PERINATAL SERVICES AND OUTCOMES IN MANITOBA

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Manitoba Centre for Health Policy
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About the Manitoba Centre For Health Policy

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

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

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

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Acronyms

ACOG	American College of Obstetricians and Gynecologists
AGA	Appropriate–for–Gestational–Age
aORs	Adjusted Odds Ratios
ART	Assisted Reproductive Technologies
BMI	Body Mass Index
CCI	Canadian Classification of Health Information
CIHI	Canadian Institute for Health Information
CPNP	Canadian Prenatal Nutrition Program
DPIN	Drug Program Information Network
EDI	Early Development Instrument
FASD	Fetal Alcohol Spectrum Disorders
HCCC	Healthy Child Committee of Cabinet
HIE	Hypoxic Ischemic Encephalopathy
ICD–9–CM	International Classification of Diseases, 9th Revision with Clinical Modifications
ICD–10–CA	International Classification of Diseases, 10th Revision with Canadian Enhancements
IPI	Interpregnancy Interval
IUGR	Intrauterine Growth Restriction
IVF	in vitro Fertilization
IVH	Intraventricular Hemorrhage
LGA	Large–for–Gestational–Age
LOS	Length–of–Stay
MACHS	Maternal and Child Health Services
MCHP	Manitoba Centre for Health Policy
NAS	Neonatal Abstinence Syndrome
NLSCY	National Longitudinal Survey of Children and Youth
NICU	Neonatal Intensive Care Unit
OR	Odds Ratio
PCOS	Polycystic Ovary Syndrome
PHAC	Public Health Agency of Canada
PHIN	Personal Health Information Number
PNC	Prenatal Care
PMR	Premature Mortality Rate
PPD	Postpartum Depression
PRAMS	Pregnancy Risk Assessment Monitoring System
PVL	Periventricular Leukomalacia
R–GINDEX	Revised–Graduated Prenatal Care Utilization Index
RDS	Respiratory Distress Syndrome
RHA	Regional Health Authority
RR	Relative Risk
SAMIN	Social Assistance Management Information Network
SCU	Special Care Unit
SGA	Small–for–Gestational–Age

SIDS	Sudden Infant Death Syndrome
SOGC	Society of Obstetricians and Gynaecologists of Canada
VBAC	Vaginal Birth After Cesarean
Winnipeg CA	Winnipeg Community Areas

Executive Summary

Introduction

This report was undertaken by the Manitoba Centre for Health Policy (MCHP) as a "deliverable" for Manitoba Health. This report expands on the descriptive analyses done by the Ministerial Working Group on Maternal/Newborn Services in 2005 and provides information to support the current work of the Maternal and Child Health Services (MACHS) Taskforce and the ongoing focus of the Healthy Child Committee of Cabinet (HCCC) on maternal health and early childhood development.

The specific objectives of this report were:

- To describe the sociodemographic characteristics of women giving birth in Manitoba
- To describe health service use by pregnant and postpartum women and their newborns and identify inequities in access to care and utilization of healthcare services
- To provide comprehensive up–to–date information on maternal health status indicators at provincial, regional, and sub–regional levels in Manitoba
- To provide comprehensive up–to–date information on newborn health status indicators at provincial, regional, and sub–regional levels in Manitoba
- To examine determinants of maternal and newborn health, including social conditions, health behaviours and risk factors, and healthcare utilization
- To examine disparities in health outcomes across a variety of factors, including socioeconomic status, region of residence, and age

Methods

This report focused on all births to Manitoba women from 2001/02 to 2008/09. Over 45 indicators of maternal and newborn health and health service use were analyzed in five main areas: a profile of women giving birth in Manitoba, maternal prenatal health, giving birth, maternal postpartum health, and fetal/newborn health. In addition to providing updated information on several indicators contained in other deliverables prepared by MCHP, we also analyzed several new indicators of maternal and newborn health, including delayed childbearing, short interpregnancy interval, use of infertility drugs prior to a live birth, travelling to give birth, antepartum hospitalization, maternal prenatal and postnatal psychological distress, healthcare provider for delivery (hospital or home birth), induction of labour, vaginal births with epidural anesthesia, breech births, vaginal breech births, severe maternal morbidity, maternal postpartum readmission to hospital, multiple births, postterm births, severe neonatal morbidity, and newborn special care unit (SCU) admission.

The indicators in this report were calculated using data that come from a collection of administrative datasets housed at the Manitoba Centre for Health Policy called the Manitoba Population Health Research Data Repository (Repository). The Repository contains only anonymized information, which is linkable across files. This information allowed us to use a population–based approach, meaning that the rates shown for the indicators are based upon virtually every woman giving birth to a live born or stillborn infant in Manitoba from 2001/02 to 2008/09. The availability of a new dataset based on the Midwifery Discharge Summary Reports enabled us to capture all births, including those occurring at home, and to report data on midwifery providers. The rates presented in this report reflect where women and their newborns live, not where they received services. For example, a pregnant woman living in a remote area in northern Manitoba may give birth in a hospital in Winnipeg, but the

hospitalization is attributed back to the rate for the remote area. Thus, the results offer insight into the complete health and healthcare use patterns of the maternal and newborn population living in the area, no matter where they receive their care.

In order to assist policy makers and planners at the regional level, the report provides information broken down by the 11 Manitoba Regional Health Authorities[1] (RHAs) and by the 12 Winnipeg Community Areas (CAs). Where data allow, a time trend analysis is presented for each indicator using four geographic areas (Winnipeg, Brandon, North, and Rural South) and Manitoba overall. The rates for the majority of indicators are also displayed according to a variety of sociodemographic, medical/obstetric, and other factors in order to demonstrate the association between these factors and the maternal or newborn health outcome or health service use indicator. Multivariable logistic regression models were developed for five selected indicators: cesarean birth, preterm birth, infant death, and maternal prenatal and postpartum psychological distress.

Findings

With over 45 indicators examined, it is beyond the scope of the executive summary to provide details on all the findings; however, some key results will be presented. Unless otherwise noted, rates are presented for the last two years of data examined (i.e., 2007/08–2008/09).

Overview of Pregnancies and Births in Manitoba

The number of pregnancies per year ranged from 18,008 in 2001/02 to 18,977 in 2008/09. Between 21–25% of pregnancies ended in a pregnancy loss each year. The number of live births steadily increased from 13,690 in 2001/02 to 15,183 in 2008/09. The number of stillbirths fluctuated between a low of 75 in 2007/08 and a high of 104 in 2008/09.

Profile of Women Giving Birth in Manitoba

Over nine percent (9.1%) of live births were to teen mothers (aged 19 and younger), while 13.3% were to mothers aged 35 and older. Despite the growing trend of delayed childbearing, only 2.9% of live births were to women aged 35 and older giving birth for the first time. Almost two out of five live births (37.9%) were to primiparas (i.e., a woman who has given birth once at 20 weeks gestation or later). Based on data from the Families First Screen, 18.9% of women with live births had less than a Grade 12 education, 11.2% were lone parents, and 4.8% were assessed as being socially isolated. A significant proportion of women giving birth were of low income: 14.0% received income assistance, while 28.9% (2006/07–2007/08) received the Healthy Baby Prenatal Benefit (available to women whose annual net family income is less than $32,000). About 14% of women participated in a Healthy Baby Community Support Program (2006/07 to 2007/08).

New and Noteworthy

Rates were reported for several new indicators in this report. In Manitoba, 7.5% of women having a live birth had prenatal psychological distress (depression and/or anxiety), whereas 13.8% had postpartum psychological distress. In the logistic regression model, the main predictor of postpartum psychological distress was prenatal psychological distress, suggesting that prenatal assessment and intervention may help reduce rates of postpartum distress. Although rates of infertility in the population cannot be calculated from administrative data due to lack of information on assisted reproductive technologies

1 During the production of this report, the RHAs were amalgamated into five larger regions, which do not correspond to the aggregate regions in this report. However, the five new RHAs are all "aggregates" of the 11 former RHAs (South Eastman + Central = Southern Health; Assiniboine + Parkland + Brandon = Prairie Mountain Health; Interlake + North Eastman = Interlake/Eastern; Burntwood + NOR–MAN = Northern RHA; Winnipeg + Churchill = Winnipeg RHA)

(ART), we analyzed use of infertility drugs and found that 2.0% of women having a live birth had used an infertility drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth. Use of infertility drugs was associated with a higher rate of multiple births: 1.9% of women who had a singleton birth used an infertility drug compared to 11.7% of women who had a multiple birth. We also found that a significant proportion of Manitoba women travel to give birth. Excluding Winnipeg residents, about half (46.8%) of women travelled outside their RHA to give birth and a quarter of women (25.2%) travelled more than 113.8 km to give birth, "as the crow flies." Pregnancies with a short interpregnancy interval (defined as less than 12 months between the last delivery and conception of the current pregnancy) are at higher risk for adverse birth outcomes. Although overall only 2.2% of multiparous women giving birth had a short interpregnancy interval, the rate was much higher (10.4%) in teen multiparous women (aged 19 and younger).

