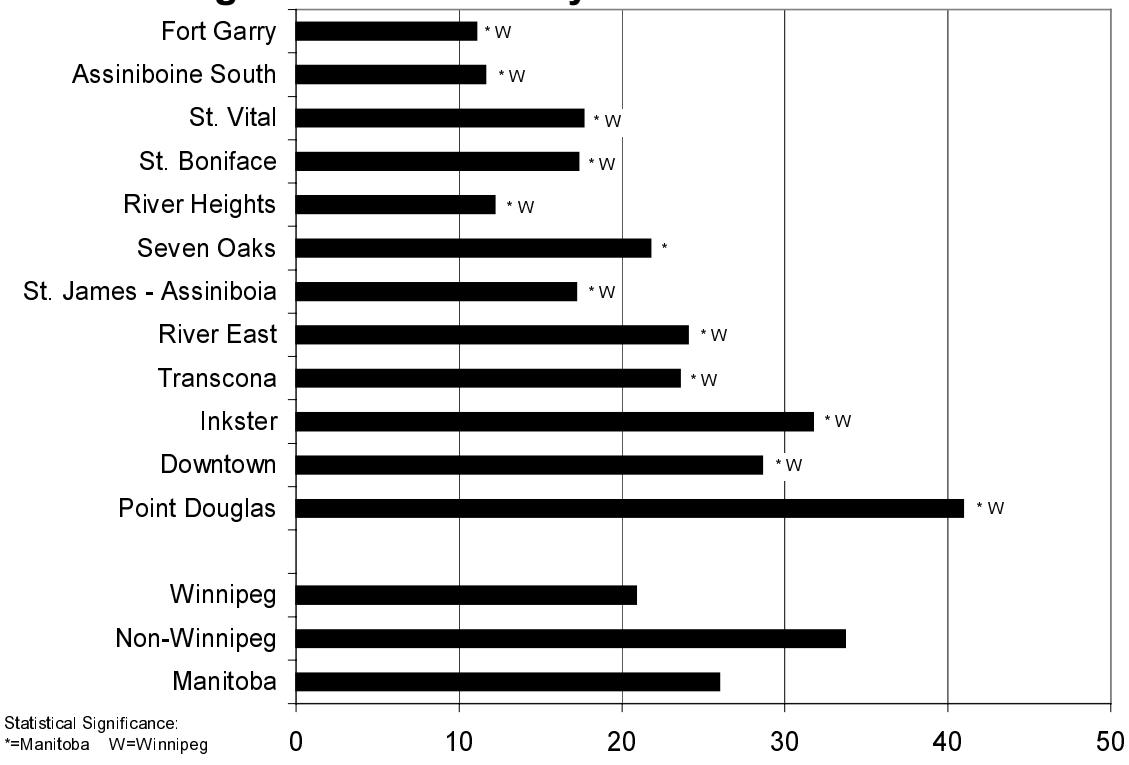


Figure 9.8: Per cent No High School Ages 25-44 Years by WCA 1996 Census



population-based indicators of educational achievement in children represent the first step toward determining how important education might be for understanding and moderating the socioeconomic gradient in health. Such an approach is consistent with the broader portrait of childhood health that the present report attempts to embody and, additionally, reflects regard for potential *childhood* markers of a developmental pathway that fosters healthy adulthood.

We present area-based data documenting the educational achievements (academic skills and abilities) for rural and Winnipeg areas. These data include the publicly available results of the 1997-98 Grade 3 mathematics standards tests. Given that these tests were administered on a province-wide basis, and were centrally marked, they permit comparisons across regions. Note that these test scores are school-based and aggregated to our rural and Winnipeg health areas (i.e., RHAs and WCAs). The mean test scores presented below were weighted by the number of students writing the exam.

All schools in the province participate in writing exams with the exception of band-operated schools and non-funded independent schools. For analytical purposes, this report includes only children who attend public schools in Manitoba. Data from funded independent schools, although available, was excluded because the scores can not always be attributed to specific geographical areas (i.e., in Winnipeg, most students travel out of their neighbourhood to attend a particular independent school). Missing data for students in band-operated schools were notable in the RHAs of Burntwood, North Eastman and Norman where estimates indicated that over one-third of grade 3-aged children were enrolled in band-operated schools (see Table 9.1).

Figures 9.9 and 9.10 show the mean score on a province-wide Grade 3 Mathematics test, by RHA and WCA, respectively. We also present the percentage of children registered in Grade 3 who wrote the exam, recognizing that this variable may

Table 9.1: Per cent of Grade 3-Aged Provincial Enrolments Located in Band-Operated Schools, 1999 (Manitoba Education and Training)

RHA	Ages 8-9
South Eastman	1.9
Central	7.7
Brandon *	
South Westman	5.5
Winnipeg *	
Marquette	6.9
North Eastman	36.7
Interlake	17.0
Parkland	11.9
Burntwood	41.8
Norman	35.6
Manitoba	8.1

* No band schools

Figure 9.9: Grade 3 Mean Math Scores by RHA, 1998 (Manitoba Education and Training)

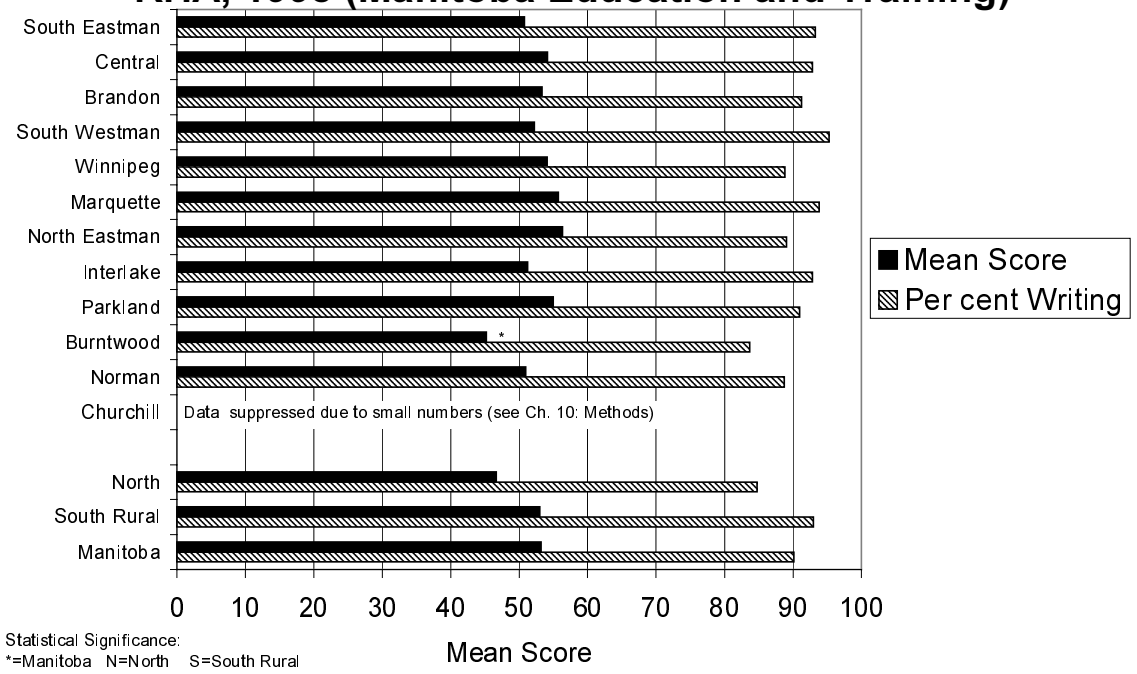
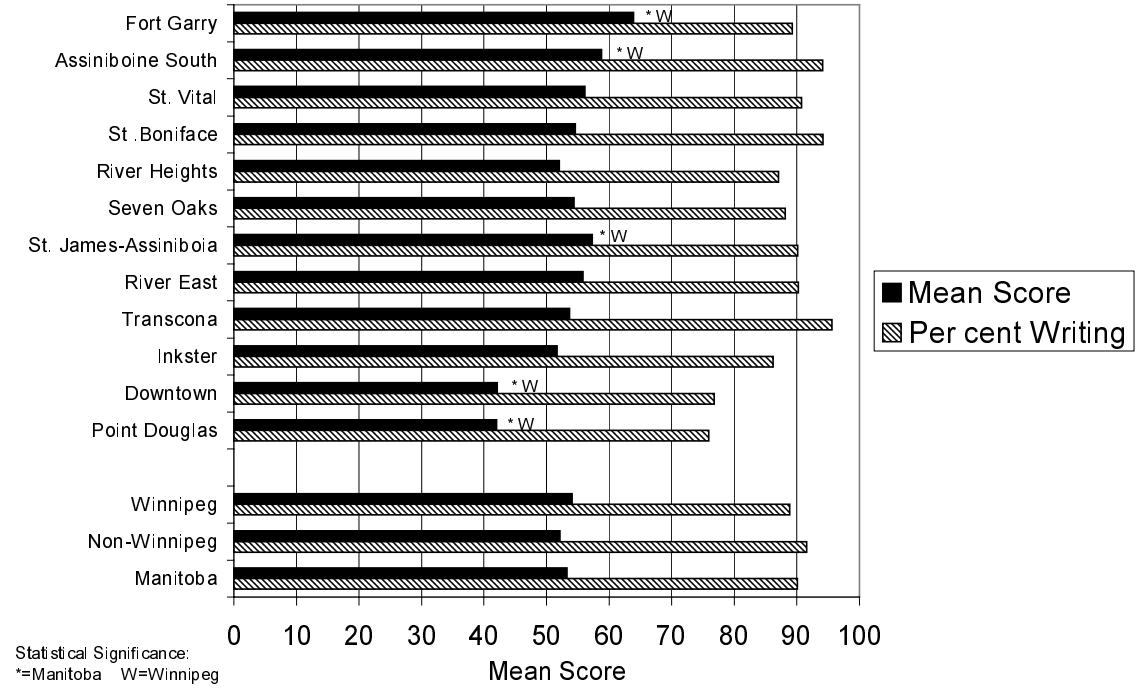


Figure 9.10: Grade 3 Mean Math Score by WCA, 1998 (Manitoba Education and Training)



vary by region and thereby represent a potential source of bias in the findings. Students who do not write the exam are those who were either absent on exam day, or exempt from writing (e.g., students with special needs or in modified programs).

We observed relatively little variation across RHAs where mean scores varied from 45.2 in Burntwood to 56.3 in North Eastman. (Note again, however, that in some RHAs a very high percentage of children attend band-operated schools). In Winnipeg areas, we observed greater variability in mean scores across areas, ranging from 42.1 and 42.0 in the Downtown and Point Douglas areas, respectively, to 63.9 in the Fort Garry community health area. Examination of Figure 9.10 also reveals some variation in the per cent of students writing exams across Winnipeg areas. The highest percentage of students not writing was observed in areas where scores also tended to be lower. There is no strong rationale for predicting that better students were more likely to be absent in areas where performance scores were lower. Indeed, we might speculate that the addition of absent students would, if anything, enhance the observed pattern or gradient across areas rather than change its nature.

Further analyses evaluated the relation between PMR rank and mean scores (see Figures 9.9 and 9.10 referred to above). This association was relatively weak for RHAs (r=-.11,ns,). Across Winnipeg areas, however, we observed a clear pattern of lower test scores in areas where the populations have relatively poorer health and higher socioeconomic risk. (r= **-.**84, p<.001).

Many factors (family, community, neighbourhood) potentially influence a child's ability to take advantage of the educational opportunities afforded him or her. Neighbourhood stability represents one of such conditions. To better understand this issue, we estimated the per cent of enrolled students in each RHA and WCA who transferred from a school in each of the areas to some other school (all grades included) (Manitoba Education and Training). Figures 9.11 and 9.12 present these data by RHA and WCA, respectively. While we observed regional

Figure 9.11: Per cent of School Transfers by RHA, 1997-98 (Manitoba Education and Training)

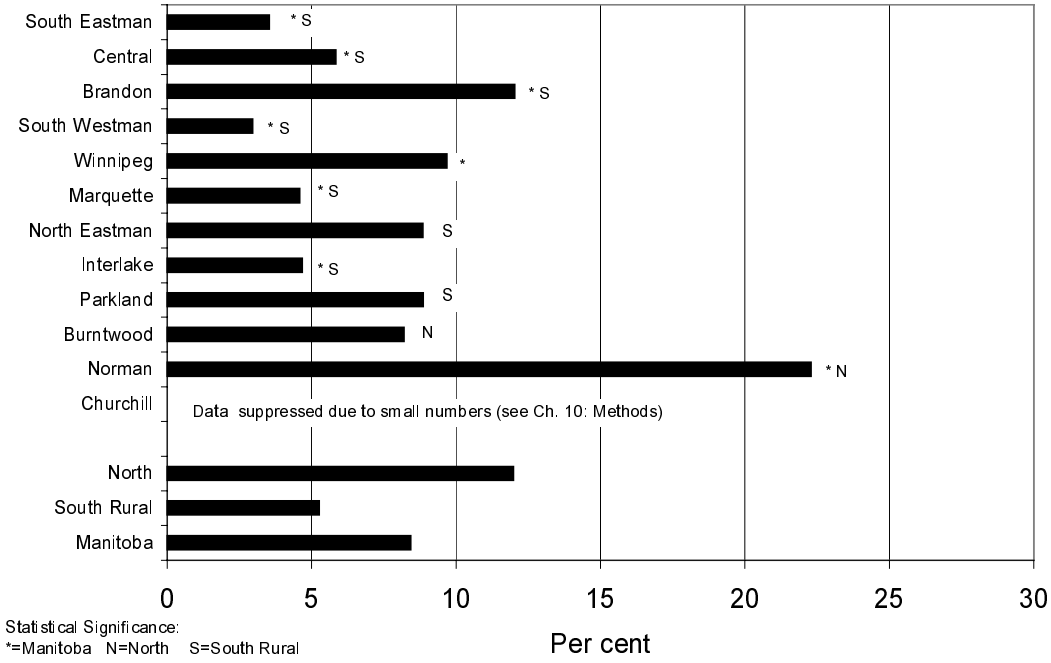
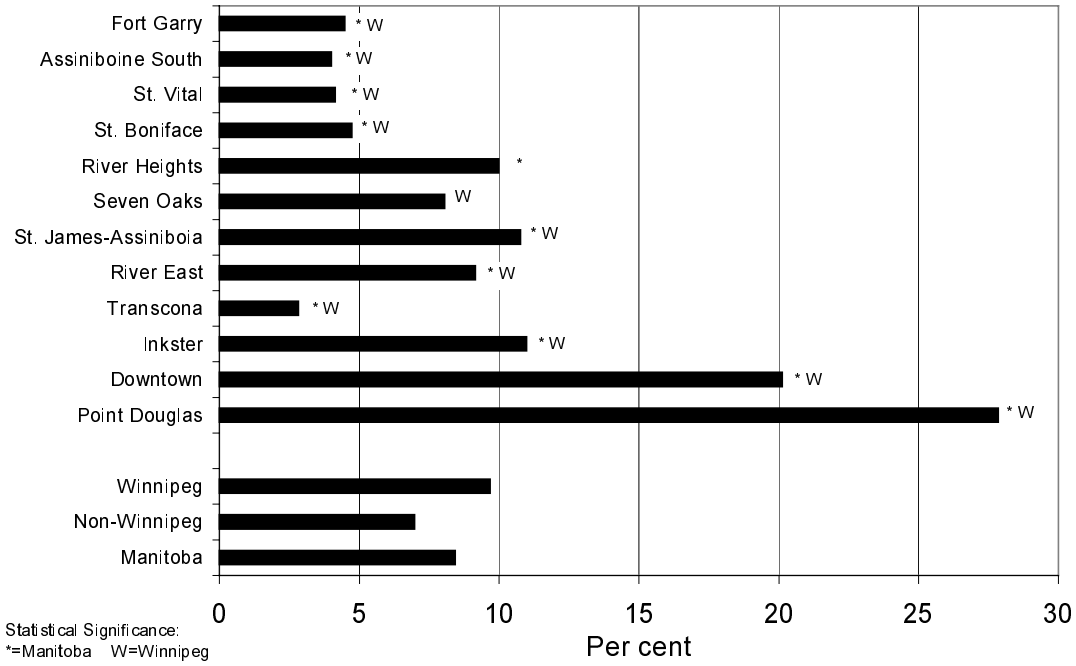


Figure 9.12: Per cent of School Transfers by WCA, 1997-98 (Manitoba Education and Training)



variation across both RHAs and WCAs, the results across Winnipeg areas appear to parallel the gradient observed for Grade 3 math scores; a higher percentage of transfers out were found in areas in which populations are at higher health and socioeconomic risk. Correlations between rank PMR and per cent transfers were much weaker for RHAs ($r=.43$, ns) than for WCAs ($r=.66$, $p<.05$).