Trends Over Time

Refer to Table E.1 for a summary of trends over time for each of the indicators.

For a number of the indicators studied, provincial rates changed significantly over time. There were concerning trends in rates of some health behaviors. For example, the rate of self–reported alcohol consumption during pregnancy increased significantly from 11.9% in 2003/04 to 13.0% in 2008/09. The rate of breastfeeding initiation showed a slight but significant decrease over time from 80.9% in 2001/02 to 79.2% in 2008/09. The Manitoba rate of breastfeeding initiation was 79.0% in 2007/09–2008/09, with the lowest rates found in North Eastman (68.9%), Parkland (64.8%), NOR–MAN (63.9%), and Burntwood (52.2%) RHAs.

There were noteworthy trends in both rates of hospital admissions and in utilization of healthcare services. The rate of antenatal hospitalization (hospitalization during pregnancy) declined over time with rates ranging from a high of 15.2 in 2004/05 to a low of 11.0 hospitalizations per 100 deliveries in 2008/09. The Winnipeg rate of 8.0 antenatal hospitalizations per 100 deliveries was significantly lower than the Manitoba rate of 11.4 per 100 deliveries in 2007/08–2008/09. Similarly, the rate of neonatal hospital readmission (readmission of newborns within 28 days of birth) decreased over time with rates ranging from 5.6% in 2001/02 to 1.7% in 2008/09. The Manitoba rate of neonatal readmission in 2003/04–2008/09 hovered around 2.0%. The main reasons for hospital admission were jaundice, respiratory problems, congenital anomalies, and infection. One concerning trend was that the rate of late initiation of prenatal care (after the first trimester) increased over time, with rates ranging from 22.9% in 2001/02 to 26.2% in 2008/09. Over a quarter of women (26.3%) initiated care after the first trimester in 2007/08–2008/09. The rate of inadequate prenatal care also increased significantly over time, ranging from a low of 10.3% in 2002/03 to a high of 12.5% in 2008/09.

There were also trends in the provider of care. There was a decline in the proportion of women receiving either prenatal care or delivery care from a general practitioner or family physician and an increase in the proportion of women receiving care from an obstetrician or a midwife. The majority of women in Manitoba received delivery care from an obstetrician, with the rate increasing over time from 68.0% in 2001/02 to 73.74 in 2007/08. Following implementation of midwifery in June 2000, the proportion of women receiving two–thirds or more of their prenatal care from a midwife increased significantly from 2.4% in 2001/02 to 4.7% in 2008/09. The proportion of women having a midwife as the provider of delivery care also increased significantly over time from 2.5% in 2001/02 to 4.7% in 2008/09. In 2008/09, 3.9% of total births having a midwife as the provider occurred in a hospital, while 0.8% took place in a

home setting. Although the number of practicing midwives has increased over time, from 22 in 2001 to 40 in 2009, the distribution of midwives has varied across RHAs. Over half of the practicing midwives work in Winnipeg, a few RHAs have none, and other RHAs have between one and six practicing midwives (Tables 3.7.1 or 4.2.1)

Regional and/or Socioeconomic Variations

Refer to Tables E.2 to E.4 for a summary of regional and socioeconomic variations for the various indicators.

There was a fairly consistent relationship between area–level socioeconomic status and maternal/newborn outcomes, with higher rates of poor outcomes observed with decreasing socioeconomic status. Women receiving income assistance also had higher rates of poor outcomes. For example, births to teen mothers were significantly higher among those living in lower income areas (i.e., area level measure) and those receiving income assistance (i.e., individual level measure). These associations between lower socioeconomic status and poorer outcomes were found for a variety of indicators including health behaviors (e.g., higher rates of smoking during pregnancy, lower rates of breastfeeding initiation, higher rates of having a short interpregnancy interval), hospitalizations (e.g., higher rates of antenatal hospitalization, maternal postpartum hospital readmission, neonatal hospital readmission), use of preventive healthcare services (e.g., lower rates of prenatal care), and health outcomes (e.g., higher rates of preterm birth).

Regional variations were also found for many of these same indicators, with northern regions of the province and inner–city areas of Winnipeg having higher rates of poor outcomes. For example, the Manitoba rate of inadequate prenatal care was 12.3% in 2007/08–2008/09, while the Winnipeg rate was lower at 7.7%. Regional variations were evident with NOR–MAN (41.0%) and Burntwood (34.9%) having significantly higher rates than the Manitoba rate. In addition, Inkster (10.8%), Downtown (14.8%), and Point Douglas (19.1%) had rates that were significantly higher than the Winnipeg rate. Rates of inadequate prenatal care were higher in younger women (aged 24 and younger); those living in lower income quintile areas, on income assistance, and having less than a Grade 12 education; and those who were a lone parent, socially isolated, or multiparous. This pattern of associations was found for many of the indicators listed above.

Comparisons to National Data

Refer to Table E.5 for a summary of how the Manitoba rates for indicators in this report compared to national rates (where data were available).

For some indicators, the rates in Manitoba were lower (i.e., better) than the national rates, particularly for obstetric interventions. Manitoba had a lower rate of assisted vaginal births (by forceps or vacuum extraction) of 8.8% (2007/08–2008/09) compared to the Canadian rate of 14.8% (2004–2005). Manitoba's cesarean birth rate of 19.8% (2007/08–2008/09) remains much lower than the Canadian rate of 28.0% (2008/09). This lower rate may be related to a relatively high rate of vaginal birth after cesarean (VBAC) (30.5%) and more liberal access to vaginal breech deliveries. The proportion of breech births that were delivered vaginally increased significantly over time from a low of 9.6% in 2005/06 to a high of 19.3% in 2008/09. In the multivariable logistic regression model, significant independent predictors of cesarean birth were maternal age of 30 and older, living outside of Winnipeg, having diabetes, hypertension, antepartum hemorrhage, multiple birth, a breech or other malpresentation, fetal distress, an infant weighing more than 4500 grams, and a previous cesarean birth or being a primipara, after adjusting for other factors in the model. Preterm, early term, and postterm gestations were all at increased risk

of cesarean birth compared to term gestation. Induction of labour was associated with a reduced risk of cesarean birth (Odds Ratio 0.91; 95% Confidence Interval 0.82–0.997, p=0.043). Income quintile and marital status were not significant predictors of cesarean birth. Therefore, the rate of cesarean birth appears to be driven by medical and obstetric indications rather than by socioeconomic status, in contrast to several other indicators.

For some indicators, the Manitoba rate was comparable to the national rate. For example, the rate of preterm birth in Manitoba (7.8%) was very similar to the Canadian rate (7.9%). The Manitoba rate of multiple births remained stable over time, ranging from 2.4% to 3.0%, and was similar to the Canadian rate which ranged between 2.9% and 3.1%.

For other indicators, the Manitoba rate was higher (i.e., worse) than the national rate. The rate of large–for–gestational age births in Manitoba (15.0%) was considerably higher than the Canadian rate of 11.1% and may be related to high rates of maternal diabetes in Manitoba. Manitoba's rate of live births to teen mothers (9.1% in 2007/08–2008/09) was substantially higher than the rate for Canada (4.8% in 2004). Our rates of maternal postpartum hospital readmission of 4.9% for women with a cesarean birth and 2.5% for women who had a vaginal birth (2007/08–2008/09) were also higher than the Canadian rates of 3.1% and 1.8% respectively in 2004/05. Although the rate of smoking during pregnancy showed a significant decline over time, the Manitoba rate of 18.1% (2007/08–2008/09) remained higher than the national average of 13.4% (2005).

Finally, the infant mortality rate is considered to be one of the most important indicators of the health of a population. The Manitoba neonatal mortality rate of 3.2 per 1,000 (2001/02–2008/09) for infants born 500 or more grams was higher than the Canadian neonatal mortality rate of 2.5 per 1,000 in 2003 and 2.7 in 2005. The Manitoba postneonatal mortality rate of 2.0 deaths per 1,000 (2001/02–2008/09) for infants born 500 or more grams was higher than the Canadian postneonatal mortality rate of 1.3 per 1,000 in 2003 and 1.3 in 2005. The Manitoba rate of 4.7 infant deaths 500 or more grams per 1,000 live births (2001/02–2008/09) was higher than the Canadian rate, which ranged from 3.7 in 2003 to 3.8 in 2004 to 4.0 in 2005. In the multivariable logistic regression model, maternal factors associated with infant mortality included being from the North and having antepartum hemorrhage. Infant characteristics associated with infant mortality were a stay in the Special Care Unit, low birth weight or preterm birth, and a five–minute Apgar score of 7 or less. Protective factors included maternal age (with each increase in age associated with a decrease in infant mortality) and breastfeeding initiation. Area–level income (income quintiles), infant sex, multiple births, and inadequate prenatal care were not significant predictors of infant mortality, once all other factors were adjusted for in the model.

Recommendations

A number of recommendations arise from this report:

1. Establish a mechanism for regular and ongoing surveillance of maternal and newborn health indicators in Manitoba.

Although this report provides valuable information on a number of maternal and newborn health indicators, it is time consuming to produce such an extensive report and the results are not as timely as would be optimal. There is a need for regular and ongoing surveillance of maternal and newborn health indicators in Manitoba, preferably on an annual or biennial basis, presenting data up to and including the most recent fiscal year. Regular surveillance reports would facilitate timely identification of both positive and negative trends and any problem areas needing immediate intervention. Regular reports

would also enhance the ability to monitor and evaluate the effectiveness of health policy or programs implemented to address previously identified inequities in health services and disparities in maternal and newborn health. Consideration needs to be given as to who should take on this responsibility for regular surveillance and what resources would be required. Decisions would also need to be made regarding a core set of indicators to be reported on a regular basis and the frequency of reporting. In addition, the capacity to study additional indicators as the need arises should also be built into the process.

2. Enhance existing prevention and health promotion strategies or develop new strategies

For preventable health indicators where the rates are of concern, consideration needs to be given to either enhancing/modifying existing prevention and health promotion strategies or developing new strategies as appropriate. This process could be informed by an analysis of the underlying reasons for why rates are increasing (or decreasing) and why existing strategies or programs may not be achieving the desired outcomes. The data presented in this report suggest that further efforts are needed to reduce rates of smoking, alcohol use, and illicit drug use during pregnancy, as these are important modifiable factors associated with adverse pregnancy outcomes. Evidence exists that smoking cessation interventions during pregnancy are effective and produce a significant reduction in low birth weight and preterm birth (Lumley et al., 2009). Avoidance of postpartum relapse among women who quit smoking while pregnant is also important for the health of both the mother and infant. Both universal and targeted efforts to reduce alcohol consumption during pregnancy are important. The InSight program is an example of one program that has been implemented in Manitoba to prevent alcohol–related birth defects by intensive one–on–one mentoring of high risk women. This program is currently being evaluated by MCHP. Continuing efforts are needed to increase rates of breastfeeding initiation, particularly in the North. Given that negative perinatal outcomes are often associated with young maternal age, prevention of teen pregnancy should be given priority. For adolescents who give birth, provision of counseling about optimal birth spacing and family planning may help reduce the rate of short interpregnancy intervals in this age group. Lastly, prevention of preterm birth should be given special emphasis because of its many adverse consequences and costs to the healthcare system and society. Ensuring that the Healthy Baby Prenatal Benefit is provided to all eligible women would be helpful, since receipt of the benefit has been associated with a reduction in preterm births (Brownell, Chartier, Au, & Schultz, 2010).

3. Improve access to and use of health services and availability of healthcare providers

Given the regional variations in use of health services, priority should be given to examining the distribution and types of providers available in various regions of the province, and subsequently developing strategies to ensure equitable access to care. In areas where services exist but are not being accessed, studying women's perception of barriers that influence use of healthcare services may assist with planning and implementing appropriate services. For example, a study of barriers to use of prenatal care among inner–city women in Winnipeg (Heaman et al., 2009a; Heaman et al., 2009b) is currently guiding implementation of initiatives to improve access to prenatal care among women living in the Downtown, Point Douglas, and Inkster areas. Innovative initiatives are also needed to improve use of prenatal care among women living in northern areas of the province. Efforts to increase participation in Healthy Baby Community Support Programs, especially for young, low income women, could potentially improve both maternal and infant outcomes.

Many women in Manitoba travel significant distances to give birth. One of the Maternal and Child Healthcare Services in Manitoba (MACHS) Task Force initiatives is addressing this issue, among others. In addition, a province wide approach to planning birthing services would be beneficial. Consideration should be given to the overall availability of birthing hospital(s), the desired level of service to be provided in each of the five new RHAs, and whether initiatives to support giving birth closer to home are feasible and/or desired by women. The impact of the increasing number of women who travel to give birth on current obstetrical resources in Winnipeg should also be considered in the planning process. In addition, ongoing planning regarding the appropriate mix and distribution of healthcare providers in the five RHAs (family practice physicians, obstetricians/gynecologists, midwives, nurse practitioners, etc.) is needed, in conjunction with efforts to improve access to prenatal and postpartum/newborn health services in all regions of the province. Increasing the overall supply of midwives and having more midwives available in remote and rural areas of the province may be one approach to improving prenatal care and may decrease the need for some women to travel to give birth. Consideration could also be given to establishing collaborative models of care in these regions of the province. Finally, strategies to improve the capacity of midwives to provide service to the designated priority populations should be considered.

4. Improve maternal and newborn health outcomes through clinical care and social determinants of health

This report provides information on a variety of health conditions and the factors that influence them, which will be helpful to policy makers, administrators, and clinicians in devising policies, programs, and clinical practice guidelines to improve maternal and newborn health. Efforts to provide evidence–based practice and a clinical practice environment that keeps obstetrical interventions rates low should be continued and supported. The low cesarean birth rate is particularly noteworthy. Maternal health could be improved through implementing strategies to reduce rates of severe maternal morbidity and critically examining the reasons underlying our high rates of maternal postpartum hospital readmission. Routine screening for prenatal psychological distress and intervening appropriately may reduce the prevalence of prenatal and postpartum distress and related adverse child outcomes. Prevention and management of maternal diabetes may help reduce the high rate of large–for–gestational age births. Newborn health could be improved through strategies to reduce the rates of neonatal morbidity and neonatal and postneonatal mortality; for example, prevention of preterm birth would be helpful in this regard. Information on causes of neonatal and postneonatal mortality and the socioeconomic and regional distribution of mortality should be used to develop a provincial strategy to reduce the overall rate of infant mortality in this province. Strategies to reduce income inequity and disparities related to the social determinants of health among women of childbearing age and their families are needed.

5. Improve data availability and quality

There are areas where surveillance information would benefit from improvement in data availability and quality:

- In light of the obesity epidemic, the impact of maternal weight and weight gain on various pregnancy outcomes is needed. Data should be collected and abstracted on pre–pregnancy weight and height (in order to calculate Body Mass Index) and maternal weight gain during pregnancy.
- The association between the various types of maternal diabetes and maternal and infant health is important to study. Although the hospital discharge abstract data uses ICD–10–CA diagnosis codes that permit differentiation of Type 1 and Type 2 and gestational diabetes, diagnosis codes

on physician claims continue to use three digit ICD 9–CM codes, which does not allow this differentiation. Because the majority of women with diabetes are managed on an outpatient basis, more specific coding of diabetes on physician claims would be useful in defining the type of diabetes.

- Data should be collected and abstracted on whether a woman had a trial of labour following a previous cesarean birth in order to enable determination of the success rate of vaginal births after cesarean.
- Another significant gap is the lack of data on breastfeeding duration. Consideration should be given to developing a mechanism to collect data on breastfeeding duration. For example, it might be possible to record whether the mother is partially or exclusively breastfeeding at each immunization visit during the infant's first year of life.
- Because of the limitations of the Families First screening data (which only covers 80% of the population and does not include First Nations women living on reserve), it would be helpful to explore the possibility of incorporating similar screening data from the Strengthening Families program offered in First Nations communities into the MCHP Repository.

Summary

This report on *Perinatal Services and Outcomes in Manitoba* is a health surveillance report. As such, it provides data collection, analysis, and interpretation of information for monitoring health problems with the aim of contributing to improved health outcomes (Public Health Agency of Canada, 2008). The report monitors not only maternal and newborn health outcomes, but also determinants of health—factors such as maternal characteristics, socioeconomic status, geography (region of residence), health behaviors, and health services—that affect those outcomes. This report is only a beginning step to improving maternal and newborn health outcomes in Manitoba. Further interpretation of the meaning of the results needs to be undertaken by various stakeholders (e.g., Manitoba Health, Healthy Child Manitoba, Regional Health Authorities, clinical facilities, and healthcare providers) with consideration given to the implications for health policy and health services. Some of the indicators have raised some "red flags" or findings that say "come and look at me more closely."[2] These red flags require further investigation into the problem and its underlying antecedents and causes, which may only be fully understood at a more local level or require additional research, perhaps with some primary data collection. In addition, the report has identified several inequities in access to care and utilization of health services and socioeconomic and regional disparities in health outcomes that may require inter–jurisdictional strategies to successfully address the problems. Strategies need to be developed to improve the health of mothers and their infants and their access to healthcare, with particular attention to the disadvantaged or vulnerable sectors of the population in the different geographic areas of Manitoba.