9.2 Community resources

Healthy communities, or neighbourhoods, provide opportunities for residents to maintain or improve their physical and mental health (Macintyre et al. 1993). The impact of communities, above and beyond the influence of the family, can be measured when family-level characteristics are controlled. For example, at age three years, children from more affluent neighbourhoods have higher IQ scores than children from less affluent neighbourhoods, even after controlling for differences in family resources (Klebanov et al. 1998). At early school age, when family factors are controlled, higher neighbourhood SES and less neighbourhood crowding remain significantly related to higher cognitive functioning (Chase-Lansdale and Gordon 1996). Adjusting for characteristics of families including income level, children from more affluent communities continue to show better developmental outcomes through adolescence, as evidenced by lower teenage out-of-wedlock birth and school dropout rates (Brooks-Gunn et al. 1993). More affluent communities often have more resources such as libraries, community programs, museums, and sports facilities. The presence of community resources has been known to influence children's behaviour and development (Kohen et al. 1998; Connor and Brink 1999). In this section we present information about some of the community resources in Manitoba.

Three important aspects to consider when assessing community resources are availability, use, and barriers to access. Availability and use are closely tied – if the resources are there, do they get used? They may not be used because people choose not to use them, don't know about them, or because of barriers, such as language, transportation, and user fees (Connor and Brink 1999).

9.2.1 Libraries

Public libraries are places to improve reading skills, to participate in story times or other reading programs, and to find information on many topics such as healthy child development (Barlow 1997). In Manitoba, there are over one hundred public libraries

(for a list of the public libraries, visit the Manitoba Library Association web site at (http://www.mla.mb.ca/public.html). Figures 9.13 and 9.14 show the approximate number of library books per person in each RHA and WCA. These graphs do not include the number of books in school libraries. Churchill had 21 books per person because of their small population and good size library, and was omitted from the graph to allow better comparison between the other RHAs. The large number of books per person in the Winnipeg area of Downtown is due to the location of the main branch of the Winnipeg Public Library, Centennial Library. These graphs show that children in every RHA have access to a similar number of books, and that number of library books in a region was not significantly correlated with PMR for either RHAs (Spearman r=.22, ns) or WCAs (Spearman r=-.10, ns). In fact, children may have access to many more different books than these graphs indicate because the regional library systems share books. In addition, bookmobiles visit smaller communities that may not have their own libraries, allowing access to books on a rotating basis (L. Innerst, personal communication, July 20, 2000).

"Libraries cannot solve all of the problems kids have, but they can and do make a tremendous difference"(Virginia Mathews 1997).

9.2.2 Child care

High quality child day care encourages children to develop social, language, and cognitive skills, and can often compensate for poor family conditions (Pence and Goelman 1987). Quality child care also benefits families, communities, and society (Doherty et al. 1995). A well-known problem with quality child day care is the lack of availability. This is as true in Manitoba as it is in other provinces. According to the Childcare Research and Resource Unit (http://www.childcarecanada.org/pt98/index.html), Manitoba has the fourth highest number of regulated child day care spaces available per 1000 children age 0-12 years (105), after Prince Edward Island (153), Quebec (149), and British Columbia (108). Figures 9.15 and 9.16 show the number of licensed child day care spaces per 1000 children aged 0-12 years across RHAs and WCAs. The pattern tends to show that regions with healthier populations have more day care spaces per 1000 children;

Access to high quality child care allows parents to have time to find and keep jobs, which is a key step in improving the health of their children (National Council of Welfare 1999).

Manitoba has the fourth highest number of regulated child day care spaces available per 1000 0- to 12-year old children. There are over one thousand licensed day cares in Manitoba, which include nursery schools, pre-schools, school age day cares, and home day cares (for more information, see http://www.childcarecanada.org/pt98/mb/mb.html).

Figure 9.13: Public Library Books Per Person By RHA

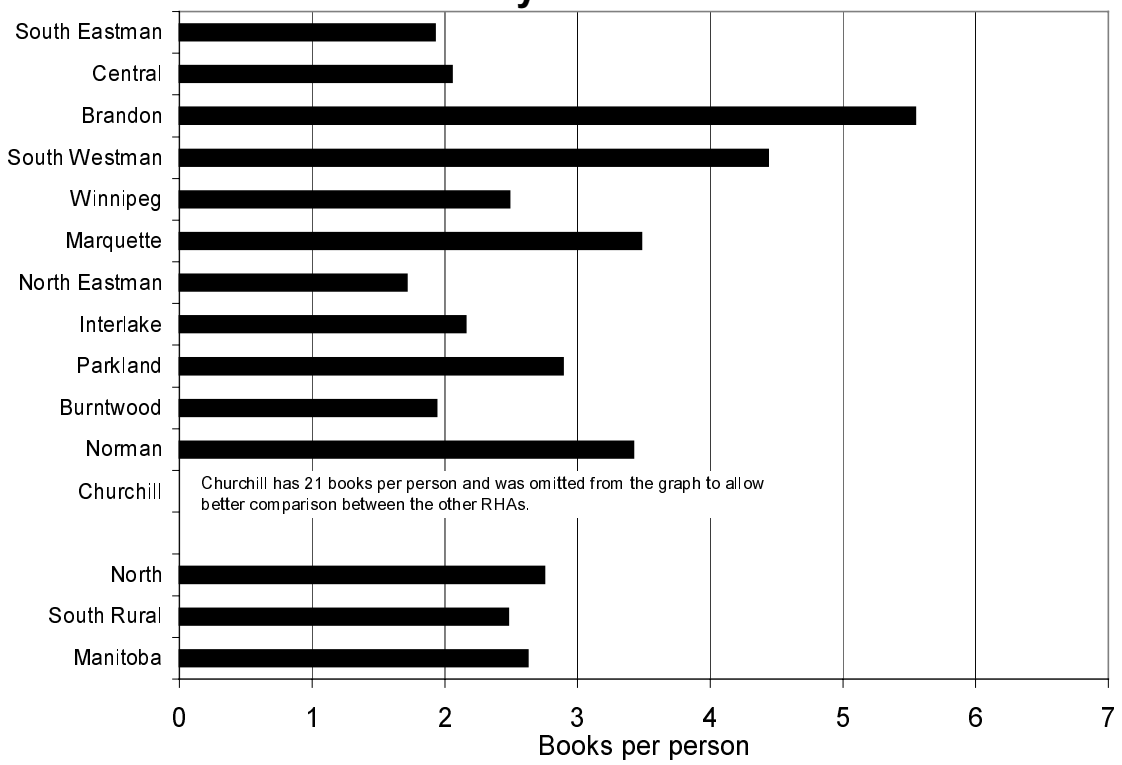


Figure 9.14: Public Library Books Per Person By WCA

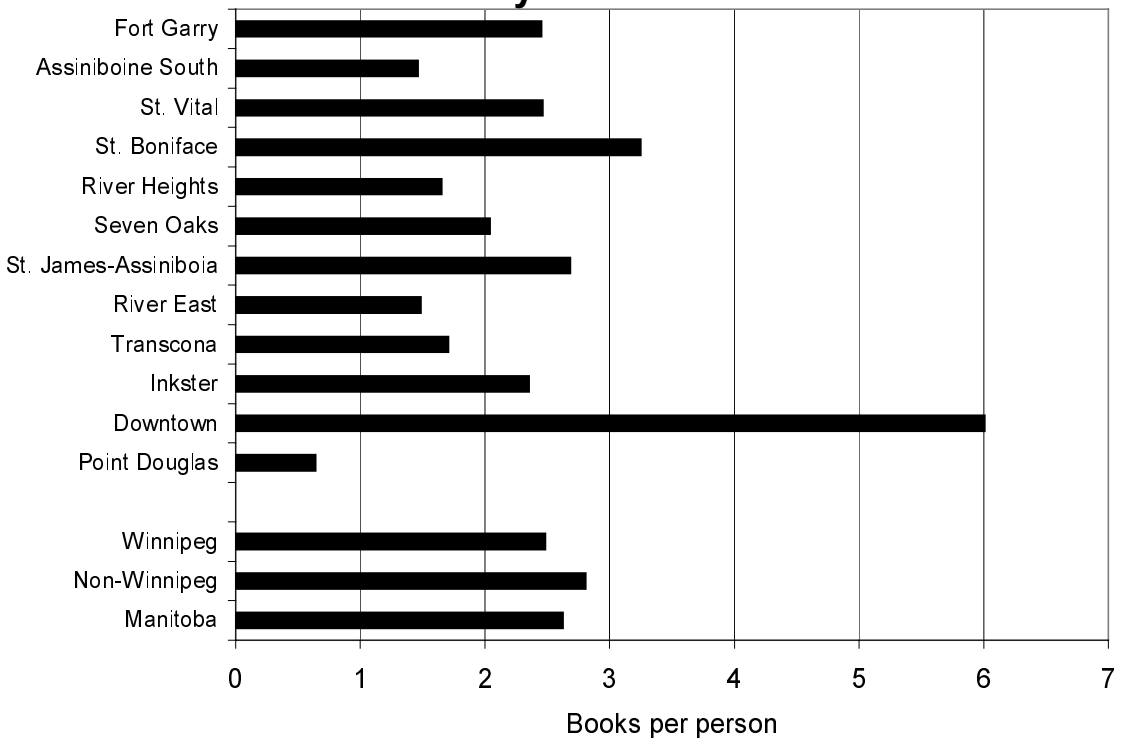


Figure 9.15: Child Day Care Spaces For Children Aged 0-12 Years By RHA, 2000

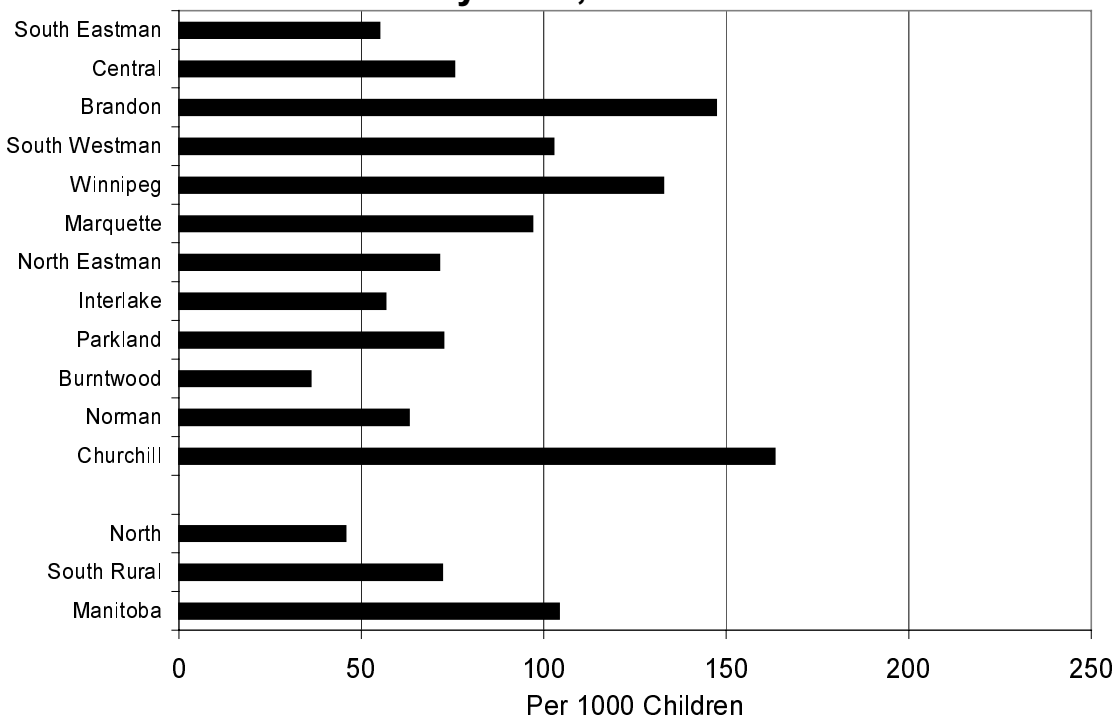
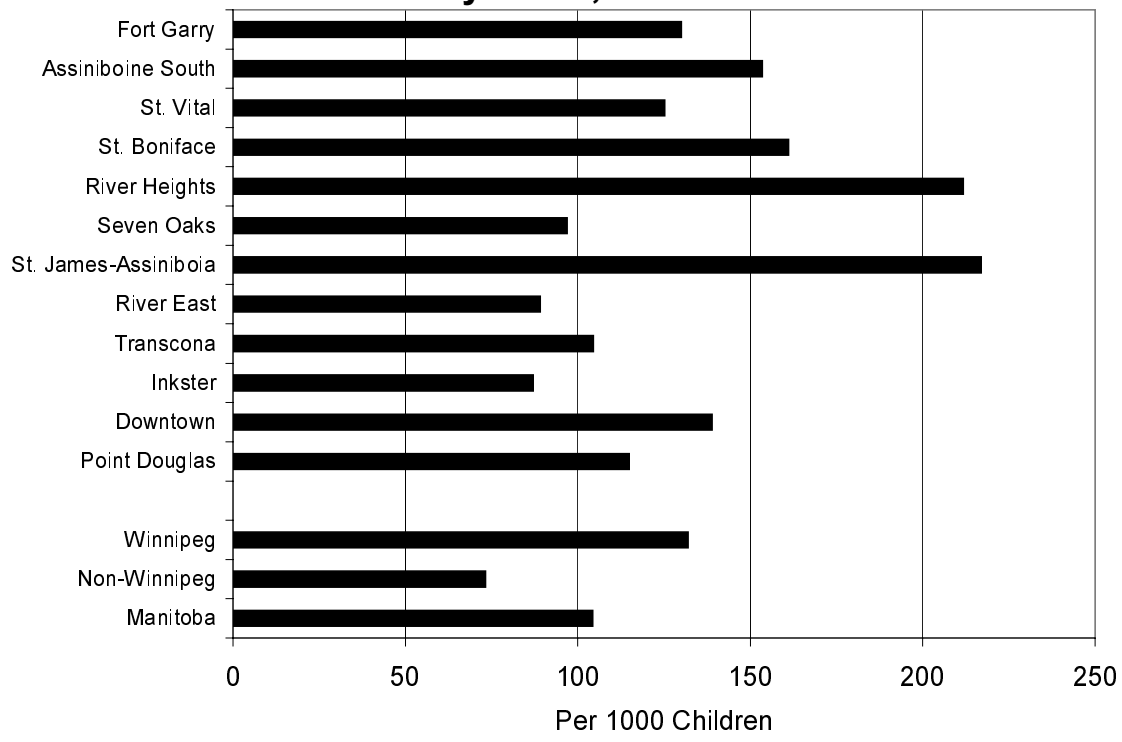


Figure 9.16: Child Day Care Spaces For Children Aged 0-12 Years By WCA, 2000



however, these relationships were non-significant at both the RHA (Spearman r=-.09, ns) and WCA (Spearman r=-.40, ns) levels. Information on unlicensed home day cares is available from the National Longitudinal Survey of Children and Youth (NLSCY), where results show an additional 131 children per 1000 were in unregulated care.

9.2.3 Sports programs and physical activity

Sports programs, both supervised and unsupervised, are part of many children's community resources. According to Sport Manitoba (personal communication, February 2000), 95% of all schools in Manitoba have a basketball court and almost every community has either indoor or outdoor ice rinks. These facilities may or may not get used by children, and aspects of the community itself may affect participation. In addition to preventing traffic injuries in children (Durkin et al. 1999), the presence of parks, playgrounds, and other play spaces, or having a supportive neighbourhood, tends to increase participation in sports (Offord 1998). When children participate in community sports programs they benefit in many ways. For example, by encouraging children and adolescents to give extra effort in a sports context, they learn to apply that attitude toward other areas in life. Such an attitude may work as a preventive strategy to protect them against the potentially negative effects of stress and trauma (Bell and Suggs 1998).