2 With acknowledgement for these ideas to Dr. Brian McCarthy, Centres for Disease Control and Prevention, Atlanta, Georgia

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Table E.1: Summary of the Trends Overtime

Chapter 2 - Profile of Women Giving Birth	Winnipeg	Brandon	Rural South	North	Manitoba
Low Education			↓		↓
Lone Parents					
Social Isolation		↑			↑
Income Assistance	↓				↓
Healthy Baby Prenatal Benefit	↑		↑	↑	↑
Healthy Baby Program	↑		↑	↑	↑
Births to Teens	↓	↓			
Births to Women Aged 35+	↑	↑			↑
Delayed Childbearing	↑	↑			
Primiparas					
Short Interpregnancy Interval				↑	↑
Chapter 3 - Maternal Prenatal Health	**Winnipeg**	**Brandon**	**Rural South**	**North**	**Manitoba**
Alcohol Consumption During Pregnancy	↑	↑			↑
Smoking During Pregnancy	↓				↓
Illicit Drug Use	↑				↑
Ectopic Pregnancy				↓	↓
Infertility Drugs	↓		↓		↓
Late Initiation of Prenatal Care	↑	↑	↑	↑	↑
Less than Five Prenatal Care Visits				↑	↑
No or Inadequate Prenatal Care			↑	↑	↑
Prenatal Psychological Distress		↑	↑		↑
Antenatal Hospitalization	↓	↓	↓		↓
Chapter 4 - Giving Birth	**Winnipeg**	**Brandon**	**Rural South**	**North**	**Manitoba**
Travelled Outside of RHA to Give Birth	n/a	↓			
Travelled more than 113.8 km to Give Birth	n/a	↓		↑	
Travelled more than 46.7 km to Give Birth	n/a	↓		↑	↑
Delivery Care by a Midwife		↑	↑	↑	↑
Induction of Labour	↓		↓		↓
Vaginal Births with Epidural Anesthesia	↑	↑	↑		↑
Assisted Vaginal Births	↑	↓		↑	↑
Cesarean Birth	↑	↑	↑		↑
Vaginal Birth after Cesarean (VBAC)				↓	
Breech Birth					
Vaginal Breech Births			↑		↑
Chapter 5 - Maternal Postpartum Health	**Winnipeg**	**Brandon**	**Rural South**	**North**	**Manitoba**
Breastfeeding Initiation	↓			↓	↓
Maternal Hospital Readmission	↑	↓	↓		
Postpartum Psychological Distress			↑	↓	
Chapter 6 - Fetal/Newborn Health	**Winnipeg**	**Brandon**	**Rural South**	**North**	**Manitoba**
Stillbirths					
Preterm Births					
Postterm Births	↑		↑	↓	↑
Small-for-Gestational-Age					
Large-for-Gestational-Age					
Multiple Births					
Apgar of 7 or Less					
Special Care Unit (NICU) Admission	↓	↓	↓		↓
Newborn Readmission	↓	↓	↓	↓	↓

Cells with a " ↑ ", had an increasing linear trend overtime, while cells with a " ↓" had decreasing trend overtime. The linear trend overtime was not significant for cells that are blank.
Cells with an "n/a" indicates that indicator was not run for that region.

Source: Manitoba Centre for Health Policy, 2012

Table E.2: Summary of Regional Health Authority (RHA) Rates Compared to the Manitoba Rate

Indicator	RHA										
Chapter 2 - Profile of Women Giving Birth	**South Eastman**	**Central**	**Assiniboine**	**Brandon**	**Winnipeg**	**Interlake**	**North Eastman**	**Parkland**	**Churchill**	**Nor-Man**	**Burntwood**
Low Education	–	+	+		–			+		+	+
Lone Parents	–	–	–		+		–	+		+	+
Social Isolation	–	+		+	–	+					
Income Assistance	–	–	–		+	–	–	+		+	
Healthy Baby Prenatal Benefit	–	–			–			+		+	+
Healthy Baby Program	+	–	+		–	+	+	+	+		
Births to Teens	–			–	–		+	+		+	+
Births to Women Aged 35+	–	–	–		+		–	–		–	–
Delayed Childbearing	–	–	–		+		–	–		–	–
Primiparas		–		+	+		–	–		–	–
Short Interpregnancy Interval	–				–					+	+
Chapter 3 - Maternal Prenatal Health	**South Eastman**	**Central**	**Assiniboine**	**Brandon**	**Winnipeg**	**Interlake**	**North Eastman**	**Parkland**	**Churchill**	**Nor–Man**	**Burntwood**
Alcohol Consumption During Pregnancy	–		+	+						+	
Smoking During Pregnancy	–	–		+		+		+		+	+
Illicit Drug Use	–	–			+					+	+
Ectopic Pregnancy											
Infertility Drugs					+						–
Late Initiation of Prenatal Care	–	+		–	–		+	+		+	+
Less than Five Prenatal Care Visits	–	–	–	–	–		+	+		+	+
No or Inadequate Prenatal Care	–	–	–	–	–		+	+		+	+
Prenatal Psychological Distress		–	–	+	+			+			–
Antenatal Hospitalization	–	+		–	–	–		+		+	+
Chapter 4 - Giving Birth	**South Eastman**	**Central**	**Assiniboine**	**Brandon**	**Winnipeg**	**Interlake**	**North Eastman**	**Parkland**	**Churchill**	**Nor–Man**	**Burntwood**
Travelled Outside of RHA to Give Birth	+	–	+	–	n/a	+	+	–	+	–	–
Travelled more than 113.8 km to Give Birth	–	–	–	–	n/a	+	+		+	+	+
Travelled more than 46.7 km to Give Birth	–	–	+	–	n/a	+	+	+	+		+
Delivery Care by a Midwife	+	+		+		–	–			+	–
Induction of Labour	–	–	+	+	–						+
Vaginal Births with Epidural Anesthesia	–	–	+	+	+					–	–
Assisted Vaginal Births		–			+		–			–	
Cesarean Birth			+	+		–	–	+			–
Vaginal Birth after Cesarean (VBAC)			–	–						–	
Breech Birth											
Vaginal Breech Births			–							+	
Chapter 5 - Maternal Postpartum Health	**South Eastman**	**Central**	**Assiniboine**	**Brandon**	**Winnipeg**	**Interlake**	**North Eastman**	**Parkland**	**Churchill**	**Nor–Man**	**Burntwood**
Breastfeeding Initiation	+	+	+	+	+		–	–		–	–
Maternal Hospital Readmission	–		–								+
Postpartum Psychological Distress				+				+			–
Chapter 6 - Fetal/Newborn Health	**South Eastman**	**Central**	**Assiniboine**	**Brandon**	**Winnipeg**	**Interlake**	**North Eastman**	**Parkland**	**Churchill**	**Nor–Man**	**Burntwood**
Stillbirths		+									+
Preterm Births	–	–					+				+
Postterm Births		+	–	–	+						–
Small-for-Gestational-Age					+					–	
Large-for-Gestational-Age					–	+		+		+	+
Multiple Births							–				
Apgar of 7 or Less				+							–
Special Care Unit (NICU) Admission	–	–	+	+	+			–		–	–
Newborn Readmission	–	–		+				+		+	

Cells with a "+" were higher than the Manitoba rate, while cells with a "–" were lower than the Manitoba rate. Cells that are blank were similar to the Manitoba rate. Cells with an "n/a" indicates that indicator was not run for that RHA.

Source: Manitoba Centre for Health Policy, 2012

Table E.3: Summary of Winnipeg Community Area Rates Compared to the Winnipeg Rate

Indicator	Winnipeg Community Area											
Chapter 2 - Profile of Women Giving Birth	**Fort Garry**	**Assiniboine South**	**St. Boniface**	**St. Vital**	**Transcona**	**River Heights**	**River East**	**Seven Oaks**	**St. James Assiniboia**	**Inkster**	**Downtown**	**Point Douglas**
Low Education	–	–	–	–	–	–		–	–	+	+	+
Lone Parents	–	–	–	–	–	–	–	–	–	+	+	+
Social Isolation											+	
Income Assistance	–	–	–	–	–	–	–	–	–	+	+	+
Healthy Baby Prenatal Benefit	–	–	–	–	–	–		–	–	+	+	+
Healthy Baby Program	–					–	–	–	–		+	+
Births to Teens	–	–	–	–		–		–		+	+	+
Births to Women Aged 35+	+	+		+		+					–	–
Delayed Childbearing	+	+	+	+		+	–		+	–		–
Primiparas						+						–
Short Interpregnancy Interval											+	+
Chapter 3 - Maternal Prenatal Health	**Fort Garry**	**Assiniboine South**	**St. Boniface**	**St. Vital**	**Transcona**	**River Heights**	**River East**	**Seven Oaks**	**St. James Assiniboia**	**Inkster**	**Downtown**	**Point Douglas**
Alcohol Consumption During Pregnancy	–	–	+	–		–	–		–	+	+	+
Smoking During Pregnancy	–	–	–	–		–	+		–	+	+	+
Illicit Drug Use	–	–		–		–		–	–	+	+	+
Ectopic Pregnancy												
Infertility Drugs	+		+								–	–
Late Initiation of Prenatal Care	–		–	–	–	–				+	+	+
Less than Five Prenatal Care Visits	–		–	–		–	–	–	–		+	+
No or Inadequate Prenatal Care	–	–	–	–	–	–	–	–	–	+	+	+
Prenatal Psychological Distress									+			
Antenatal Hospitalization	–										+	+

Indicator	Winnipeg Community Area											
Chapter 4 - Giving Birth	**Fort Garry**	**Assiniboine South**	**St. Boniface**	**St. Vital**	**Transcona**	**River Heights**	**River East**	**Seven Oaks**	**St. James Assiniboia**	**Inkster**	**Downtown**	**Point Douglas**
Delivery Care by a Midwife						+		–		–	+	
Induction of Labour								–				
Vaginal Births with Epidural Anesthesia	+						+				–	–
Assisted Vaginal Births						+		+				–
Cesarean Birth			+									
Vaginal Birth after Cesarean (VBAC)												
Breech Birth				+								
Vaginal Breech Births												
Chapter 5 - Maternal Postpartum Health	**Fort Garry**	**Assiniboine South**	**St. Boniface**	**St. Vital**	**Transcona**	**River Heights**	**River East**	**Seven Oaks**	**St. James Assiniboia**	**Inkster**	**Downtown**	**Point Douglas**
Breastfeeding Initiation	+	+	+	+		+			+	–	–	–
Maternal Hospital Readmission											+	+
Postpartum Psychological Distress					+			–				+
Chapter 6 - Fetal/Newborn Health	**Fort Garry**	**Assiniboine South**	**St. Boniface**	**St. Vital**	**Transcona**	**River Heights**	**River East**	**Seven Oaks**	**St. James Assiniboia**	**Inkster**	**Downtown**	**Point Douglas**
Stillbirths												
Preterm Births	–										+	+
Postterm Births											+	
Small-for-Gestational-Age								+			+	
Large-for-Gestational-Age												
Multiple Births									+			
Apgar of 7 or Less												
Special Care Unit (NICU) Admission											+	+
Newborn Readmission										+		

Cells with a "+" were higher than the Winnipeg rate, while cells with a "–" were lower than the Winnipeg rate. Cells that are blank were similar to the Winnipeg rate. Cells with an "n/a" indicates that indicator was not run for that Winnipeg Community Area

Source: Manitoba Centre for Health Policy, 2012

Table E.4: Summary of the Association Between Selected Sociodemographic Characteristics with Each Indicator

Indicator	Sociodemographic and Other Characterisics																	
	Maternal Age Reference=25-29					Rural Income Quintiles, Reference=Rural 5 (highest)				Urban Income Quintiles Reference=Urban 5 (highest)				Income Assistance	Low Education	Lone Parent	Socially Isolated	Primipara
	12-19	20-24	30-34	35-39	40+	Rural 4	Rural 3	Rural 2	Rural 1	Urban 4	Urban 3	Urban 2	Urban 1					
Chapter 2 - Profile of Women Giving Birth																		
Low Education	+	+	–	–		+	+	+	+	+	+	+	+	+	n/a	+	+	–
Lone Parents	+	+	–	–	–			+	+	+	+	+	+	+	+	n/a	+	+
Social Isolation			–		+	+	+	+	+	+	+	+	+	+	+	+	n/a	–
Income Assistance	+	+	–	–	–	+		+	+	+	+	+	+	n/a	+	+	+	–
Healthy Baby Prenatal Benefit	+	+	–	–	–	+	+	+	+	+	+	+	+	+	+	+	+	–
Healthy Baby Program	+	+	–	–	–	+	+	+	+		+	+	+	+	+	+	+	+
Births to Teens	n/a	n/a	n/a	n/a	n/a		+	+	+	+	+	+	+	+	+	+		+
Births to Women Aged 35+	n/a	n/a	n/a	n/a	n/a	–	–	–	–	–	–	–	–	–	–	–	+	–
Delayed Childbearing	n/a	n/a	n/a	n/a	n/a	–	–	–	–	–	–	–	–	–	–	–		n/a
Primiparas	+	+	–	–	–		–	–	–		+	+		–	–	+	–	n/a
Short Interpregnancy Interval	+	+	–	–	s	+	+	+	+		+	+	+	+	+	+	+	n/a
Chapter 3 - Maternal Prenatal Health																		
Alcohol Consumption During Pregnancy	+	+	–	–	–		+	+	+		+	+	+	+	+	+		+
Smoking During Pregnancy	+	+	–	–					+	+	+	+	+	+	+	+		–
Illicit Drug Use	+	+	–	–							+	+	+	+	+	+	+	+
Ectopic Pregnancy			+	+	+								+	n/a	n/a	n/a	n/a	n/a
Infertility Drugs	–	–	+	+	+	–	–	–	–		–	–	–	–	–		–	+
Late Initiation of Prenatal Care	+	+	–	–		+	+	+	+		+	+	+	+	+	+	+	–
Less than Five Prenatal Care Visits	+	+	–	–			+	+	+		+	+	+	+	+	+	+	–
No or Inadequate Prenatal Care	+	+	–	–		+	+	+	+		+	+	+	+	+	+	+	–
Prenatal Psychological Distress	–		+	+				–	–	+	+		+	+	+	+	+	–
Antenatal Hospitalization	+	+	–	–				+	+			+	+	+	+	+	+	+

Indicator	Sociodemographic and Other Characterisics																	
	Maternal Age Reference=25-29					Rural Income Quintiles, Reference=Rural 5 (highest)				Urban Income Quintiles Reference=Urban 5 (highest)				Income Assistance	Low Education	Lone Parent	Socially Isolated	Primipara
	12-19	20-24	30-34	35-39	40+	Rural 4	Rural 3	Rural 2	Rural 1	Urban 4	Urban 3	Urban 2	Urban 1					
Chapter 4 - Giving Birth																		
Travelled Outside of RHA to Give Birth		–	+	+		–	–	–	–	n/a	n/a	n/a	n/a	–	–	–	–	+
Travelled more than 113.8 km to Give Birth	+	+	–			+	+	+	+	n/a	n/a	n/a	n/a			+		–
Travelled more than 46.7 km to Give Birth	+	+				+	+	+	+	n/a	n/a	n/a	n/a	–		+	–	–
Delivery Care by a Midwife	–	–		–		–	–	–	–		+	+		–	–	–		–
Induction of Labour								+	+					–			–	+
Vaginal Births with Epidural Anesthesia	+			–		–		–	–				–	–	–	+	–	+
Assisted Vaginal Births	+	–			+		–	–	–				–	–	–			+
Cesarean Birth	–	–	+	+	+				–				–	–	–	–		+
Vaginal Birth after Cesarean (VBAC)	+			–					+				+	+		+		n/a
Breech Birth	–	–	+	+					–				–		–	–		+
Vaginal Breech Births	+					+			+					+				–
Chapter 5 - Maternal Postpartum Health																		
Breastfeeding Initiation	–	–	+	+			–	–	–	–	–	–	–	–	–	–	–	+
Maternal Hospital Readmission	+		–					+	+		+	+	+	+	+	+		
Postpartum Psychological Distress	–						+	–					+	+	+	+	+	–
Chapter 6 - Fetal/Newborn Health																		
Stillbirths					+			+	+						n/a	–	n/a	
Preterm Births			+	+	+				+				+	+	+	+		n/a
Postterm Births	+		–			+	+						+		+	+		n/a
Small-for-Gestational-Age										+	+	+	+					+
Large-for-Gestational-Age			+	+	+				+								–	–
Multiple Births	–	–	+	+			–		–							–		–
Apgar of 7 or Less														+				n/a
Special Care Unit (NICU) Admission			+	+	+		+		+			+	+	+		+		+
Newborn Readmission									+			+	+	+	n/a	+		

Cells with a "+" had a rate that was significantly higher than the reference catergory's rate, while cells with a "–" had a rate that was significantly lower than the reference category's rate. Cells that were blank had a rate that was similar to the reference category's rate. Cells with an "n/a" indicates that indicator was not run for that characteristic

The reference category for low eduction is Grade 12 education or higher.

The reference category for lone parent is married/partnered.

The reference category for socially isolated is not socially isolated.