Physical activity can also have positive effects on both physical health and emotional well-being. Children can gain a sense of mastery and competence from participating in both organized and unorganized sports. According to the 1996 NLSCY, almost 70% of Manitoba children frequently (more than once per week) participated in some form of organized or unorganized sport. In *urban* areas (Winnipeg and Brandon) children from low income families were less likely to participate frequently in sports (54.1%) than children from high income families (71.8%). (Caution must be exercised in interpreting group differences found with NLSCY data, as significance tests controlling for sampling variability were unavailable; please see Chapter 10: Methods). In

rural areas, participation in sports did not vary according to family income. In both urban and rural areas, children in families with mothers who had some post-secondary education were somewhat more likely to participate frequently in sports (77.4%) than those with mothers who did not have this level of education (66.4%).

One possible outcome of inactivity in children is obesity**.** There is ample evidence showing that obesity and overweight are associated with a number of health problems including coronary heart disease (Manson et al. 1990) and diabetes (Holbrook et al. 1990). Childhood obesity has increased over the past several years, with approximately one in four children experiencing problems of overweight (Fruhbeck 2000). The increase in rates of obesity in children have been paralleled by dramatic increases in sedentary activities such as TV watching, and computer and video games (Andersen et al., 1998). Studies suggest that obesity in childhood can have serious consequences in adulthood (Mossberg 1989; Must et al. 1992), including continued obesity (Fisch et al. 1975; Guo and Chumlea 1999; Guo et al. 1994; Rolland-Cachera et al. 1987). According to 1996 National Population Health Survey data, almost 29% of Manitoba children were obese or at risk for obesity (please see Glossary entry "obesity and risk for obesity" for definitions of these measures). Although the per cent of children who were obese or at risk for obesity ranged from 23% to 36% across regions, the differences were not statistically significant, possibly due to the high sampling variability in the NPHS data.

According to the 1996 NLSCY, almost 35% of Manitoba children under the age of 14 years watch 1 or less hours of television a day. On the other hand almost 25% of Manitoba children spend 3 or more hours a day watching television.

9.2.4 Nutrition

Healthy diets are important for children's health, not only with respect to obesity and overweight, but also with respect to malnourishment. The cost of food in a region is another community resource that can affect children, with healthy food intake potentially more difficult for children in regions where food costs are high. A study by Alderson and Ogden (1999), however, showed that the nutritional value of food was an important motivator for mothers when choosing food for their children; whereas, cost and

"In terms of longitudinal studies, research has shown that a person's adult health is influenced by their nutrition as a child." (Alderson and Ogden, 1999)

availability were motivators when mothers chose food for themselves. Both cost and quality of food have been found to vary by geographic location; families living in lower income or inner-city urban areas have less access to healthy and affordable food (Sooman et al. 1993; Travers 1996). A Manitoba Agriculture and Food web site (http://www.gov.mb.ca/agriculture/homeec/cba24s01.html) provides information on yearly food costs in different regions of Manitoba. A food basket contains 5-12 servings of grain products, 5-10 servings of vegetables and fruits, 2-4 servings of milk products, and 2-3 servings of meat and alternatives per day per person, based on a family of two adults and two children. The food basket costs were obtained from stores in each region in October 1998, and the yearly cost of a food basket for a family of four in a small northern community was nearly $1,400 higher than for the same family in Winnipeg. The most expensive places to feed an infant were small communities in South Westman, where it was approximately $500 more expensive per year than in Winnipeg.

MANITOBA YEARLY FOOD COSTS

Region/location	*Family*	*Infant*
Winnipeg	*$5,964*	*$1,368*
Central:		
· Portage la Prairie	*$6,080*	*$1,416*
· Smaller communities (8)	*6,573*	*1,696*
South west region:		
· Brandon	*$5,814*	*$1,413*
· Smaller communities (6)	*7,101*	*1,824*
North west region:		
· Dauphin	*$6,106*	*$1,414*
· Smaller communities (4)	*6,292*	*1,542*
Eastern/Interlake:		
· Steinbach	*$6,344*	*$1,386*
· Smaller communities (6)	*6,456*	*1,775*
North:		
· Thompson	*$6,339*	*$1,595*
· Smaller communities (3)	*7,357*	*1,667*

9.3 Household environment

There are many factors about the home in which a child lives that affect his/her current and future health status.

9.3.1 Household crowding

Household crowding has been associated with an increased prevalence of respiratory and other infections in children, as well as the acquisition of bacteria that have been linked to diseases such as gastric ulcer (Graham 1990; McCallion et al. 1996). In an evaluation of Haemophilus influenza (Hib) vaccination, children aged 2 to 18 months who *acquired* invasive Hib disease, even though vaccinated, were more likely to live in crowded households. (Jafari et al. 1999). Additionally, children living in crowded households are more likely to be exposed to passive smoking, and have an increased risk of pedestrian injury (crowding may encourage time out of the home) (Christoffel et al. 1996; Jarvis et al. 1992). Finally, household crowding

Housing needs grow….

Between 1991 and 1996 in Manitoba, the percentage of renters in "core housing need"(because current housing lacks facilities, needs major repairs, is crowded and expensive) increased from 25% to 32%. (Canadian Council on Social development 1999)

has been connected with poor academic performance and impaired social relationships (Evans et al. 1998).

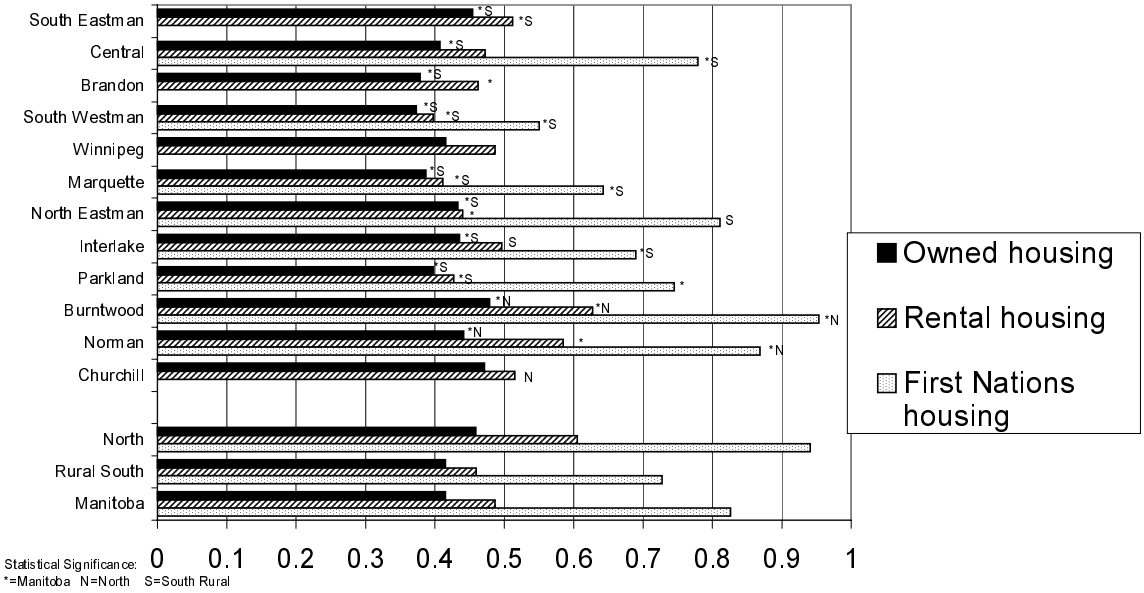
Our data show that the household crowding index (number of persons per room) was significantly greater in First Nations community than rental housing, and greater in rental than owner occupied housing (Figures 9.17 and 9.18). Crowding in First Nations, rental and owner-occupied housing was significantly greater in the North, than in southern RHAs. In comparison to the southern rural average, crowding in rental and owner-occupied housing was more likely in South Eastman and Interlake regions. In addition, North Eastman had greater crowding in owner-occupied housing and Winnipeg in rental accommodation than the South. Within Winnipeg, Point Douglas, Downtown, Inkster and Seven Oaks regions had the highest crowding for rental housing. Crowding in owner-occupied housing was significantly correlated with the healthiness of the populations in the Winnipeg community areas (Spearman rank correlation=0.594, $p<0.04$).

9.3.2 Exposure to household smoke

There is considerable evidence about the health risks of exposure to second-hand smoke. Children are at particular risk. Children living in households where they are exposed to second-hand smoke are more likely to succumb to sudden infant death syndrome, are at increased risk of middle ear infections, experience reduced lung development, exhibit greater severity of childhood asthma and may be more likely to develop asthma, have increased incidence of lower respiratory illness, and greater frequency of chronic respiratory symptoms (Stone 1992; U.S. Department of Health and Human Services 1994). They also have more days of restricted activity, bed confinement, and missed school each year than children not exposed to second-hand smoke in the home (Canadian Council on Social Development 1999). Long-term health risks include a greater risk of cardiovascular disease (Stone 1994) and lung cancer (Stone 1992). Figure 9.19 presents NPHS data showing exposure of Manitoba children to second-hand smoke. Almost 41% of Manitoba children aged 12 to 19 years were exposed to second hand smoke in the home.

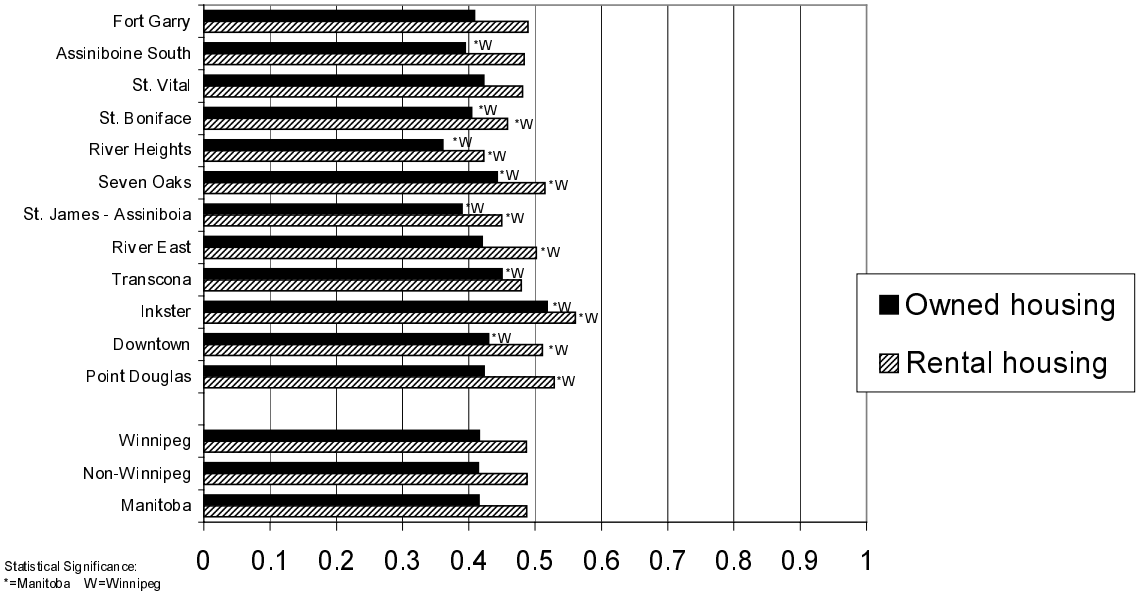
According to national data from the 1996 NPHS, 14% of Canadians aged 12 years or older believed there are no health risks from second hand smoke for non-smokers or had no opinion on the matter (Federal, Provincial and Territorial Advisory Committee on Population Health 1999). Interestingly, younger people were more aware of the risks than older people. Awareness of the risk of exposure to second-hand smoke increases as both education and income level increase.

Figure 9.17: Household Crowding Index (Number of Persons per Room) by Housing Type and RHA, 1996 Census



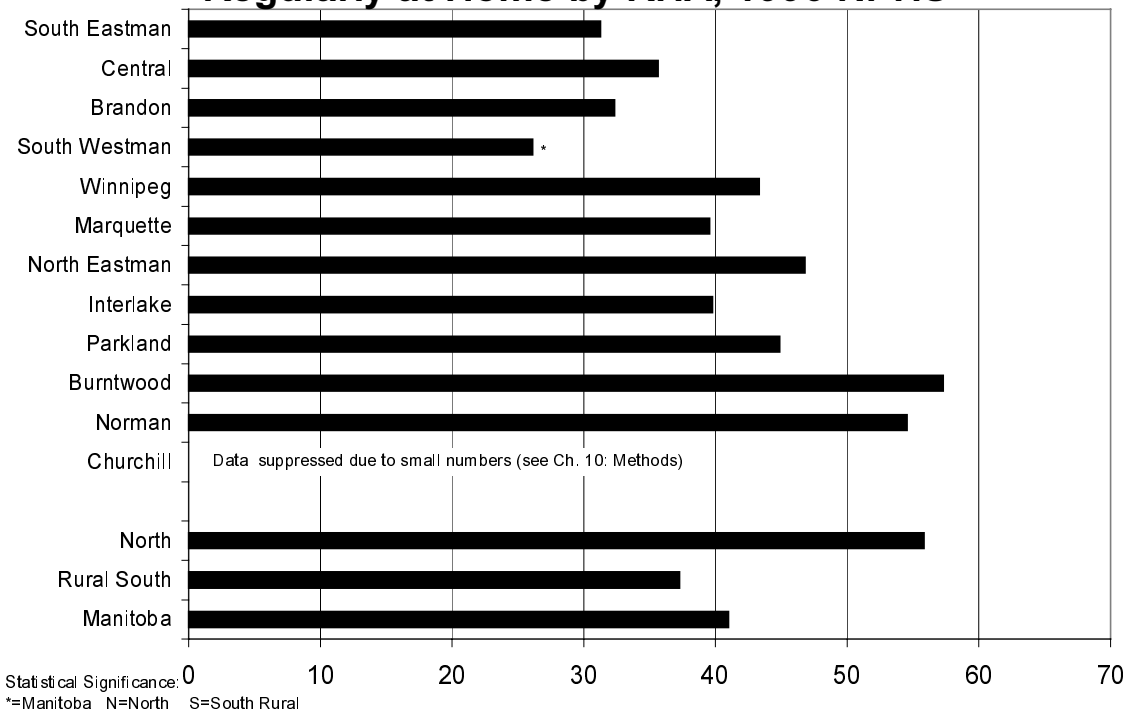
Statistical Significance:
*=Manitoba N=North S=South Rural

Figure 9.18: Household Crowding Index (Number of Persons per Room) by Housing Type and WCA, 1996 Census



Statistical Significance:
*=Manitoba W=Winnipeg

Figure 9.19: Per cent Children Aged 12-19 Years Exposed to Second-Hand Smoke Regularly at Home by RHA, 1996 NPHS



Exposure to second-hand smoke was significantly greater in the North compared to rural South. Although regional variation was evident, due to high sampling variability, only one region, South Westman, was statistically different from the Manitoba average. South Westman had the lowest percentage of children exposed to second-hand smoke in the household, at just over 26%. Children in low income families were more likely to be exposed to second-hand smoke in the household (66.6% compared to 37.3% among families with higher incomes).

9.3.3 Parental depression

Growing up in a home with a depressed parent can have a profound effect on a child's sense of well-being and development. Depressed parents may be emotionally unavailable and have little energy for their children. According to the 1996 NLSCY, most Manitoba children do not grow up in homes with depressed parents. Nonetheless, 5.7% of Manitoba children under the age of 14 years lived in a home with a depressed parent at the time of the 1996 NLSCY survey. The likelihood of a child living with a depressed parent was associated with income, maternal education and lone-parent status: children living in low income households (<$20,000) were more likely to live with a depressed parent (11.6%) than children from non-low income families (4.6%); children living in families where the mother did not have some post-secondary education were more likely to live with a depressed parent (7.3%) than those where the mother did have this level of education (1.7%); and, finally, children living in lone-parent families were more likely to live with a depressed parent (14.0%) than children living in two-parent families (4.2%). (Once again, caution must be exercised in interpreting group differences found with NLSCY data, as significance tests controlling for sampling variability were unavailable; please see Chapter 10: Methods).

NLSCY and NPHS survey questions

The exact wording of survey questions used in the analyses of this report are found in the Glossary section.