Source: Manitoba Centre for Health Policy, 2012

Table E.5: Comparison of Manitoba Rates to Published Canadian Rates

Indicator	Comparison to Canadian Rate
Chapter 2 - Profile of Women Giving Birth	
Low Education	higher
Births to Teens	higher
Births to Women Aged 35+	similar
Delayed Childbearing	lower
Chapter 3 - Maternal Prenatal Health	
Alcohol Consumption During Pregnancy	higher
Smoking During Pregnancy	higher
Illicit Drug Use	higher
Antenatal Hospitalization	lower
Chapter 4 - Giving Birth	
Delivery Care by an Obstetrician	higher
Delivery Care by a General Practitioner/ Family Physician	higher
Delivery Care by a Midwife	similar
Induction of Labour	lower
Assisted Vaginal Births	lower
Cesarean Birth	lower
Vaginal Birth after Cesarean (VBAC)	higher
Breech Birth	lower
Chapter 5 - Maternal Postpartum Health	
Breastfeeding Initiation	lower
Maternal Hospital Readmission	higher
Chapter 6 - Fetal/Newborn Health	
Stillbirths	higher
Preterm Births	similar
Postterm Births	higher
Small-for-Gestational-Age	lower
Large-for-Gestational-Age	higher
Multiple Births	lower
Special Care Unit (NICU) Admission	lower
Neonatal Mortality	higher
Postneontal Mortality	higher
Infant Mortality	higher

Source: Manitoba Centre for Health Policy, 2012

Chapter 1: Introduction

1.1 Background and Objectives

This report was undertaken by the **Manitoba Centre for Health Policy (MCHP)**[3] as a "deliverable" funded by **Manitoba Health**. This report expands on the descriptive analyses done by the Ministerial Working Group on Maternal/Newborn Services in 2005 and provides information to support the current work of the Maternal and Child Health Services (MACHS) Taskforce and the ongoing focus of the Healthy Child Committee of Cabinet (HCCC) on maternal health and early childhood development. Manitoba Health requested that the following information be included in the deliverable: general rates of full term and preterm births, **stillbirths**, and neonatal death rates should be measured and compared across regions of Manitoba and subsequently compared to national rates. A more in–depth analysis of the demographic characteristics of women giving birth in Manitoba, the types of deliveries they are experiencing (e.g., **cesarean birth** versus vaginal birth), the types of anesthesia utilized, and the rate at which women are induced should be examined. Also, the place of birth (home versus hospital) and the type and location of the hospital (relative to the mother's region of residence) should be further described, as well as consideration of key perinatal **risk factors** (e.g., alcohol use during pregnancy).

The specific objectives of this report were:

- To describe the sociodemographic characteristics of women giving birth in Manitoba
- To describe health service use by pregnant and **postpartum** women and their newborns and identify inequities in access to care and utilization of healthcare services
- To provide comprehensive up–to–date information on maternal **health status** indicators at provincial, regional, and sub–regional levels in Manitoba
- To provide comprehensive, up–to–date information on newborn health status indicators at provincial, regional and sub–regional levels in Manitoba
- To examine determinants of maternal and newborn health, including social conditions, health behaviours and risk factors, and healthcare utilization
- To examine disparities in health outcomes across a variety of factors, including **socioeconomic status**, region of residence, and age

The report is organized into five main areas:

- Profile of Women Giving Birth in Manitoba
- Maternal Prenatal Health
- Giving Birth
- Maternal Postpartum Health
- Fetal/Newborn Health

1.2 Design and Methods

We used information from selected **administrative data** files (from Manitoba Health; Healthy Child Manitoba; and Manitoba Entrepreneurship, Training, and Trade–see section on Data Sources Used in this Study for a full description). The indicators presented in this report reflect where people live, not where they received services. Where possible we based our definitions for indicators on those used in the Canadian Perinatal Health Report (Public Health Agency of Canada, 2008) to facilitate comparisons to national data. Additionally, similar to other Perinatal Health reports, all rates in this report are

3 Terms in **bold typeface** are defined in the Glossary at the end of this report.

unadjusted or **crude rates** (i.e., no **age–** or sex–**adjustments** have been done). This allowed us to compare the Manitoba rates to other provincial and national rates. Results were **suppressed** where the counts upon which the rates were based represented one to five events (zeros are reported). This practice avoids breaches of confidentiality and is similar to the way in which Statistics Canada reports data. The analyses in this kind of report are intended to be primarily descriptive, not explanatory. That is, the report shows what the data reveal, not how or why those results have come about. Answering the latter questions requires information about the context, history, and local circumstances; this is not available in the administrative data used for this report.

1.3 Data Sources Used in this Study

MCHP, a research unit of the Department of Community Health Sciences in the University of Manitoba's Faculty of Medicine, houses sets of data collectively referred to as the **Population Health Research Data Repository** (often referred to as the **Repository**). The Repository is a comprehensive collection of administrative, registry, survey, and other databases primarily comprising residents of Manitoba. It was developed to describe and explain patterns of healthcare and profiles of health and illness, which facilitates inter–sectoral research in areas such as healthcare, education, and social services. The administrative health database, for example, holds records for virtually all contacts with the provincial healthcare system, the **Manitoba Health Services Insurance Plan** (including physicians, hospitals, personal care homes, home care, and pharmaceutical prescriptions) of all registered individuals. MCHP acts as a steward of the information in the Repository for agencies such as Manitoba Health. Prior to MCHP receiving these data, identifying information such as name and street address are removed. In addition, the true health number (personal health information number or PHIN) is scrambled or encrypted by Manitoba Health prior to transfer of data to the Repository housed at MCHP. Therefore, the Repository contains **de–identified data**, which are only linkable across files through the encrypted number and are only linked for purposes of the study after all approvals are met. The specific files we analysed and the key research insights that each file contributed to the project are as follows:

Data from Manitoba Health, specifically **hospital abstracts**, **physician claims**, pharmaceutical claims (from the **Drug Programs Information Network/ DPIN**), **Vital Statistics**, **Midwifery Discharge Summary Reports** and the **Manitoba Health Insurance Registry** were used to develop indicators of maternal and newborn health service use and health status.

Data from Healthy Child Manitoba, specifically the Families First and Health Baby data, provided information for some of the sociodemographic factors (including relationship status, maternal education, **social isolation**, and health behaviors such as smoking) as well as information regarding the recipients of the **Healthy Baby Prenatal Benefit** and participation in **Healthy Baby Community Support Programs**.

Data from Manitoba Entrepreneurship, Training and Trade, specifically the **Social Assistance Management Information Network (SAMIN)**, were used to identify women who received **income assistance** during either the pre– or postnatal period.

Data from the public use 2006 **Census** of Canada files were used to define area–level socioeconomic status by using the mean household income of an area's residents. This is reported as **income quintiles**.

All data management, programming, and analyses were performed using **SAS ®** statistical analysis software, version 9.2.

Families First Screening Dataset

The **Families First Screening** dataset varies from most of the other datasets used in this report and requires a more detailed explanation. **Public Health Nurses** in Manitoba attempt to screen all families with newborns within a week of discharge from hospital for biological and social risk factors that are associated with poor child outcomes during a routine postnatal visit. The form used in this screen, the Families First Screening form (formerly known as the **BabyFirst screening form**), contains 39 items related to biological and social risk factors. Three or more risk factors indicate that a family may require additional supports such as intensive home visiting, financial support, parenting programs, mental health services, or child care. The data from this screening form are captured in the Families First Screening Dataset which is maintained by Healthy Child Manitoba. As illustrated in Figure 1.1, not all women receive the screen; 79.5% of women in Manitoba were screened in 2007/08–2008/09. The Regional Health Authorities (RHAs) of South Eastman (96.6%), Central (83.9%), Brandon (95.3%), and Winnipeg (87.8%) had significantly higher rates of screening than the Manitoba rate, while Interlake (69.7%), North Eastman (66.4%), Parkland (65.6%), NOR–MAN (44.5%), and Burntwood, (35.6%) had lower rates. In **First Nations communities**, postnatal visits are conducted by federally funded nurses; and, as the Families First Screening Program is a provincially funded program, the screen is not completed on these women. For this reason, women living in First Nations communities are excluded from those analyses involving Families First Data. The 2007 evaluation of the BabyFirst program found that about a third of the women not screened were from First Nations communities. The evaluation also found families who were not screened tended to be more vulnerable (e.g., younger mothers, those living in lower income areas) than families that did get screened. Additionally, it found that the infants who were not screened were at a higher risk for maltreatment than the general population of infants (Brownell et al., 2011).

Although screening data are available from 2000 onward, comparisons to other survey results suggest that some of the items, (e.g., smoking and alcohol/drug use during pregnancy) resulted in under–estimates in the first few years of screening (Brownell et al., 2008). For this reason, for analyses using Families First Screening data, only data from 2003 onward are examined.

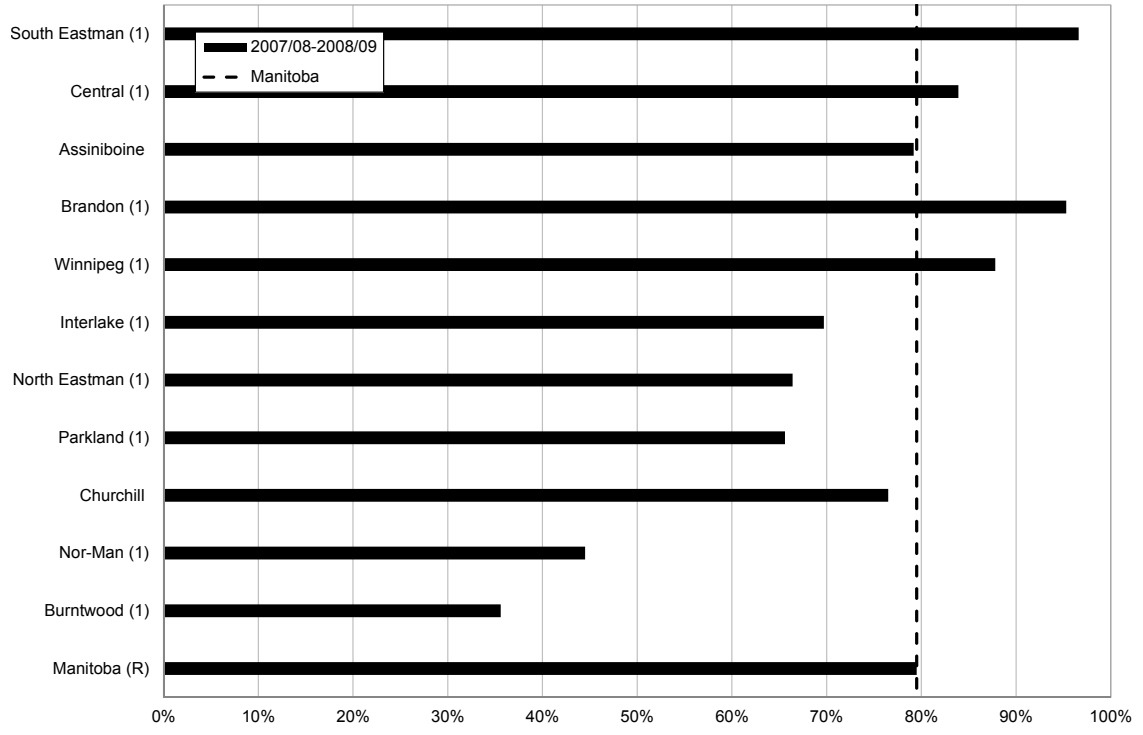
Table 1.1: Women Giving Birth Linked to a Family First Screening Form Record by RHA, 2007/08-2008/09

RHA of Residence	Number of Women Giving Birth	Women Giving Birth Linked to Families First Record	
		Number	Percent
South Eastman (1)	1,958	1,891	97%
Central (1)	3,006	2,523	84%
Assiniboine	1,456	1,153	79%
Brandon (1)	1,308	1,246	95%
Winnipeg (1)	14,582	12,796	88%
Interlake (1)	1,641	1,143	70%
North Eastman (1)	960	637	66%
Parkland (1)	1,049	688	66%
Churchill	34	26	77%
Nor-Man (1)	856	381	45%
Burntwood (1)	2,571	915	36%
Manitoba	**29,424**	**23,401**	**80%**

'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)

Source: Manitoba Centre for Health Policy, 2012

Figure 1.1: Proportion of Women Giving Birth Linked to a Family First Screening Form Record by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

1.4 Study Period

The study period used for each indicator in this report varied slightly; data on births was drawn from the years 2001/02–2008/09. We also used data from 2009/10 to provide a "look forward" year for selected indicators (e.g., women giving birth in 2008/09 were followed up to 12 months to identify cases of postnatal psychological distress). When years are indicated with a "/" (e.g., 2001/02), this indicates a **fiscal year** of April 1–March 31 (i.e., 2001/02 means April 1, 2001 to March 31, 2002). **Calendar years** are indicated by listing the year (i.e., 2001 refers to January 1, 2001–December 31, 2001). Some data required for certain indicators were not available for the entire time frame of 2001/02–2008/09. Additionally, on April 1, 2004, Manitoba hospitals replaced **ICD–9–CM** with **ICD–10–CA** for coding diagnoses and the **Canadian Classification of Health Interventions (CCI)** for coding procedures. These coding changes did not affect a majority of our indicators; however for a few of the indicators (e.g., Vaginal Births with Epidural Anesthesia), we decided to limit the time trend analysis to the ICD–10–CA period due to concerns about coding changes.

1.5 How to Read this Report

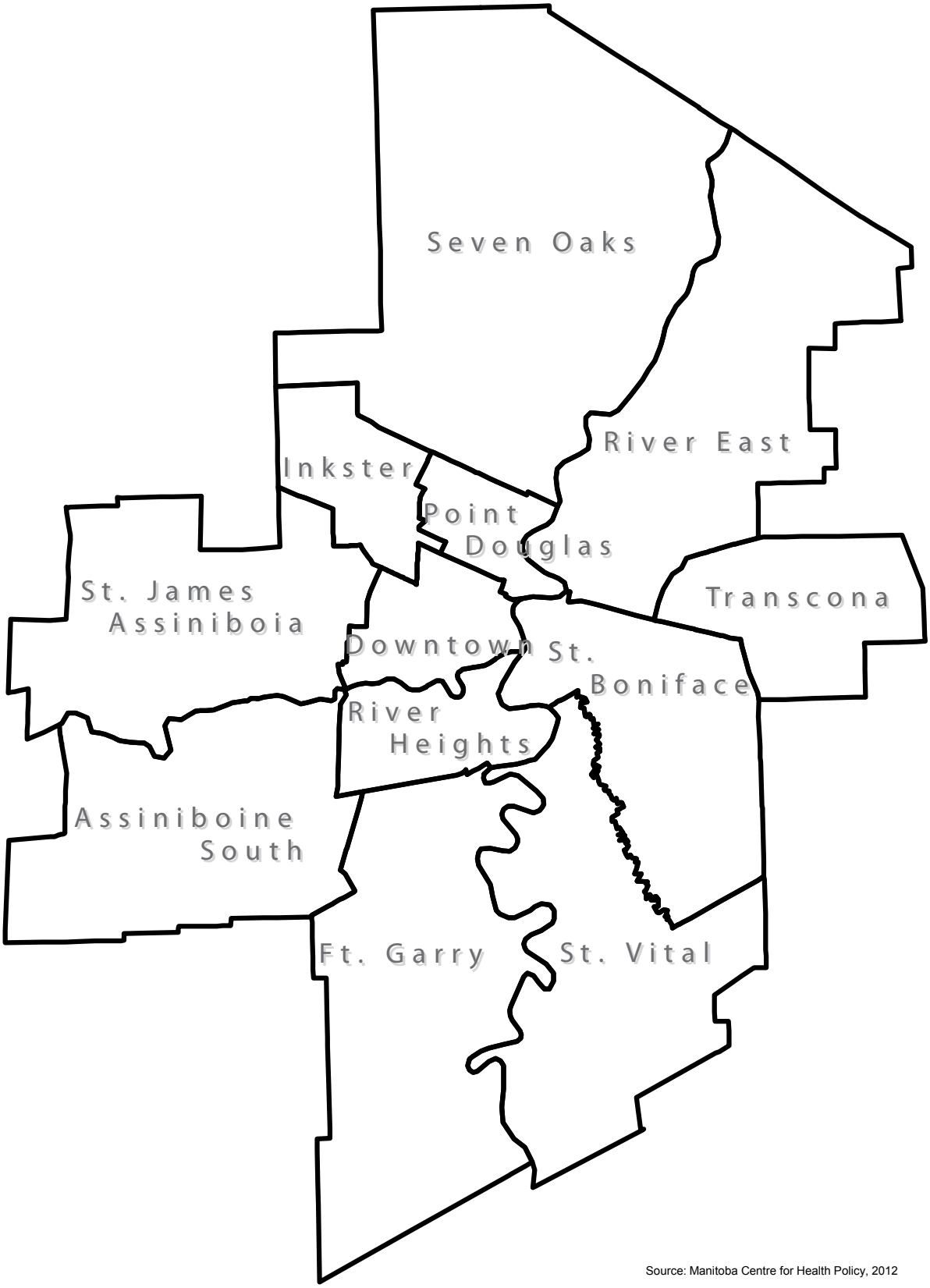
Where data allow, a time trend analysis is presented for each indicator using four geographic areas (Winnipeg, Brandon, North, Rural South) plus the province as a whole. Data are also presented for the 11 Manitoba RHAs, the 12 Winnipeg Community Areas (CAs), and for a variety of Sociodemographic and Other Characteristics. Figure 1.2 provides a map of where each RHA is located; Figure 1.3 is where each Winnipeg CA is located.

Figure 1.2: Map of the 11 Manitoba Regional Health Authorities (RHAs)

Source: Manitoba Centre for Health Policy, 2012

During the production of this report, the RHAs were amalgamated into five larger regions, which do not correspond to the aggregate regions in this report. However, the five new RHAs are all "aggregates" of the 11 former RHAs (South Eastman + Central = Southern Health; Assiniboine + Parkland + Brandon = Western RHA; Interlake + North Eastman = Interlake/Eastern; Burntwood + NOR–MAN = Northern RHA; Winnipeg + Churchill = Winnipeg RHA).