9.4 Socioeconomic conditions and child health: A summary

Throughout this report, we performed analyses to

assess the association between various key child health indicators and neighbourhood income level. Several of these analyses revealed significant trends, suggesting an income gradient in child health status. That is, for many of the key indicators of child health, we found poorer health outcomes with decreasing income levels. Some of the key child health indicators associated with income were: infant mortality (Chapter 2), low birth weight (Chapter 3), newborn readmission (Chapter 3), hospitalization rates of children less than one year of age for lower respiratory tract infections (Chapter 5), injury mortality (Chapter 6), injury hospitalization (Chapter 6), hospital utilization (Chapter 7), specialist visits (Chapter 7), continuity of care (Chapter 7), antibiotic use (Chapter 7), use of iron supplements (Chapter 7), use of pain relief drugs (Chapter 7), and use of mental health drugs (Chapter 7). Research suggests that socioeconomic gradients in health found in childhood persist into adulthood (Davey Smith et al. 1998; Lundberg 1993; Marmot 1997; Rahkonen et al. 1997; van de Mheen 1997; van Der Lucht and Groothoff 1995). Moreover, the gradient effect observed suggests that it is not absolute deprivation alone that affects health, but also relative differences in income (Wilkinson 1997).

In each chapter of this report we have also discussed the relationship between child health indicators and the healthiness of the population in the region in which a child lives, as measured by premature mortality ratio (PMR). Correlations between PMR and the child health indicators yield interesting information on the relationship of the overall health of the population within a region and the need of health care in that region with the health of the region's child population. For many of the key child health indicators, poorer outcomes were found for those children living in the regions where the populations are found to have the poorer overall health. A summary of the child health indicators and their correlation with PMR is given in Tables 9.2 and 9.3. Where missing data were not a problem the child health indicators were correlated with PMR values for all Non-Winnipeg RHAs and WCAs combined, and are presented in Table 9.2. Where missing data

Figure 9.20: Child Mortality Ages 1-4 Years versus Premature Mortality Rate, 1994-98

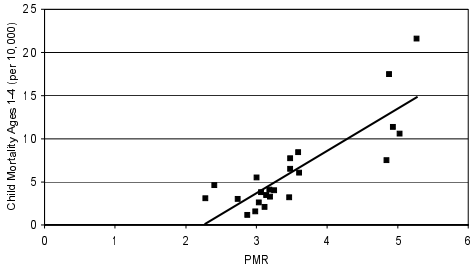


Figure 9.21: Injury Hospitalization Rates versus Premature Mortality Rates, 1994-97

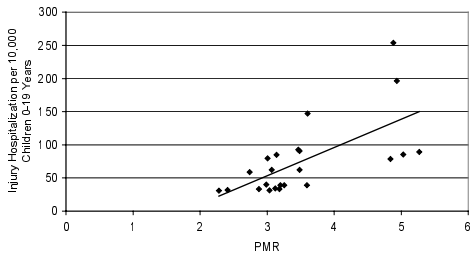


Table 9.2: Correlation of Child Health Variables With Premature Mortality Rate (PMR)

Demographic Indicators – Chapter 2	"r" Spearman's correlation with PMR	p-value
% children 0-19 years old	0.37	0.08
General fertility	0.74 ***	0.00006
Infant mortality, excluding < 500 g	0.67 ***	0.002
Child mortality 1-4 years old	0.81 ***	0.000003
Child mortality 5-9 years	0.27	0.23
Child mortality 10-14 years	0.60 **	0.002
Child mortality 15-19 years	0.47 *	0.027
Stillbirths	0.55 **	0.007
Infant mortality including < 500 g	0.41	0.06
Perinatal Indicators – Chapter 3		
Premature birth rate	0.09	0.69
Low birth weight rate	-0.07	0.76
High birth weight rate	-0.27	0.20
Maternal length of stay (vaginal)	0.35*	0.097
Maternal length of stay (C Section)	0.50*	0.015
Breastfeeding initiation rate	-0.79***	0.000009
Reproductive Health of Adolescents – Chapter 4		
Teen pregnancy rates	0.85***	0.000001
Injury Indicators – Chapter 6		
Injury mortality	0.68***	0.0005
Injury hospitalization	0.71***	0.0001
Utilization Indicators – Chapter 7		
Hospital Utilization	0.71***	0.0001
Quality of Care Indicators – Chapter 8		
Vaginal birth after Caesarean section rates	0.02	0.91
Caesarean section rates (adjusted for maternal age)	0.16	0.47
Complete immunization schedule at one year old	-0.61**	0.002
Complete immunization schedule at two years old	-0.42*	0.04
Tonsillectomy-adenoidectomy rates	0.29	0.3855
Social Determinants Indicators – Chapter 9		
Per cent low income	0.38	0.07
Per cent lone parent	0.73***	0.0001
Per cent 25-44 unemployed	0.78***	0.0001
Per cent 25-44 no high school	0.71***	0.0001
Obesity/risk for obesity[+]	0.39	0.2345
Persons per room	0.62**	0.0017
Household smoke[+]	0.63*	0.0388

*p<0.05; **p<0.01; ***p<0.001

Because some of the demographic indicators were not normally distributed, Spearman's correlation tests were used, where the ranks rather than the actual data are used.

[+]Comparisons using NPHS data do not include WCAs.

Table 9.3: Correlation of Child Health Variables With Premature Mortality Rate (PMR)

Treatment Prevalence Indicators – Chapter 5	"r" Spearman's correlation with PMR - RHA level (p-value)	"r" Spearman's correlation with PMR - WCA level (p-value)
Lower respiratory tract infection, < 1 year old	0.664 (p<0.018)*	0.608 (p<0.036)*
Lower respiratory tract infection, 1-4 years old	0.776 (p<0.003)**	0.678 (p<0.015)*
Asthma, 5-9 years old	NS	NS
Asthma, 10-14 years old	NS	NS
Asthma, 15-19 years old	NS	NS
Any cardiovascular condition, 15-19 years old	NS	NS
Cardiovascular condition, excluding stroke, 15-19 years old	NS	NS
Type I diabetes mellitus, 15-19 years old	0.594 (p<0.042)*^	NS
Seizure disorder, 15-19 years old	NS	NS
Age-Standardized Rates – Chapter 7		
Hospitalization	0.748 (p<0.005)**	0.832 (p<0.0008)***
Physician visit	NS	0.622 (p<0.031)*
Children with 5 or more prescriptions for antibiotics	NS	0.832 (p<0.0008)***
Children with 1-4 prescriptions for antibiotics	NS	0.734 (p<0.0065)**
Children with one or more prescriptions for iron supplements	NS	0.545 (p<0.067)
Children with one or more prescriptions for narcotic analgesics	NS	NS
Children with one or more prescriptions for NSAIDs	0.804 (p<0.0016)**	NS
Children with one or more prescriptions for ADHD drugs	NS	NS
Children with one or more prescriptions for antidepressants	-0.559 (p<0.059)	NS
Children with one or more prescriptions for antipsychotics	NS	NS
Children with one or more prescriptions for anxiolytics	NS	0.615 (p<0.033)*
Social Determinants Indicators – Chapter 9		
Grade 3 mean math scores	-0.11 (NS)	-0.84 (p<0.01)**
Per cent transfer out of school	0.43 (NS)	0.66 (p<0.05)*
Number of library books	0.224 (p=0.4845)	-0.105 (p=0.7456)
Day care spaces per 1000 children	-0.091 (p=0.7787)	-0.399 (p=0.1993)

*p<0.05; **p<0.01; ***p<0.001

Because some of the demographic indicators were not normally distributed, Spearman's correlation tests were used, where the ranks rather than the actual data are used.

were a potential problem for Non-Winnipeg RHAs, correlations were calculated separately for RHAs and WCAs and are presented in Table 9.3. As can be seen from these two tables, for over half of the child health indicators examined in this report, child health was associated with the general health of a region's population. This association was not perfect, however. As the scatter plots in the sidebar illustrate, even when a significant correlation existed between PMR and a child health indicator, some regions had better or poorer outcomes than expected given their overall general health. For example, two regions with high PMR that perform quite differently on many of the indicators of child health examined were Burntwood and the Downtown area of Winnipeg. Children from Burntwood fairly consistently display much poorer health outcomes than expected, even given their high PMR, whereas children from the Downtown region often have better outcomes than would be expected given their high PMR. A close examination of those areas that perform better or worse than expected on specific indicators could facilitate identification of policies and/or practices that could serve as models for others or alternatively, as warnings about systematic problems with policy.

Figure 9.22: Per cent Children Aged 0-19 Years with Five or More Prescriptions for Antibiotic vs. PMR by WCA, 1998/99

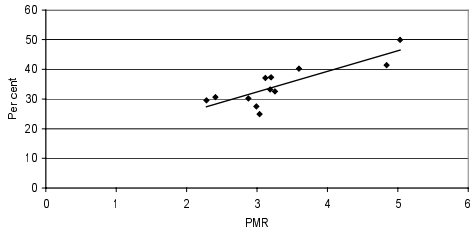
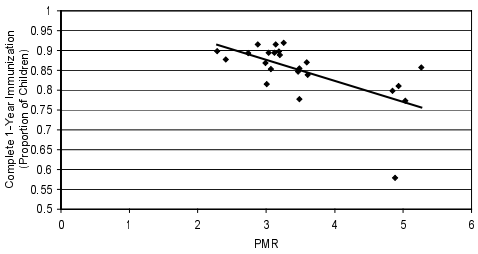


Figure 9.23: Complete Schedule of 1-Year Immunizations (1994-1997) versus Premature Mortality Rates



Key Points in this chapter

Regional profiles (Section 9.1)

- Considerable regional variation exists in the per cent of children living in families in the lowest income quintile, ranging from less than 10% for South Eastman and Norman to over 50% for those children residing in Parkland for the RHAs and from less than 10% for Assiniboine South, Seven Oaks, St. James Assiniboia and Transcona to over 50% for those children living in Downtown and Point Douglas for Winnipeg Community Areas.
- The per cent of lone-parent families tends to be higher in the North (18.5%) and Winnipeg (16.3%) than in the rural South (9.1%), with regional variations evident.
- Unemployment for 25- to 44-year-olds ranges from less than 3% in South Westman to almost 20% in Churchill and from less than 4% in Assiniboine South, St. Vital and Transcona to

over 14% in Point Douglas.
- The per cent of those not finishing high school is lower in Winnipeg than the other RHAs, but within Winnipeg the per cents range from 11% in Fort Garry to over 40% in Point Douglas.
- Grade 3 mean scores on math standards tests ranged from less than 43 in the Downtown and Point Douglas areas, to 64 in Fort Garry. Across RHAs where some regions have a high percentage of children who attend band schools (who are not required to write exams) scores varied from 45 in Burntwood to 56 in North Eastman. For Winnipeg areas, both mean scores and neighbourhood stability (measured by per cent of children transferring out of schools within the area) were associated with PMR.

Community resources (Section 9.2)
- Children have access to a number of public library books, ranging from 1.7 books per person in North Eastman to 5.5 in Brandon, and 0.6 in Point Douglas to 6.0 in Downtown. Churchill was extremely different from the other RHAs with 21.0 books per person, because of the small population and good size library.
- Manitoba has 105 licensed child day care spaces per 1000 children aged 0-12 years. Information on unlicensed home day cares available from the NLSCY shows an additional 131 children per 1000 are in unregulated care.
- Manitoba children are less likely to participate in sports if they are from low-income families that live in urban areas, and if their mothers' do not have any post-secondary education.
- Almost 29% of Manitoba children are obese or at risk for obesity.
- The yearly cost of a food basket for a family of four in a small northern community was nearly $1,400 higher than for the same family in Winnipeg, and the most expensive places to feed an infant were small communities in South Westman, where it was approximately $500 more expensive per year than in Winnipeg.

Household environment (Section 9.3)
- Children are more likely to live in crowded

houses if they live in First Nations communities, and least likely to be exposed to crowding if they live in owner occupied homes.

- Crowding in First Nations, rental and owner-occupied housing is greater in the North than in southern regions, and for rental housing is greatest in Point Douglas, Downtown, Inkster and Seven Oaks regions of Winnipeg.
- Almost 41% of Manitoba children 12 to 19 years are exposed to second hand smoke in the home, with greater exposure in the North compared to rural South.
- Manitoba children are more likely to live with a depressed parent if they are from a low-income family, if their mothers' do not have any post-secondary education, and if they are from a lone-parent family.

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CHAPTER 10: METHODS

10.0 Methods

The nature of this report is to provide a description of the health of children in Manitoba. Therefore, we gleaned information from several sources and used a variety of methods to measure "health" in children. A glossary at the end of the report contains more detailed information of the specific measures and special calculations. This chapter explains general concepts of the methods and which data sources were used in this report.

This chapter explains general concepts of the methods and data sources used in this report.

10.1 Study design and population

This is a descriptive, cross-sectional study of children residing in the province of Manitoba. Most information covers the period from April 1, 1994 to March 31, 1999. However, in some cases, data from the calendar years (January through December) 1994 to 1998 were used. Also, at the time of the preparation of this report, cause-specific mortality data were only available up to December 1997. All graphs and tables indicate the years used. We have defined Manitoba children as residents of Manitoba who were 0 to 19 years old during the years reported.

This is a cross-sectional study of children ages 0 to 19 residing in the province of Manitoba from 1994 to 1998.

10.2 Sources of data

We used three types of data sources in this report: health care administrative, Vital Statistics and survey data. The health care administrative data originate from Manitoba Health and are anonymized encounter-based records of Manitobans' interactions with the health care system. These data are housed in the Population Health Research Data Repository at the University of Manitoba. These administrative databases have been established to be both reliable and valid for examining health and health care use (Roos et al. 1987; Roos et al. 1988; Muhajarine et al. 1997; Kozyrskyj and Mustard 1998).

Three data sources were used: health care administrative data, Vital Statistics and survey data.

The Manitoba Health Services Insurance Plan (MHSIP) provides universal first dollar coverage (no deductibles, no co-payments) for hospital care and most physician services. Prescription drugs are covered subject to an income-based deductible.

10.2.1 Hospital separations per 1000

Hospitalizations per 1000 measures the number of hospital contacts per 1,000 residents for any given region, regardless of where the hospitalization took place. Rates of hospitalization were developed using the number of separations for children in a given region (numerator) divided by the child population in that region (denominator).

10.2.2 Physician visits per 1000

Rates of physician visits per 1000 provide a measure of the total ambulatory utilization of physician services by residents of a given region, regardless of where the service took place. Physician visit rates were defined by the number of visits by children in a given region (numerator) divided by the child population of that region (denominator).

10.2.3 Prescriptions per 1000

Rates of prescription medications per 1000 provide a measure of the intensity of pharmaceutical use by Manitoba residents. These rates were defined as the number of different classifications of drugs used by children in a given region (numerator) during a particular year divided by the child population in that region (denominator). Prescriptions dispensed in hospitals and in nursing stations are excluded. The latter results in the under-reporting of prescription data from northern Manitoba.

10.2.4 Vital Statistics measures

We used vital statistics measures to obtain mortality information, such as date of death and reasons for the death. For cause-specific mortality, only deaths until December 1997 were available from Vital Statistics.

10.3 Survey data

The 1994 and 1996 National Population Health Survey (NPHS) and the 1994 and 1996 National Longitudinal Survey of Children and Youth (NLSCY) were used to 1) provide information that was not

Survey data comes from the Statistics Canada 1994 and 1996 National

available from health administrative data and 2) to provide validity checks on some administrative data. These surveys are administered by Statistics Canada, and use a multi-stage, cluster design to choose respondents. Therefore, specialized analyses were required for statistical testing in order to adjust for the design effect. We implemented the bootstrapping program provided by Statistics Canada to do the statistical analyses for the NPHS survey. The bootstrapping programs were not available for the NLSCY. Therefore, results from the NLSCY should be interpreted with caution.

Population Health Surveys (NPHS) and the 1994 and 1996 National Longitudinal Survey of Children and Youth (NLSCY).

Statistical analyses for survey data requires bootstrapping to account for the design effect of the survey. Bootstrapping techniques were used in the analysis of the NPHS data, but were not available for the NLSCY.

10.3.1 NPHS

The National Population Health Survey comprises two sections: 1) a general or household survey asked of all household members; and 2) a health section, in which only one family member age 13 years or more was selected. The 1996 NPHS for Manitoba also included children 0-12 years old. Most of these children had another family member (age 13 or older) who also responded to the Health portion of the survey. Therefore, we had respondents who were ages 0 to 19 from the NPHS. Data used in this report comes from those individuals who answered the health portion of the survey.

The "Health" portion of the NPHS survey was used to obtain information for children ages 0 to 19.

10.3.2 NLSCY

The National Longitudinal Survey of Children and Youth was administered in 1994 and 1996. Most data reported here come from the 1996 cycle. However, some data from 1994 are found in this report, especially if the information was not available in the 1996 survey. In 1994, children ages 0-11years were questioned on several components, including health, education and activities. Parental information, such as work, income and health was also obtained. Data from teachers and principals were also obtained on the social and academic aspects of school. The 1996 survey included most of the same questions for children 0-13 years old.

The 1994 NLSCY contains information for children ages 0-11. The 1996 NLSCY surveyed the same children and added children ages 0-1, so that the respondents in 1996 are 0-13 years old.

10.3.3 Census

We used the aggregate 1996 census data for Manitoba

The 1996 census was used to obtain

to obtain average neighbourhood income, employment status, living arrangements and lone-parent status. The census population of Manitoba in 1996 is 1,100,295, with 2,050 populated enumeration areas (EA) in the province of Manitoba, giving a mean population of approximately 540 people. EAs have a maximum of 440 dwellings in urban areas and a minimum of 125 dwellings in rural areas (Statistics Canada, computer file 1998). The census file contains aggregated information, in which case we used data at the enumeration area level.

average neighbourhood income, education, employment status, living arrangements and lone-parent status.

Twenty per cent of the population was given a "long form" of the census, which was a more detailed questionnaire. This information is also available only in aggregate form. While all enumerated persons were asked information on parental status, only those responding to the long form were asked about their income, employment and living arrangements (Statistics Canada, 1997). Income information is reported for the population 15 years of age and over, excluding institutional residents. (Statistics Canada, http://…define.html). Income distributions are suppressed if the total non-institutional population in the area is less than 250, or if less than 250 people in an EA reported an income (Statistics Canada, computer file 1998).

Income distributions are suppressed if the total non-institutional population in the area is less than 250, or if less than 250 people in an EA reported an income.

While most of the province was enumerated, two First Nations communities were incompletely enumerated in 1996. Since many First Nations communities also have less than 250 people, income was not reportable. Thus, some areas of the province have missing income information which may affect the calculations of the income quintiles (see the glossary term "income quintiles" to find out how income was derived).

10.4 Study measures

Health and health related measures are discussed in each chapter. The glossary provides definitions of the measures of child health and region characteristics.

The measures of child health and region characteristics are defined in the glossary.

10.5 Analyses

A variety of methods were used in the analyses carried out in this report. Analyses contained in the report were carried out using different levels of aggregation. Most analyses of health administrative data compared Regional Health Authority (RHA) and Winnipeg Community Area (WCA) measures to provincial and regional measures. Rates in the RHAs were compared to rates of the province, the rural south and the north.

Most analyses of health administrative data compared Regional Health Authority (RHA) and Winnipeg Community Area (WCA) measures to provincial and regional measures.

For simplicity of presentation of graphs showing rates across RHAs, only certain significance symbols were depicted. The overall Winnipeg RHA rate was compared to the Manitoba total; other RHAs in the south were compared to both the Manitoba and the rural south totals; RHAs in the north (Burntwood, Norman, and Churchill) were compared to both the Manitoba and north totals. WCA rates were compared to the Manitoba and the Winnipeg overall rate.

Statistical comparison tests of age- and sex-standardized rates were done using t-test methodology developed by Carriere and Roos (1997). All rates based on administrative data examining all age groups together were age- and sex-standardized. Rates were suppressed where cell counts were less than 5. The glossary explains how rates were calculated.

Age and sex standardized rates were compared using t-tests. Spearman rank correlations and Cochran-Armitage trend tests were performed for some measures in the report.

Correlations and trend tests were performed for some of the measures. Rates of "health" measures were tested for correlation with PMR, using the Spearman rank correlation method. Trend tests were calculated using the Cochran-Armitage test for trend. All data management, programming and analyses were performed using SAS® software.

Data management, computer programming and statistical analyses were done using SAS® software.

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GLOSSARY

Adjusted Rates All rates based on all children aged 0 to 19 years used for comparisons across regions or income quintiles have been adjusted or age- and sex-standardized. This procedure mathematically removes the effects of different population structures that influence overall rates of use of health care. *See Rates and Standardizing.*

Age and Age Groups This deliverable focuses on children, using ages 0-19 years to define children. Age groups used for analyses are under 1 year, 1-4, 5-9, 10-14 and 15-19 years. For many analyses the first two age groups (under 1 and 1 to 4 years) were combined. In some cases, only certain age groups were used (e.g. perinatal, teen-age pregnancy, etc.) As well, perinatal and reproductive health sections include information on mothers and the ages for mothers are defined as 15-44 years. *See Age Calculations for more information.*

Age Calculations Age calculations differ for numerators and denominators. Age for the numerator is the age at the time of the claim date, hospital admission date, or initial drug prescription date. Age for the denominator is calculated as the age at the end of December of the year, e.g., for fiscal year 1994/95, Age = 1994 – birth year.

Asthma Asthma is defined on the basis of a diagnosis or prescription drug for asthma. The diagnosis-based definition is at least one hospitalization or physician visit over one year for asthma (ICD-9-CM=493: Asthma) OR asthma-like diagnoses, (ICD-9-CM=464: Acute laryngitis and tracheitis, 466: Acute bronchitis and bronchiolitis, 490: Bronchitis, not specified as acute or chronic, 491: Chronic bronchitis, 770: Other respiratory conditions of fetus and newborn) in conjunction with at least one prescription for an asthma drug: bronchodilators, corticosteroids, non-steroidal anti-inflammatory drugs, leukotriene receptor antagonists, identified by generic or trade name. The prescription-based definition is at least one prescription over one year for an asthma drug: bronchodilators, corticosteroids, non-steroidal anti-inflammatory drugs, leukotriene receptor antagonists, identified by generic or trade name. Oral corticosteroids are excluded from the prescription-based definition.

At-Risk Birth Weight Either low or high birth weight. *See Low Birth Weight and High Birth Weight for actual weights used in definitions.*

Avoidable Hospitalization For Immunizable and Preventable Infections Hospitalization for primary diagnosis of : congenital syphilis, whooping cough [ICD-9-CM code=033] in children > 3 months old (principal or secondary diagnosis); measles [055], mumps [072], rubella [056] in children > 1 years old; tetanus [037]; polio [045]; rheumatic fever [390, 391]; diphtheria [032]; and Hemophilus meningitis [3200] or epiglottitis [4643] in children < 5 years old.

Body Mass Index *See Obesity and Risk for Obesity.*

Breastfeeding Duration Rate Duration rates were based on NLSCY 1996 survey data for Manitoba, where the length of breastfeeding was reported by the mother for any child less than 2 years of age at the time of survey. The mother was asked if the infant was initially breastfed, and if so, for how long. One of the possible answers was "still breastfeeding". The reported duration data (Breastfeeding in Canada: A review and update. Health Canada, 1999) excluded any children who were still breastfeeding in the analysis of duration.

The analysis presented in this report used a statistical technique called a Kaplan Meier Survival analysis, which could incorporate all the data including data from children who were still breastfeeding at the time of the survey. When the NLSCY 1996 data was reanalyzed in this way, very different results were observed compared to the national reports which excluded this data. Table G.1 records the differences. There is a significant ($p<0.001$) bias whereby breastfeeding rates at 3-, 6-, and 12-month postpartum were underestimated by 11% or more. For example, using a complete set of data, about 36% of all infants were being breastfed at 6 months postpartum. But excluding infants from the analysis if they were still breastfeeding at the time of the survey, only about 21% of all infants were being breastfed at 6 months postpartum – a difference of 15% underestimation bias.

Published data on the NLSCY and NPHS surveys (Maclean 1998; Health Canada 1999) must be read with caution. First, the data is only based on those infants who were weaned at the time of surveying. Secondly, the data quoted for breastfeeding duration is similar to Figure 3.23, giving the proportion of *breastfed* infants who were still breastfeeding at given time points postpartum. The NPHS study in 1996 found that 34% of breastfed infants living in the Prairies were being breastfed more than 6 months (31% Canadian average), of those 86% who had initiated breastfeeding. So at a population level, this means that 29% of all infants were breastfeeding more than 6 months (.34 multiplied by .86). Similarly, the NLSCY 1996 study found that 29% of the breastfed Prairies region infants were breastfed more than six months, of the 83% who had initiated

breastfeeding. So at a population level, this means that 24% of all infants were being breastfed more than six months. But the two national studies both excluded children who were breastfeeding at the time of the survey, basing their duration statistics on those children who had been weaned. This may explain why the NPHS survey yields data more similar to our data, since children were included in the survey if they were less than 5 years old. One could assume that if breastfeeding duration rates had not substantially changed over the previous five years, then the bias would not be as extreme as seen in the NLSCY survey where children were only surveyed if they were 2 years old or less.

We "recrunched" the NLSCY data for Manitoba, both from 1994 (n=271) and 1996 (n=199). The NPHS sample sizes are too small for analysis at the provincial level. Table G.1 demonstrates the effect of excluding versus including those children still breastfeeding at the time of the NLSCY survey. Using the complete set of data, the population rate of breastfed babies in 1996 was as follows: 85%±5% initiation rate; 57% ±7% breastfeeding at least 3 months; 36% ±7% breastfeeding at least 6 months; and 15%±6% breastfeeding at least 12 months. Figure 3.22 illustrates this. It also means that about 42% of those infants initially breastfed were still breastfeeding at 6 months (36% divided by 85%). Figure 3.23 illustrates this.

Table G.1: Comparison of breastfeeding rates using the complete data versus the data excluding any infant breastfeeding at the time of the survey for NLSCY Manitoba data (1994 and 1996)

	Initiation rate	**3-month rate**	**6-month rate**	**12-month rate**
1994 NLSCY complete data	82.7%	51.4%	32.7%	13.3%
1994 NLSCY excluding infants breastfeeding at time of survey	78.5%	40.2%	19.6%	2.7%
1996 NLSCY complete data	84.9%	56.7%	36.2%	15.3%
1996 NLSCY excluding infants breastfeeding at time of survey	80.0%	44.0%	20.7%	3.3%

Breastfeeding Initiation Rate The ratio of live born babies born in a Manitoba hospital with a Manitoba postal code or municipality code who were exclusively or partially breast fed, to the number of live born babies born in a Manitoba hospital with a Manitoba postal code or municipality code.

Caesarean Section Rate The ratio of women giving birth by Caesarean Section, to the number of women giving birth during fiscal years 1994/95-1998/99.

Calendar year A calendar year runs from January 1 to December 31.

Cardiovascular Disease A cardiovascular condition is defined on the basis of a diagnosis or prescription drug for the condition. *For any cardiovascular condition:* The diagnosis-based definition is at least one hospitalization or physician visit over one year for cardio or cerebrovascular diagnoses (ICD-9-CM= 390-429, 430-448, 458; *see Table G.2 for descriptions*). The prescription-based definition is at least one prescription over one year for a cardiovascular drug, excluding propranolol (Anatomic Therapeutic Chemical [ATC] classification system for drugs = B01A, C01A, C01B, C01CA17, C01D, C02AA, C02AB, C02C, C02D, C02L, C03, C04AD, C05BA, C07AA01, C07AA02, C07AA03, C07AA04, C07AA06, C07AA07, C07AA12, C07AB, C07AG, C07B, C07C, C08, C09, C10). *For cardiovascular condition, excluding cerebrovascular (e.g. stroke) or vascular conditions:* The diagnosis-based definition is the above diagnosis-based definition, but excluding cerebrovascular/vascular diagnoses: (ICD-9-CM=430-448). The prescription-based definition is the above prescription-based definition, but excluding anti-coagulants (ATC=B01A) if no cardiac diagnoses (ICD-9-CM=390-429, 458), and anti-platelet drugs (ATC= C04AD, C05BA).

Table G.2: Cardio or Cerebrovascular Diagnoses (ICD= 390-429, 430-448, 458)

ICD-9-CM Code	Category	ICD-9-CM Code	Category
390	Rheumatic fever without mention of heart involvement	423	Other diseases of pericardium
391	Rheumatic fever with heart involvement	424	Other diseases of endocardium
392	Rheumatic chorea	425	Cardiomyopathy
393	Chronic rheumatic pericarditis	426	Conduction disorders
394	Diseases of mitral valve	427	Cardiac dysrhythmias
395	Diseases of aortic valve	428	Heart failure
396	Diseases of mitral and aortic valves	429	Ill-defined descriptions and complications of heart disease
397	Diseases of other endocardial structures	430	Subarachnoid hemorrhage
398	Other rheumatic heart disease	431	Intracerebral hemorrhage
401	Essential hypertension	432	Other and unspecified intracranial hemorrhage
402	Hypertensive heart disease	433	Occlusion and stenosis of precerebral arteries
403	Hypertensive renal disease	434	Occlusion of cerebral arteries
404	Hypertensive heart and renal disease	435	Transient cerebral ischemia
405	Secondary hypertension	436	Acute, but ill-defined, cerebrovascular disease
410	Acute myocardial infarction	437	Other and ill-defined cerebrovascular disease
411	Other acute and subacute forms of ischemic heart disease	438	Late effects of cerebrovascular disease
412	Old myocardial infarction	440	Atherosclerosis
413	Angina pectoris	441	Aortic aneurysm and dissection
414	Other forms of chronic ischemic heart disease	442	Other aneurysm
415	Acute pulmonary heart disease	443	Other peripheral vascular disease
416	Chronic pulmonary heart disease	444	Arterial embolism and thrombosis
417	Other diseases of pulmonary circulation	446	Polyarteritis nodosa and allied conditions
420	Acute pericarditis	447	Other disorders of arteries and arterioles
421	Acute and subacute endocarditis	448	Disease of capillaries
422	Acute myocarditis	458	Hypotension

Child Day Care The information on licensed child day cares in Manitoba came from the Child Day Care program of Manitoba Family Services and Housing. Licensed child day cares were classified into RHAs and WCAs by the nearest postal code to the location of the day care.

Child Death Rate The number of deaths of children aged 1-4 years in a given year per 1000 children in this age group. This is considered a useful measure of the burden of preventable communicable diseases in the child population.

Child Mortality Rate The number of deaths of children aged 1-19 years in a given year per 1000 children in this age group. Because child death is a rare event, child mortality rates are presented by larger geographical regions. *See Table G.3 for descriptions of pie chart categories.*

Correlation with PMR *See Premature Mortality Rate (PMR).*

C-Section Rate *See Caesarean Section Rate.*

Data Suppression Data was suppressed when the cell count was less than five. *See also Rates and Standardizing.*

Denominators *See Rates and Standardizing.*

Diabetes Mellitus *See Type I Diabetes Mellitus.*

Table G.3: Child Mortality

Causes of Mortality	ICD-9-CM Code	ICD Description
Circulatory System	390-392	Diseases of the circulatory system
Congenital Anomalies	740-759	Congenital anomalies
Digestive Diseases	520-579	Diseases of the digestive system
Infectious/Parasitic	001-139	Infectious and parasitic diseases
Injury	800-9999	Injury and poisoning, wounds, burns, foreign bodies
Neoplasms	140-239	Neoplasms
Nervous System	320-389	Diseases of the nervous system and sense organs
Respiratory System	460-519	Diseases of the respiratory system
Other	240-279	Endocrine, nutritional and metabolic diseases, and immunity disorders
	280-289	Diseases of the blood and blood-forming organs
	290-319	Mental disorders
	580-629	Diseases of the genitourinary system
	760-779	Certain conditions originating in the perinatal period
	780-799	Symptoms, signs, and ill-defined conditions

Drug Categories for Prescription Use Analysis The 10 drug categories are: (1) ADHD (Attention-Deficit Hyperactivity Disorder) drugs, (2) Antibiotics, (3) Antidepressants (selective serotonin reuptake inhibitors, tricyclic antidepressants, monoamine oxidase inhibitors), (4) Antipsychotics, (5) Anxiolytics, (6) Iron supplements, (7) Narcotic analgesics, (8) NSAIDs (nonsteroidal anti-inflammatory drugs) and other arthritis drugs, (9) Pain relief drugs, (10) Mental health drugs. *See Table G.4 for category definitions.*
E-Codes *See External Cause of Injury Codes*

Table G.4: Drug Categories for Prescription Use Analysis

Drug Category	Definition
ADHD (Attention-Deficit Hyperactivity Disorder) drugs	At least one prescription over a one year period for **ATC code** = N06B **OR generic name** = methylphenidate, pemoline, dexamphetamine **OR trade name** = ritalin, pms-methylphenidate, riphenidate, cylert, dexedrine
Antibiotics	At least one prescription over a one year period for ATC code = J01
Antidepressants (selective serotonin reuptake inhibitors, tricyclic antidepressants, monoamine oxidase inhibitors)	At least one prescription over a one year period for ATC code = N06AA01, N06AA02, N06AA04, N06AA06, N06AA09, N06AA10, N06AA12, N06AA17, N06AA22, N06AB03, N06AB05, N06AB06, N06AB08, N06AF03, N06AF04, N06AG02, N06AX05, N06AX06
Antipsychotics	At least one prescription over a one year period for ATC code = N05AA, N05AB, N05AC, N05AD, N05AF, N05AG, N05AH01, N05AH02, N05AH03, N05AK, N05AN01, N06AX02, N05AX08
Anxiolytics	At least one prescription over a one year period for ATC code = N05BA, N05BE, N05CA, N05CC, N05CD, N05CF
Iron supplements	At least one prescription over a one year period for ATC code = B03AA, B03AC **OR trade name** = fer-in-sol, ferodan
Narcotic analgesics	At least one prescription over a one year period for ATC code = N02AA, N02AB, N02AC, N02AD
NSAIDs (nonsteroidal anti-inflammatory drugs) and other arthritis drugs	At least one prescription over a one year period for ATC code = M01, excluding M01AX07 **OR trade name** = rheumatrex
Pain relief drugs	see narcotic analgesics, NSAIDs
Mental health drugs	see ADHD drugs, antidepressants, antipsychotics, anxiolytics

External Cause of Injury Codes (E-Codes) E-codes are used to define environmental events, circumstances and conditions as the cause of injury, poisoning, and other adverse effects related to injury hospitalizations and mortality. The ICD-9-CM E-code on the hospital claim may be in any one of the 16 diagnosis codes and the first one found going from 1 to 16 is used. The vital statistics record has ICD-9 E-codes listed in the cause of death. The E-codes used in this report are given in Table G.5. Excluded from this list and from our definition of injuries are injuries resulting from misadventures during surgical or medical care, and adverse drug reactions.

Table G.5: ICD-9-CM/ICD-9 External Cause of Injury Codes (E-codes)

External Cause of Injury Category	ICD-9-CM/ICD-9 Definition
Motor Vehicle	E810: Motor vehicle traffic accident involving collision with train E811: Motor vehicle traffic accident involving re-entrant collision with another vehicle E812: Other motor vehicle traffic accident involving collision with motor vehicle E813: Motor vehicle traffic accident involving collision with other vehicle E814: Motor vehicle traffic accident involving collision with pedestrian E815: Other motor vehicle traffic accident involving collision on the highway E816: Motor vehicle traffic accident due to loss of control, without collision on the highway E817: Noncollision motor vehicle traffic accident while boarding or alighting E818: Other noncollision motor vehicle traffic accident E819: Motor vehicle traffic accident of unspecified nature E822: Other motor vehicle nontraffic accident involving collision with moving object E823: Other motor vehicle nontraffic accident involving collision with stationary object E824: Other motor vehicle nontraffic accident while boarding and alighting E825: Other motor vehicle nontraffic accident of other and unspecified nature
Other Vehicle	E820: Nontraffic accident involving motor-driven snow vehicle E821: Nontraffic accident involving other off-road motor vehicle E826: Pedal cycle accident E827: Animal-drawn vehicle accident E828: Accident involving animal being ridden E829: Other road vehicle accident E831: Accident to watercraft causing other injury E833: Fall on stairs or ladders in water transport E834: Other fall from one level to another in water transport E835: Other and unspecified fall in water transport E836: Machinery accident in water transport E837: Explosion, fire, or burning in watercraft E838: Other and unspecified water transport accident E840: Accident to powered aircraft at takeoff or landing E841: Accident to powered aircraft, other and unspecified E842: Accident to unpowered aircraft E843: Fall in, on, or from aircraft E844: Other unspecified air transport accidents E845: Accident involving spacecraft E846: Accidents involving powered vehicles used solely within the buildings and premises of industrial or commercial establishment E847: Accidents involving cable cars not running on rails E848: Accidents involving other vehicles, not elsewhere classified
Poisoning	E850: Accidental poisoning by analgesics, antipyretics, and antirheumatics E851: Accidental poisoning by barbiturates E852: Accidental poisoning by other sedatives and hypnotics

Table G.5 Continued

External Cause of Injury Category	ICD-9-CM/ICD-9 Definition
Poisoning (continued)	E853: Accidental poisoning by tranquilizers E854: Accidental poisoning by other psychotropic agents E855: Accidental poisoning by other drugs acting on central and autonomic nervous system E856: Accidental poisoning by antibiotics E857: Accidental poisoning by other anti-infectives E858: Accidental poisoning by other drugs E860: Accidental poisoning by alcohol, not elsewhere classified E861: Accidental poisoning by cleansing and polishing agents, disinfectants, paints, and varnishes E862: Accidental poisoning by petroleum products, other solvents and their vapors, not elsewhere classified E863: Accidental poisoning by agricultural and horticultural chemical and pharmaceutical preparations other than plant food and fertilizers E864: Accidental poisoning by corrosives and caustics, not elsewhere classified E865: Accidental poisoning from poisonous foodstuffs and poisonous plants E866: Accidental poisoning by other and unspecified solid and liquid substances E867: Accidental poisoning by gas distributed by pipeline E868: Accidental poisoning by other utility gas and other carbon monoxide E869: Accidental poisoning by other gases and vapors E980: Poisoning by solid or liquid substance, undetermined whether accidentally or purposely inflicted E981: Poisoning by gases in domestic use, undetermined whether accidentally or purposely inflicted E982: Poisoning by other gases, undetermined whether accidentally or purposely inflicted
Falls	E880: Fall on or from stairs or steps E881: Fall on or from ladders or scaffolding E882: Fall from or out of building or other structure E883: Fall into hole or other opening in surface E884: Other fall from one level to another E885: Fall on same level from slipping, tripping, or stumbling E886.9: Fall on same level from collision, pushing, or showing, by or with other person - Other and unspecified E887: Fracture, cause unspecified E888: Other and unspecified fall
Fire and Flames	E890: Conflagration in private dwelling E891: Conflagration in other and unspecified building or structure E892: Conflagration not in building or structure E893: Accident caused by ignition of clothing E894: Ignition of highly flammable material E895: Accident caused by controlled fire in private dwelling E896: Accident caused by controlled fire in other and unspecified building or structure E897: Accident caused by controlled fire not in building or structure E898: Accident caused by other specified fire and flames E899: Accident caused by unspecified fire
Natural and Environmental Factors	E900: Excessive heat E901: Excessive cold E902: High and low air pressure and changes in air pressure E903: Travel and motion

Table G.5 Continued

External Cause of Injury Category	ICD-9-CM/ICD-9 Definition
Natural and Environmental Factors (continued)	E904: Hunger, thirst, exposure and neglect E905: Venomous animals and plants as the cause of poisoning and toxic reactions E906: Other injury caused by animals E907: Lightning E908: Cataclysmic storms, and floods resulting from storms E909: Cataclysmic earth surface movements and eruptions E928.1: Other and unspecified environmental and accidental causes - Prolonged stay in weightless environment: E928.2: Other and unspecified environmental and accidental causes - Exposure to noise
Drowning	E830: Accident to watercraft causing submersion E832: Other accidental submersion or drowning in water transport accident E910: Accidental drowning and submersion
Suffocation and Choking	E911: Inhalation and ingestion of food causing obstruction of respiratory tract or suffocation E912: Inhalation and ingestion of other object causing obstruction of respiratory tract or suffocation E913: Accidental mechanical suffocation
Sports	E886.0: Fall on same level from collision, pushing, or shoving, by or with other person - in sports E917.0: Striking against or struck accidentally by objects or persons – in sports
Late Effects	E929: Late effects of accidental injury E989: Late effects of injury, undetermined whether accidentally or purposely inflicted
Violence to Self	E950: Suicide and self-inflicted poisoning by solid or liquid substances E951: Suicide and self-inflicted poisoning by gases in domestic use E952: Suicide and self-inflicted poisoning by other gases and vapors E953: Suicide and self-inflicted injury by hanging, strangulation, and suffocation E954: Suicide and self-inflicted injury by submersion [drowning] E955: Suicide and self-inflicted injury by firearms and explosions E956: Suicide and self-inflicted injury by cutting and piercing instrument E957: Suicide and self-inflicted injuries by jumping from high places E958: Suicide and self-inflicted injury by other and unspecified means E959: Late effects of self-inflicted injury
Violence by Others	E960: Fight, brawl, rape E961: Assault by corrosive or caustic substance, except poisoning E962: Assault by poisoning E963: Assault by hanging and strangulation E964: Assault by submersion [drowning] E965: Assault by firearms and explosives E966: Assault by cutting and piercing instrument E967: Child and adult battering and other maltreatment E968: Assault by other and unspecified means E969: Late effects of injury purposely inflicted by other person E970: Injury due to legal intervention by firearms E971: Injury due to legal intervention by explosions E972: Injury due to legal intervention by gas E973: Injury due to legal intervention by blunt object E974: Injury due to legal intervention by cutting and piercing instrument

Table G.5 Continued

External Cause of Injury Category	ICD-9-CM/ICD-9 Definition
Violence by Others (continued)	E975: Injury due to legal intervention by other specified means E976: Injury due to legal intervention by unspecified means E977: Late effects of injuries due to legal intervention E978: Legal execution
Other	E914: Foreign body accidentally entering eye and adnexa E915: Foreign body accidentally entering other orifice E916: Struck accidentally by falling object E917.1: Striking against or struck accidentally by objects or persons - caused by crowd, by collective fear or panic E917.2: Striking against or struck accidentally by objects or persons – in running water E917.9: Striking against or struck accidentally by objects or persons - other E918: Caught accidentally between objects E919: Accidents caused by machinery E920: Accidents caused by cutting and piercing instruments or objects E921: Accident caused by explosion of pressure vessel E922: Accident caused by firearm missile E923: Accident caused by explosive material E924: Accident caused by hot substance or object, caustic or corrosive material, and steam E925: Accident caused by electric current E926: Exposure to radiation E927: Overexertion and strenuous movements E928.0: Other and unspecified environmental and accidental causes - prolonged stay in weightless environment E928.8: Other and unspecified environmental and accidental causes - other E928.9: Other and unspecified environmental and accidental causes - unspecified accident E990: Injury due to war operations by fires and conflagrations E991: Injury due to war operations by bullets and fragments E992: Injury due to war operations by explosion of marine weapons E993: Injury due to war operations by other explosion E994: Injury due to war operations by destruction of aircraft E995: Injury due to war operations by other and unspecified forms of conventional warfare E996: Injury due to war operations by nuclear weapons E997: Injury due to war operations by other forms of unconventional warfare E998: Injury due to war operations but occurring after cessation of hostilities E999: Late effect of injury due to war operations
Undetermined	E983: Hanging, strangulation, or suffocation, undetermined whether accidentally or purposely inflicted E984: Submersion [drowning], undetermined whether accidentally or purposely inflicted E985: Injury by firearms and explosives, undetermined whether accidentally or purposely inflicted E986: Injury by cutting and piercing instruments, undetermined whether accidentally or purposely inflicted E987: Falling from high place, undetermined whether accidentally or purposely inflicted E988: Injury by other and unspecified means, undetermined whether accidentally or purposely inflicted

Fertility Rate *See General Fertility Rate or Total Fertility Rate.*

Fiscal Year (FY) For most businesses, health care institutions included, the fiscal year is defined as starting April 1 and ending the following year at March 31. For example, the 1996/97 fiscal year would be April 1, 1996 to March 31, 1997, inclusive, and may also be denoted as FY 1996.

General Fertility Rate The number of live births in an area during a year per 1000 women of childbearing age for that year, defined as the midyear female population age 15-44 in the same area for the same year.

High Birth Weight Rate The number of live born babies (in calendar years 1994-1998) with a birth weight of more than 4000 grams divided by the total number of live born babies (in calendar years 1994-1998). Thirty liveborn babies with a newborn birth weight value of 9999 grams were excluded from analyses.

Hospitalization Rates The number of hospital discharges in a given year(s) divided by the population as of December 31 of that year(s).

Immunization Rate Proportion of children who, by their first, second, and seventh birthdays, have been fully immunized against diphtheria, pertussis, tetanus, Haemophilus influenzae type b (Hib), measles, mumps, and rubella.

Immunization Schedule By Age The recommended immunization schedule for children under 2 years of age (also shown in Table G.6) includes: (a) Four Diphtheria, tetanus, pertussis (DaPT or DPT) shots. These are given at two, four, six, and 18 months of age. Prior to 1997 the DPT vaccine used whole cell pertussis, and after that, the vaccine used acellular pertussis (DaPT); (b) Four inactivated Polio (IPV) shots. These are given at two, four, six and 18 months of age. Prior to November 1997, oral polio vaccine was given at two, four and 18 months of age; (c) Four *Haemophilus influenzae* type b (Hib) shots. These are given at two, four, six, and 18 months of age; (d) One measles, mumps, and rubella (MMR) shot at 12 months of age. A second dose of MMR is recommended at least one month after the first dose is given, at 5 years; and (e) The hepatitus B (Hep B) vaccine (3 doses) is given to Grade 4 students. References: Manitoba Health personal communication; Canadian Immunization Guide, 5th Edition, 1998; Canadian National Report on Immunization, 1997 (The Journal of the Canadian Paediatric Society, Volume 3 Supplement B, March/April 1998); & Canadian National Report on Immunization, 1996. (Canada Communicable Disease Report, Supplement, Volume 23S4, May 1997).

Table G.6: Manitoba Childhood Immunization Schedule

Age	DaPTP given as "one needle"	HIB	MMR	HBV	Td
2 mo.	x	x			
4 mo.	x	x			
6 mo.	x	x			
12 mo.			x 1.		
18 mo.	x	x			
4-6 years	x		x		
Grade 4				xxx	
14-16 yrs.					x
Every 10 yrs thereafter					x

1. Must be on or after 1st birthday

HBV – hepatitis B vaccine
D or d – diphtheria
aP – acellular pertussis (whooping cough)
T – tetanus
Hib – haemophilus influenzae b
M – measles (red measles)
M – mumps
R – rubella (german measles)
P – inactivated polio

Source: Manitoba Health, Public Health Branch, Communicable Disease Control Unit, October 25, 2000.

Income Level Low income is defined as a household income of less than $20,000 for survey data only. *See Rural Income Quintile and Urban Income Quintile for the income quintile levels.*

Income Quintiles Residents of Manitoba were placed into either urban or rural income quintiles based on their postal codes (municipal codes were not used). The postal codes were sorted into urban and rural, where urban is Winnipeg and Brandon, and rural comprises all other RHAs. Then the postal codes were sorted by average household income value (lowest to highest income), which was assigned based on publicly available census data from 1996 that provided household income at the Enumeration Area level. Next, postal code population values (specific to year 1996) were classified by average income from lowest income to highest income, so that approximately 20% of the population was present in each class. Each class of postal codes formed an income quintile, with the lowest income quintile representing areas with the lowest average income, and the highest income quintile representing areas with the highest average income. Classification by postal codes adds a degree of error in that the postal codes on our data often define where people receive their mail rather than where they live. But this error is minimized by the fact that we are grouping the income values into quintiles. The 1996 census does not include some First Nations reserves, so the average income in those areas may be off. *See Rural Income Quintiles or Urban Income Quintiles for the actual income quintile values used.*

Infant Mortality Rate The number of deaths among infants under one year of age (at December 31) per 1000 live births, for a given period of time (calendar years 1994-1998). Infant mortality is considered a useful indicator of the level of health within a community. *See Table G.7 for descriptions of pie chart categories.*

Injury Hospitalizations Hospitalizations lasting one day or longer that resulted from an injury as indicated by the presence of one of the ICD-9-CM E-Codes listed in Table G.5 on the hospital record. Newborn hospitalizations with E-Codes are excluded, as are brain deaths. Because separations were counted rather than episodes of care, children who were hospitalized in one hospital and then transferred to a different hospital were counted twice. About 5½% of the injury hospitalizations that occurred over the 5-year period involved a transfer.

Injury Mortality Death due to injury, as defined by the presence of one of the ICD-9 E-Codes listed in Table G.5 on the vital statistics record.

Injury Mortality Rates These rates are calculated by dividing the total number of injury deaths in a given year(s) by the population as of December 31 of the same year(s). Injury mortality rates for this report were calculated using four years of data, calendar years 1994 to 1997.

Libraries *See Public Libraries.*

Lone Parent Family Statistics Canada defined a lone parent family as a mother or a father, with no spouse or common-law partner present, living in a dwelling with one or more never married sons and/or daughters, where never married sons and/or daughters are defined as blood, step, or adopted children of any age (note that this does not necessarily fit our definition of children: s*ee Age and Age Groups).*

Low Birth Weight Rate The number of live born babies (in calendar years 1994-1998) with a birth weight of less than 2500 grams divided by the total number of live born babies (in calendar years 1994-1998). Analyses of low birth weight infants included 7 liveborn infants with a newborn birth weight value of less than 100 grams.

Lower Respiratory Tract Infection The diagnosis-based definition for five years of age and older is at least one diagnosis over one year for lower respiratory tract infection (ICD-9-CM=011: Pulmonary tuberculosis, 012: Other respiratory tuberculosis, 466: Acute bronchitis and bronchiolitis, 480: Viral pneumonia, 481: Pneumococcal pneumonia [Streptococcus pneumoniae pneumonia], 482: Other bacterial pneumonia, 483: Pneumonia due to other specified organism, 484: Pneumonia in infectious diseases classified elsewhere, 485: Bronchopneumonia, organism unspecified, 486: Pneumonia, organism unspecified, 487: Influenza, 490: Bronchitis, not specified as acute or chronic, 491: Chronic bronchitis). The definition for age less than five years of age is at least one diagnosis over one year for lower respiratory tract infection, as defined above, or asthma (ICD-9-CM=493: Asthma). Two outcomes are reported: 1) hospitalization for lower respiratory tract infection, and 2) hospitalization or physician visit for lower respiratory tract infection. The diagnoses recorded in the first diagnostic field of the hospitalization abstract was used.

Maternal Length of Stay The average total number of days of care for an inpatient hospitalization associated with a live or stillborn birth (including labour, delivery, and postpartum) per maternal birth record; calculated by subtracting the discharge date from the admission date.

National Longitudinal Survey of Children and Youth *See NLSCY.*

National Population Health Survey *See NPHS.*

Neonatal Birth to 28 days.

Table G.7: Infant Mortality

Causes of Mortality	ICD-9-CM Code	ICD Description
Circulatory System	390-392	Diseases of the circulatory system
Complications of Labour	762	Fetus or newborn affected by complications of placenta, cord, and membranes
	763	Fetus or newborn affected by other complications of labour and delivery
	767	Birth trauma
	768	Intrauterine hypoxia and birth asphyxia
Congenital Anomalies	740-759	Congenital anomalies
Digestive System	520-579	Diseases of the digestive system
	777	Perinatal disorders of digestive system
Endocrine/Metabolic	240-279	Endocrine, nutritional and metabolic diseases, and immunity disorders
	775	Endocrine and metabolic disturbances specific to the fetus and newborn
Fetal Hemorrhage	772	Fetal and neonatal hemorrhage
Ill-defined/Unknown	799	Other ill-defined and unknown causes of morbidity and mortality
Infectious/Parasitic	001-139	Infectious and parasitic diseases
	771	Infections specific to the perinatal period
Injury	800-8699 880-9299 950-9999	Excludes open wound of head, neck, and trunk; effects of foreign body entering through orifice; and burns.
Maternal Conditions/ Complication	760	Fetus or newborn affected by maternal conditions which may be unrelated to present pregnancy
	761	Fetus or newborn affected by maternal complication of pregnancy
Neoplasm	140-239	Neoplasms
Nervous System	320-389	Diseases of the nervous system and sense organs
Respiratory System	460-519	Diseases of the respiratory system
	770	Other respiratory conditions of fetus and newborn
Short Gestation/Low Birth Weight	765	Disorders relating to short gestation and unspecified low birth weight
SIDS	798	Sudden death, cause unknown
Other	280-289	Diseases of the blood and blood-forming organs
	580-629	Diseases of the genitourinary system
	7780	Hydrops fetalis not due to isoimmunization
	7789	Unspecified condition involving the integument and temperature regulation of fetus and newborn
	7795	Drug withdrawal syndrome in newborn
	7796	Termination of pregnancy (fetus)
	7798	Other specified conditions originating in the perinatal period

Newborn Readmission Rate The ratio of infants with a hospital stay taking place more than one day after discharge from the birth hospital stay, to the number of live born infants (born in calendar years 1994-1998) who were discharged from their birth hospital stay alive. We have calculated the rates for the first six weeks following the birth hospital discharge - for the first 2 weeks, 2-4, and 4-6 weeks post-discharge. Infants who were not discharged alive from their birth hospital stay were excluded from this analysis. The readmissions are counted at the birth region of residence. *See Table G.8 for descriptions of pie chart categories.*

Table G.8: Newborn Readmissions

Reason for Readmission	ICD-9-CM Code	ICD Description
Accompanying a sick person	V650	Healthy person accompanying sick person
Congenital Anomalies	740-759	Congenital anomalies
Dehydration/fever/pyrexia	7784 7806	Dehydration fever/pyrexia/hyperthermia/fever Pyrexia of unknown origin
Digestive	520-579 777 787	Diseases of the digestive system Perinatal disorders of digestive system Symptoms involving digestive system
Endocrine/Metabolic	240-279 775	Endocrine, nutritional and metabolic diseases, and immunity disorders Endocrine and metabolic disturbances specific to the fetus and newborn
Feeding Problems	7793 7833	Feeding problems in newborn Feeding difficulties and mismanagement
Genitourinary	580-629	Diseases of the genitourinary system
Infectious/Parasitic	001-139 771 V290	Infectious and parasitic diseases Infections specific to the perinatal period Observation for suspected infectious condition
Injury/Poisoning/Wounds	800-999	Injury and poisoning, wounds, burns, foreign bodies
Jaundice	774	Other perinatal jaundice
Lack of Expected Development	7834	Lack of expected normal physiological development
Nervous System	320-389 781	Diseases of the nervous system and sense organs Symptoms involving nervous and musculoskeletal systems
Require care	V201	Healthy infant or child receiving care
Respiratory	460-519 770 786	Diseases of the respiratory system Other respiratory conditions of fetus and newborn Symptoms involving respiratory system and other chest symptoms
Other	140-239 280-289 390-392 680-709 710-739 772 773 7781 7790 7791 7807 782 784 789 V298 V584 V612 V643 V660 V665 V718 V812	Neoplasms Diseases of the blood and blood-forming organs Diseases of the circulatory system Diseases of the skin and subcutaneous tissue Diseases of the musculoskeletal system and connective tissue Fetal and neonatal hemorrhage Hemolytic disease of fetus or newborn, due to isoimmunization Sclerema neonatorum Convulsions in newborn Unspecified cerebral irritability in newborn Malaise and fatigue Symptoms involving skin and other integumentary tissue Symptoms involving head and neck Other symptoms involving abdomen and pelvis Observation for other specified suspected condition Other aftercare following surgery Parent-child problems (including abuse/neglect) Procedure not carried out Convalescence following surgery Convalescence following other treatment Observation for other specified suspected conditions Special screening for other and unspecified cardiovascular conditions

NLSCY Sample Size 1996 NLSCY Manitoba sample: normalized weights (the numbers used in the analyses, since they are weighted to represent the population distribution and compensate for sampling design), and the actual numbers, given in brackets, are shown in Table G.9. The normalized weight means that a person can sometimes represent more than one individual, or less than one individual, depending upon their age and gender and geographical location.

Table G.9: NLSCY 1996 normalized weights (and actual numbers) by age and gender

AGE	Male normalized weight (actual number)	Female normalized weight (actual number)	Total normalized weight (actual number)
0	51.9 (81)	48.9 (77)	100.8 (158)
1	53.4 (91)	50.3 (79)	103.7 (170)
2	53.5 ((75)	51.1 (70)	104.6 (145)
3	56.9 (78)	51.3 (76)	108.2 (154)
4	51.3 (50)	51.5 (58)	102.8 (108)
5	51.1 (63)	53.7 (44)	104.8 (107)
6	62.3 (38)	52.4 (56)	114.8 (94)
7	59.4 (44)	60.6 (41)	120.0 (85)
8	51.3 (53)	42.8 (26)	94.2 (79)
9	57.5 (30)	52.7 (30)	110.2 (60)
10	51.7 (54)	50.0 (40)	101.7 (94)
11	55.9 (46)	57.6 (37)	113.5 (83)
12	53.7 (32)	46.3 (37)	99.9 (69)
13	53.1 (43)	50.5 (34)	103.5 (77)
14	1.2 (1)	0 (0)	1.2 (0)
TOTAL	764.3 (779)	719.8 (705)	1484 (1484)

Note: for NLSCY 1994, the only data in this report is for 10 and 11 year old females. The normalized weights (and actual numbers) for these two categories are: 10 year old females n = 63.2 (58); 11 year old females n = 80.4 (56).

NLSCY Survey Questions Used in Analyses *See Table G.10.*

Table G.10: NLSCY Survey Questions Used in Analyses

Chapter	Analysis of…	NLSCY Question
3	Prenatal Risk Factors	• How frequently did you consume alcohol during your pregnancy with … ? (E.g. Beer, wine, liquor) • During the pregnancy with … did you suffer from any of the following: Pregnancy diabetes? High blood pressure? Other physical problems? • Compared to other babies in general, would you say that …'s health at birth was: Excellent? Very good? Good? Fair? Poor? • Did you smoke during your pregnancy with …? • From whom did you receive pre-natal care? • During the pregnancy with … did you suffer from any of the following: Pregnancy diabetes?
3	Breastfeeding	• Are/Is you/his/her mother currently breastfeeding … ? • Did you/his/her mother breastfeed him/her even if only for a short time? • For how long?
4	Onset of Menstruation	• Have you begun to menstruate (your monthly periods)?

Table G.10 Continued

Chapter	Analysis of…	NLSCY Question
4	Dating Activity	• How often have you had the following experiences with a boyfriend/girlfriend? (a) Holding hands, (b) Hugging, (c) Kissing, (d) Petting above the waist, (e) Petting below the waist, (f) Sexual intercourse (going all the way) • In the past year (last 12 months), about how many times have you attempted to touch the private parts of another person's body (while knowing that they would probably object to this)?
5	Asthma, cardiovascular and seizure disorders	• Has … ever had asthma that was diagnosed by a health professional? • Does … have any of the following long-term conditions? (03) heart condition or disease, (04) epilepsy
6	Seat Belt Use	• How often do you use a seat belt when you ride in a car?
6	Bicycle Helmet Use	• How often do you wear a helmet when you ride your bicycle?
9	Home Day Cares	• Do you currently use child care such as daycare or babysitting while you (and your spouse/partner) are at work or studying? • Which of the following methods of child care do you currently use while you (and your spouse/partner) are at work or studying? Care provided in someone else's home by a non-relative? Is the person providing this care licensed by the government or approved by a family daycare agency? • Care in someone else's home by a relative? Is the person providing this care licensed by the government or approved by a family daycare agency? • Care in own home by a relative other than a sister or brother of the child? • Care in own home by a non-relative?
9	Sport Participation	• In the past 12 months, outside of school hours, how often has…: Taken part in sports with a coach or instructor (except dance or gymnastics)? • Taken lessons or instruction in other organized physical activities with a coach or instructor such as dance, gymnastics or martial arts? • Taken part in unorganized sports or physical activities without a coach or instructor?
9	Television Watching	*For children 10-11 years old* • On average, about how many hours a day do you watch TV? *For children 12-13 years old* • Outside of school hours, how many days a week do you watch TV or videos? • On average, on the days you watch TV or videos, about how many hours a day do you watch?
9	Parental Depression	• How often have you felt or behaved this way during the past week: I felt depressed.

Non-Winnipeg Includes all RHAs except Winnipeg.
North The RHAs of Burntwood, Norman, and Churchill.
NPHS Sample Size 1996 NPHS Manitoba sample: normalized weights (the numbers used in the analyses, since they are weighted to represent the population distribution and compensate for sampling design), and the actual numbers, given in brackets, are shown in Table G.11. The normalized weight means that a person can sometimes represent more than one individual, or less than one individual, depending upon their age and gender and geographical location.

Table G.11: NPHS 1996 normalized weights (and actual numbers) by age and gender

AGE	Male normalized weight (actual number)	Female normalized weight (actual number)	Total normalized weight (actual number)
0	129.9 (128)	96.4 (115)	226.3 (243)
1	105.6 (129)	105.6 (111)	211.2 (240)
2	99.5 (113)	99.8 (118)	199.3 (231)
3	67.6 (97)	102.4 (99)	170.0 (196)
4	96.3 (104)	82.4 (114)	178.7 (218)
5	134.2 (107)	106.1 (104)	240.2 (211)
6	137.2 (132)	82.0 (98)	219.2 (230)
7	81.1 (112)	110.6 (128)	191.7 (240)
8	105 (118)	123.0 (135)	228.0 (253)
9	120.8 (152)	120.1 (140)	240.9 (292)
10	100.9 (177)	90.7 (155)	191.5 (332)
11	98.4 (160)	86.0 (166)	184.4 (326)
12	138.2 (84)	118.7 (58)	256.9 (142)
13	54.7 (63)	108.6 (71)	163.2 (134)
14	94.1 (52)	98.7 (71)	192.8 (123)
15	150.1 (82)	92.9 (70)	243.0 (152)
16	140.6 (81)	81.6 (63)	222.1 (144)
17	102.4 (77)	76.5 (73)	178.9 (150)
18	94.3 (67)	127.9 (77)	222.1 (144)
19	85.4 (67)	98.0 (76)	183.4 (143)
TOTAL 0-19	2136.1 (2102)	2007.9 (2042)	4144 (4144)

NPHS Survey Questions Used in Analyses *See Table G.12.*

Numerators Numerator values come from administrative data during fiscal years 94/95 – 98/99 or calendar years 1994-1998, for ages 0-19. In some cases, numerators may be a subset of these 5 years. Where numerators were less than 5 cases, rates were not calculated. *See also: Adjusted Rates, Rates and Standardizing.*

Obesity and Risk For Obesity Obesity and risk for obesity for children and adolescents aged 6 to 19 years was defined as the 85th percentile of Body Mass Index (BMI) from the National Health and Nutrition Examination Survey I (NHANES I) (Himes and Dietz, 1994; Must, Dallal, Dietz, 1991; WHO, 1995). BMI was calculated with height in metres and weight in kilograms data from the 1996 National Population Health Survey, using the calculation (kg/m^2). BMI has been shown to provide a reasonable measurement of obesity in children at the population level (Dietz and Bellizzi, 1999; Ellis, Abrams and Wong, 1999). Cut-offs for each gender by age group were taken from Must, Dallal, and Dietz (1991) and are given in Table G.13.

Percent Population 25-44 Years Unemployed Based on the 1996 Census using a 20% sample. Statistics Canada defined unemployed persons as those persons, excluding institutional residents, who, during the week (Sunday to Saturday) prior to Census Day (1996), were without paid work and were available for work and either: (a) had actively looked for work in the past four weeks; or (b) were on temporary lay-off and expected to return to their job; or (c) had definite arrangements to start a new job in four weeks or less.

Percent Population 25-44 Years With No High School Based on the 1996 Census using a 20% sample. According to Statistics Canada this refers to persons, excluding institutional residents, who did not hold a secondary school graduation certificate or its equivalent, regardless of whether or not other educational qualifications were held.

Persons Per Room Based on the 1996 Census using a 20% sample. Statistics Canada defined this as the number of persons per room in a private household dwelling, where room was defined as an enclosed area within a dwelling which is finished and suitable for year-round living. Partially divided L-shaped rooms are considered to be separate rooms if they are considered as such by the respondent (e.g., L-shaped dining-room living-room arrangements). Not counted as rooms are bathrooms, halls, vestibules and rooms used solely for business purposes.

Table G.12: NPHS Survey Questions Used in Analyses

Chapter	Analysis of…	NLSCY Question
4	Sexual activity	• Have you ever had sexual intercourse? • How old were you when you first had sexual intercourse? • In the past 12 months have you had sexual intercourse?
4	Birth Control Pill Use	• In the past month, that is, from <1 month ago> to yesterday, did you take any of the following medications: (if female and age <= 49) … birth control pills?
4	Condom Use	• For that(these) relationship(s) that lasted less than a year, how often did you use a condom in the past 12 months? • Did you use a condom the last time?
5	Asthma, cardiovascular and seizure disorders	*For children <12 years old* • Has … ever had asthma that was diagnosed by a health professional? • Does … have any of the following long-term conditions? (03) heart condition or disease, (04) epilepsy *For children 12 years and older* • Does … have asthma? • Does … have heart disease, high blood pressure or effects of stroke? • Does … have epilepsy?
6	Injuries to Body Parts	• In the past 12 months, that is, from <12 months ago> to yesterday, was … injured? • What part of your/his/her body was injured?
6	Activity-Limiting Injury	• In the past 12 months, did … have any injuries that were serious enough to limit your/his/her normal activities?
7	Nurse Practitioners	• In the past 12 months, how many times have/has you/… seen or talked on the telephone with a nurse for care or advice about your/his/her physical, emotional, or mental health?
9	Obese/Risk for Obesity	• How tall are/is you/… without shoes on? • How much do/does you/… weigh?
9	Second-hand Smoke	• Does anyone in this household smoke regularly inside the house?

Table G.13: 85th Percentiles of BMI from NHANES I, Ages 6 to 19 Years

Age	Male	Female
6	16.64	16.17
7	17.37	17.17
8	18.11	18.18
9	18.85	19.19
10	19.60	20.19
11	20.35	21.18
12	21.12	22.17
13	21.93	23.08
14	22.77	23.88
15	23.63	24.29
16	24.45	24.74
17	25.28	25.23
18	25.92	25.56
19	26.36	25.85

Physician Visits Any contact between a patient and physician at one of the following locations: physician's office, outpatient or emergency department, clinic, Personal Care Home, the patient's home, or northern / remote nursing station. Unless specified, physician visits include consultative and non-consultative care. Contact with patients who are in hospital and for salaried physicians are not included.

Population by RHA *See Table G.14.*
Population by WCA *See Table G.15.*
Post-Neonatal 29 days to age 1 year.
Premature Birth Rate The ratio of live born babies born in a Manitoba hospital with a Manitoba postal code or municipality code with a gestation of less than 37 weeks to the number of live born babies born in a Manitoba hospital with a Manitoba postal code or municipality code.
Premature Mortality Rate (PMR) The number of deaths of people aged 0-74 years, divided by the number of residents between 0 and 74 in the area. The values are standardized to account for age/sex differences in populations. This is considered the best single measure to reflect the healthiness of a group of people, and their need for health care services (Carstairs and Morris, 1991; Eyles et al., 1991; Eyles and Birch, 1993). All graphs in this deliverable are ordered according to the PMR we calculated, from lowest PMR (healthiest) on the top of the y-axis, to the highest PMR (least healthy) on the bottom of the y-axis list. When we correlated the PMR to all other indicators, we did the following: We took all 11 Non-Winnipeg RHAs and the 12 Winnipeg Community Areas data, to yield 23 data points (of PMR and the specific indicator to be correlated). We then ran a Spearman's correlation test, since the data breached the assumption of normality. Spearman's correlation tested to see if the rank ordering of PMR and the health indicator showed a pattern. A correlation coefficient "r" can take the values of -1 to 0 to +1; 0 means no correlation, -1 means a perfect negative correlation and +1 a perfect positive correlation. For example, a correlation of 0.6 means that as PMR increases, so does the health indicator value, and this straight line relationship would explain (0.6)(0.6) or .36, i.e., 36% of the variation.
Proportion of Visits to Usual Provider (Continuity of Care) Proportion of visits to most frequently seen physician during the year.
Public Libraries Information from the Manitoba Library Association list of Public Libraries in Manitoba (http://www.mla.mb.ca/public.html) was used to obtain the number of library books per region. For libraries without book collection numbers on the web site, the main branch libraries or individual libraries were contacted. Libraries were classified into RHAs and WCAs by postal code.
Rates and Standardizing Rates were standardized for age and gender using the direct method of standardization. For most of the analyses in this report, the age groups used for standardization were: 0, 1-4, 5-9, 10-14, and 15-19 years. One-year rates were based on data from the 98/99 fiscal year, three-year rates were based on data from the 96/97 – 98/99 fiscal years and five-year rates were based on data from the 94/95 – 98/99 fiscal years. The 1996 population structure (December) was the population to which rates were standardized. When numerators were less than 5 cases, rates were suppressed due to instability. *See also: Adjusted Rates, Numerators.*
Readmission Rate (Newborn) *See Newborn Readmission Rate.*
Regional Health Authorities (RHAs) The province of Manitoba is divided into 12 Regional Health Authorities, in which 2 of the RHAs are cities (Brandon and Winnipeg). See map in Chapter 1. *See also: Winnipeg Regional Health Authority.*
Rural For this deliverable, rural is defined as all RHAs excluding Winnipeg and Brandon, classified by postal code.
Rural Income Quintiles The income values for each of the five rural income quintiles are: 1: $14,858.00 to $32,159.14 (mean = $27,374.73); 2: $32,184.95 to $36,428.00 (mean = $34,730.72); 3: $36,428.00 to $40,628.71 (mean = $38,911.73); 4: $40,650.32 to $47,882.37 (mean = $44,840.67); and 5: $47,889.01 to $90,712.00 (mean = $61,172.17). *See Income Quintiles for further description of both urban and rural income quintiles.*
Seizure Disorders A seizure disorder is defined on the basis of a diagnosis or prescription drug for the condition. The diagnosis-based definition is at least one hospitalization or physician visit over one year for seizure disorder (ICD=345: Epilepsy). The prescription-based definition is at least one prescription over one year for an anti-convulsant (Anatomic Therapeutic Chemical classification system for drugs =N03 *OR generic name* = phenobarbital, primidone, clobazam, clonazepam, divalproex, valproic acid, gabapentin, vigabatrin, fosphenytoin, phenytoin, carbamazepine, ethosuximide, methsuximide, lamotrigine, topiramate *OR trade name* = mysoline, apo-primidone, frisium, novo-clobazam, rivotril, clonazepam, alti-clonazepam, apo-clonazepam, gen-clonazepam, nu-clonazepam, pms-clonazepam, rho-clonazepam, epival, depakene, deproic, gen-valproic, novo-valproic, neurontin, pms-valproic acid, sabril, cerebyx, phenytoin, dilantin, tegretol, apo-carbamazepine, novo-carbamazepine, nu-carbamazapine, taro-carbamazepine, zarontin, celontin, lamictal, topamax).
Single Parent Family *See Lone Parent Family.*

Table G.14: Percentages and Actual Numbers by Gender, for Age Classifications, in RHAs for the Year 1998.

	0-4		5-9		10-14		15-19		20+	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
South Eastman	3.80%	3.67%	4.34%	4.24%	4.41%	4.10%	4.51%	3.96%	33.76%	33.20%
Central	3.96%	3.64%	4.29%	4.04%	4.32%	4.11%	4.26%	3.95%	33.27%	34.16%
Brandon	3.16%	3.27%	3.66%	3.53%	3.79%	3.66%	3.51%	3.47%	33.52%	38.43%
South Westman	3.03%	2.80%	3.56%	3.36%	3.85%	3.71%	3.87%	3.58%	35.35%	36.90%
Winnipeg	3.23%	3.07%	3.47%	3.30%	3.31%	3.17%	3.20%	3.09%	35.37%	38.80%
Marquette	2.95%	2.85%	3.37%	3.29%	3.71%	3.56%	3.95%	3.55%	35.89%	36.88%
North Eastman	3.54%	3.44%	4.17%	3.97%	4.09%	3.93%	4.00%	3.79%	35.36%	33.70%
Interlake	3.20%	3.06%	3.86%	3.58%	4.07%	3.62%	3.76%	3.48%	35.80%	35.57%
Parkland	3.23%	2.99%	3.71%	3.40%	3.89%	3.58%	3.87%	3.62%	35.44%	36.27%
Burntwood	6.23%	5.97%	6.08%	6.11%	5.38%	4.98%	4.62%	4.40%	29.01%	27.23%
Norman	4.58%	4.51%	4.86%	4.54%	4.32%	4.27%	4.44%	3.92%	32.76%	31.81%
Churchill	5.18%	4.81%	4.52%	4.52%	4.15%	3.11%	3.30%	3.39%	35.91%	31.10%
Manitoba	3.46%	3.30%	3.78%	3.60%	3.70%	3.51%	3.58%	3.39%	34.78%	36.92%

	0-4		5-9		10-14		15-19		20+		Total Population
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
South Eastman	2010	1940	2295	2240	2331	2170	2387	2094	17849	17555	52871
Central	3865	3549	4183	3940	4214	4006	4149	3846	32430	33302	97484
Brandon	1490	1540	1723	1664	1788	1725	1655	1636	15799	18110	47130
South Westman	1056	976	1242	1171	1341	1293	1349	1249	12326	12865	34868
Winnipeg	21041	19998	22572	21466	21540	20612	20804	20085	230210	252537	650865
Marquette	1115	1079	1277	1245	1403	1349	1495	1344	13580	13955	37842
North Eastman	1379	1337	1622	1545	1593	1529	1557	1474	13758	13113	38907
Interlake	2392	2293	2886	2677	3042	2709	2813	2607	26785	26613	74817
Parkland	1411	1307	1620	1487	1697	1563	1692	1579	15477	15840	43673
Burntwood	2812	2695	2744	2759	2430	2250	2085	1988	13097	12293	45153
Norman	1170	1152	1243	1161	1104	1092	1134	1002	8376	8132	25566
Churchill	55	51	48	48	44	33	35	36	381	330	1061
Manitoba	39796	37917	43455	41403	42527	40331	41155	38940	400068	424645	1150237

Table G.15: Percentages and Actual Numbers by Gender, for Age Classifications, in Winnipeg Community Areas for the Year 1998.

	0-4		5-9		10-14		15-19		20+	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Fort Garry	3.21%	3.02%	3.57%	3.51%	3.50%	3.39%	3.47%	3.28%	34.93%	38.12%
Assiniboine South	2.63%	2.60%	3.56%	3.54%	3.90%	3.81%	3.85%	3.46%	33.93%	38.73%
St. Vital	3.35%	3.17%	3.79%	3.39%	3.51%	3.36%	3.17%	3.13%	34.15%	38.98%
St. Boniface	2.97%	3.06%	3.29%	3.21%	3.08%	2.87%	3.23%	3.06%	35.95%	39.29%
River Heights	2.66%	2.62%	2.61%	2.47%	2.41%	2.36%	2.36%	2.33%	36.34%	43.83%
Seven Oaks	3.01%	2.94%	3.33%	3.18%	3.39%	3.26%	3.33%	3.44%	34.86%	39.27%
St. James-Assiniboia	2.86%	2.75%	3.01%	2.84%	2.80%	2.63%	2.86%	2.72%	36.14%	41.39%
River East	3.14%	3.02%	3.45%	3.33%	3.42%	3.25%	3.51%	3.29%	34.86%	38.73%
Transcona	3.50%	3.19%	3.99%	3.60%	3.82%	3.62%	3.50%	3.32%	35.07%	36.39%
Inkster	4.22%	3.57%	4.34%	3.96%	4.18%	4.03%	3.89%	3.74%	33.23%	34.84%
Downtown	3.63%	3.36%	3.40%	3.33%	3.03%	2.89%	2.76%	2.73%	37.78%	37.08%
Point Douglas	4.09%	3.86%	4.10%	3.85%	3.52%	3.38%	3.00%	3.00%	35.35%	35.86%
Winnipeg	3.23%	3.07%	3.47%	3.30%	3.31%	3.17%	3.20%	3.09%	35.37%	38.80%

	0-4		5-9		10-14		15-19		20+		Total Population
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Fort Garry	1967	1852	2190	2149	2144	2076	2124	2012	21396	23352	61262
Assiniboine South	958	947	1299	1289	1421	1388	1405	1262	12369	14118	36456
St. Vital	2043	1930	2308	2063	2135	2049	1930	1908	20799	23739	60904
St. Boniface	1374	1414	1518	1483	1422	1324	1494	1413	16606	18149	46197
River Heights	1514	1495	1486	1408	1374	1347	1342	1327	20700	24968	56961
Seven Oaks	1731	1687	1911	1825	1948	1874	1913	1979	20036	22567	57471
St. James-Assiniboia	1727	1659	1820	1717	1690	1588	1725	1641	21826	24998	60391
River East	2861	2751	3142	3032	3119	2960	3197	3001	31756	35285	91104
Transcona	1185	1080	1349	1216	1293	1223	1182	1122	11859	12307	33816
Inkster	1318	1113	1353	1237	1303	1259	1213	1168	10370	10873	31207
Downtown	2707	2506	2536	2485	2262	2152	2061	2037	28167	27647	74560
Point Douglas	1656	1563	1660	1561	1428	1371	1216	1214	14323	14529	40521
Winnipeg	21041	19997	22572	21465	21539	20611	20802	20084	230207	252532	650850*

* Winnipeg Community Areas are based on postal definitions. Rural Health Authorities are based on geographical boundaries. Therefore, there is slight discrepancies between the Winnipeg Regional Health Authority total and the sum total of the Winnipeg Community Areas.

Socioeconomic Factor Index (SEFI) A score that reflects the non-medical determinants of health, such as age, single parent status, female labour force participation, unemployment, and education. The lower the SEFI score, the more favourable the socio-economic conditions.

South Rural The RHAs of Central, Interlake, Marquette, North Eastman, Parkland, South Eastman, and South Westman (excludes Winnipeg, Brandon, and the RHAs in the north).

Statistical Testing of Rates We have implemented a Bonferroni correction factor using 99% confidence intervals when testing for statistical significance between rates. The Bonferroni is a statistical method that adjusts the significance level when multiple comparisons are made.

Teen Pregnancy Rate The ratio of pregnancies in teenagers aged 15-19 in a given period (including live births, stillbirths, abortions, and ectopic pregnancies), to the total female population ages 15-19 at mid-period.

Tonsillectomy and Adenoidectomy The ICD-9-CM procedure codes used to identify children undergoing these procedures were: 282-282.9: Tonsillectomy without adenoidectomy; 283-283.9: Tonsillectomy with adenoidectomy; and 286-286.9: Adenoidectomy without tonsillectomy. Rates for tonsillectomy/adenoidectomy in this report are not directly comparable to those found in the report "Comparative Indicators of Population Health and Health Care Use for Manitoba's Regional Health Authorities" (Black et al., 1999) because of different ages included. The current report included all children aged 0 to 19 years, whereas the Black et al. (1999) report included only those children aged 0 to 14 years.

Total Fertility Rate The number of children who would be born to an average woman who experiences each of the age-specific fertility rates of a population in a given year as she progresses through her reproductive lifetime.

Treaty First Nations Children First Nations is a term that came into common usage in the 1970's to replace the word "Indian". Although the term First Nation is widely used, no legal definition of it exists. Among its uses, the term "First Nations peoples" refers to the group of Aboriginal persons called Indians, both Status and Non-Status. Terms of the 1876 Indian Act designated "Status" (or Treaty, or registered) and "Non-Status" Indians in legal terms. All Status or Treaty Indians receive entitlements of land, voting rights, and Band membership. In this report, we use the term "Treaty First Nations" to refer to a Status Indian, and "First Nations community" to refer to the separate tracts of land often called "reserves". In our current MCHPE database only 68,000 Treaty First Nations people are identified, estimated to be roughly 2/3 of all Treaty First Nations people in Manitoba.

Trend Test The Cochran-Armitage trend test was used.

Type I Diabetes Mellitus The diagnosis-based definition is at least three physician claims for diabetes diagnoses (ICD-9-CM=250: Diabetes mellitus) over 2 years (1996-1998), excluding Treaty First Nations children.

Urban For this deliverable, urban is defined as Winnipeg and Brandon, classified by postal code.

Urban Income Quintiles The income values for each of the five urban income quintiles are: 1: $10,577.00 to $31,207.00 (mean = $24,645.67); 2: $31,207.00 to $39,848.00 (mean = $35,901.62); 3: $39,848.00 to $49,817.00 (mean = $44,504.82); 4: $49,817.00 to $62,231.00 (mean = $55,765.34); and 5: $62,231.00 to $170,386.00 (mean = $79,667.02). *See Income Quintiles for further description of both urban and rural income quintiles.*

Vaginal Birth After Caesarean Section (VBAC) Rate The ratio of women who had previously received a Caesarean Section who gave birth via a vaginal delivery, to the number of women who had two pregnancies where the first was a C-section during fiscal years 1994/95-1998/99.

Winnipeg Community Areas (WCAs) The 12 planning districts within the Winnipeg RHA, which have similar populations to the rural and northern RHAs. See map in Chapter 1.

Winnipeg Regional Health Authority (WRHA) The Winnipeg Regional Health Authority is one of the RHAs. Since it comprises about half the population of Manitoba, the WRHA has created 12 planning districts called the Winnipeg Community Areas. *See Winnipeg Community Areas.*

Years. Most analyses cover fiscal years 94/95 to 98/99. In some cases, calendar years 1994-1998 have been used.