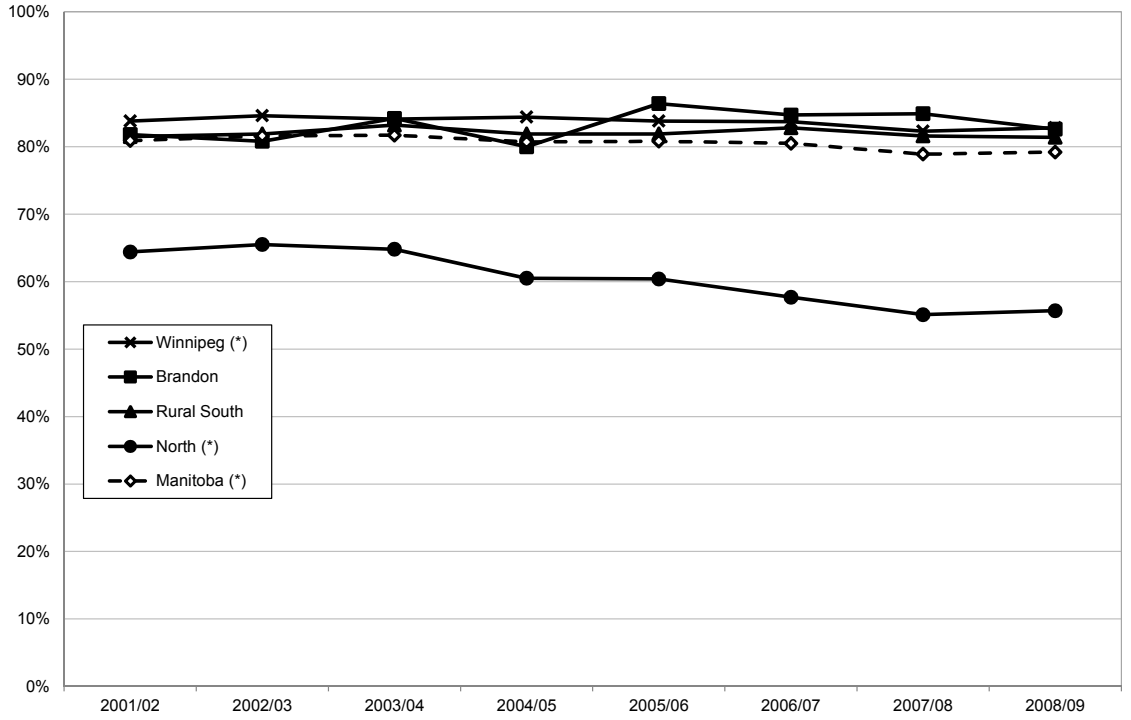
Figure 1.3: Map of the 12 Winnipeg Community Areas (CAs)



Source: Manitoba Centre for Health Policy, 2012

For most indicators examined in this report, you will find a figure of time trend lines showing the data for that indicator over time (as an example, Figure 5.1.1: Breastfeeding by Region and Year). Four geographic areas of the province are represented: Winnipeg, Brandon, the Rural South aggregate area (includes South Eastman, Central, Assiniboine, Interlake, North Eastman, and Parkland RHAs), and the North aggregate area (includes NOR–MAN, Burntwood, and Churchill RHAs), plus a time trend is presented for Manitoba as a whole. The Manitoba rate is represented by a dashed line to allow a visual comparison to the other areas. No statistical testing between the areas was done. An asterisk '*' next to the area's name indicates the linear trend over time for that area was significant at $p<0.05$. This significance was determined using a Cochran–Armitage Trend Test. Gaps in the line indicate that for one (or more) time points, the rate was suppressed due to small numbers.

Figure 5.1.1: Breastfeeding Initiation at Hospital Discharge by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

Additionally, analyses comparing rates for RHAs and Winnipeg CAs and by Sociodemographic and Other Characteristics are provided. For these bar charts, the most recent years available were used, generally 2007/08 to 2008/09 (with the same year range used for all three charts); the number of years was expanded for rare events to avoid suppression of data. The more rare the event, the more years of data were required to provide statistically reliable results (e.g., neonatal death rates were presented for 2001/02 to 2008/09).

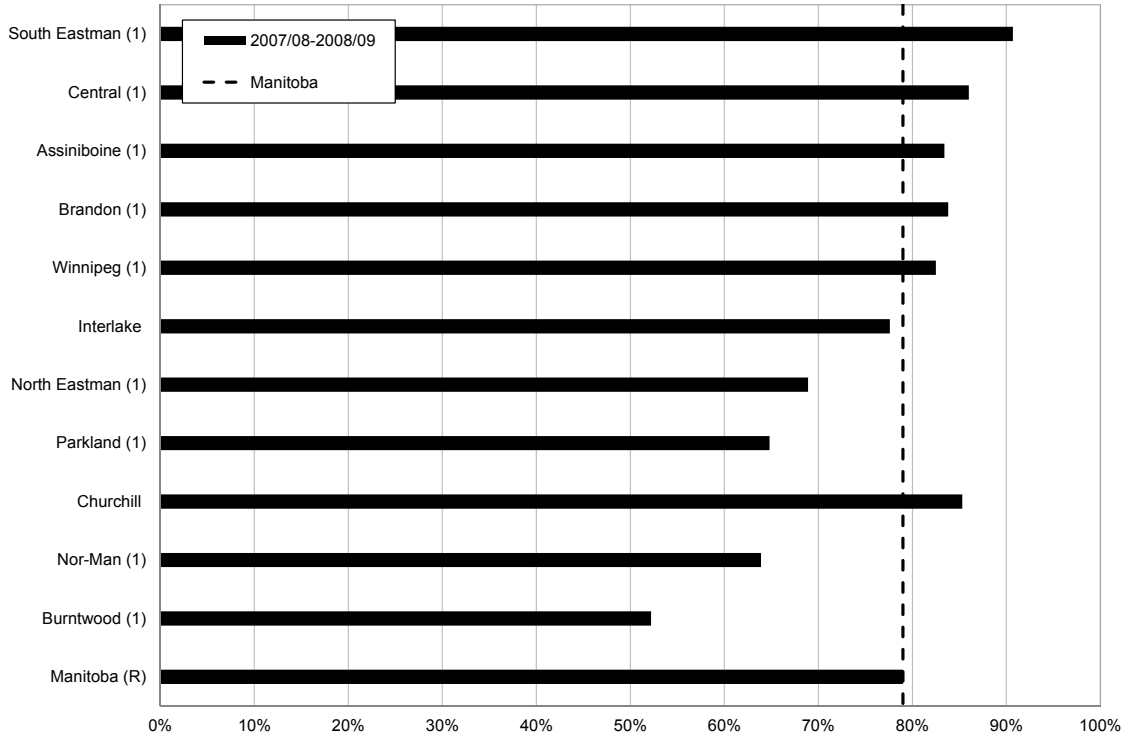
The ordering of the RHA and Winnipeg CA graphs was done in a particular order, which is consistent throughout the report and similar to other MCHP reports. This order is based on the overall health status of the population as measured by the premature mortality rate (PMR) over a 10–year period (1996–2005).[4] A death before the age of 75 is considered premature, so the PMR is the rate at which area residents die prematurely in a given period per 1,000 residents aged 0 to 74. Given that some of

4 Ten years of data were used because some districts have small populations, so multiple years are required to provide reliable estimates.

the indicators in this report are based on newborns and infants, the use of PMR to order graphs may not seem logical. However, PMR is considered to be the best single indicator of overall health status of a region's population and need for healthcare (Carstairs & Morris, 1991; Eyles & Birch, 1993; Eyles, Birch, Chambers, Hurley, & Hutchison, 1991). PMR is strongly correlated with socioeconomic indicators (Martens, Frohlich, Carriere, Derksen, & Brownell, 2002) which have been shown to predict child health outcomes. Additionally, using PMR to order the graphs in this report also facilitates making comparisons across MCHP reports. PMR values for each of the RHAs and Winnipeg CAs can be found in the Manitoba RHA Indicator Atlas 2009 (Fransoo et al., 2009). For the RHA figures, the RHAs with the lowest PMR (that is, the best overall health status and relatively high socioeconomic status) are shown at the top of each graph (South Eastman, Central, Assiniboine); the other RHAs follow in order of increasing PMR, ending with the Burntwood RHA which has the highest PMR and relatively low socioeconomic status. Similarly for the Winnipeg CA figures, the CAs with the lowest PMR are shown at the top of each graph (Fort Garry, Assiniboine South, St. Boniface); the other CAs follow in order of increasing PMR, ending with Point Douglas.

In the RHA figures, the dashed vertical line indicates the Manitoba rate for that indicator (e.g., Figure 5.1.2: Breastfeeding by RHA). This allows for a visual comparison of the rates. Statistical testing was done to allow comparison between each RHA's rate to the Manitoba rate. The (R) next to Manitoba indicates that this was the reference group for the statistical testing. A (1) next to a RHA indicates that that area's rate was significantly different from the Manitoba rate at $p<0.01$ determined using a Chi–Square test. An (s) next to a region's name indicates that the data were suppressed due to small numbers.

Figure 5.1.2: Breastfeeding Initiation at Hospital Discharge by RHA, 2007/08-2008/09

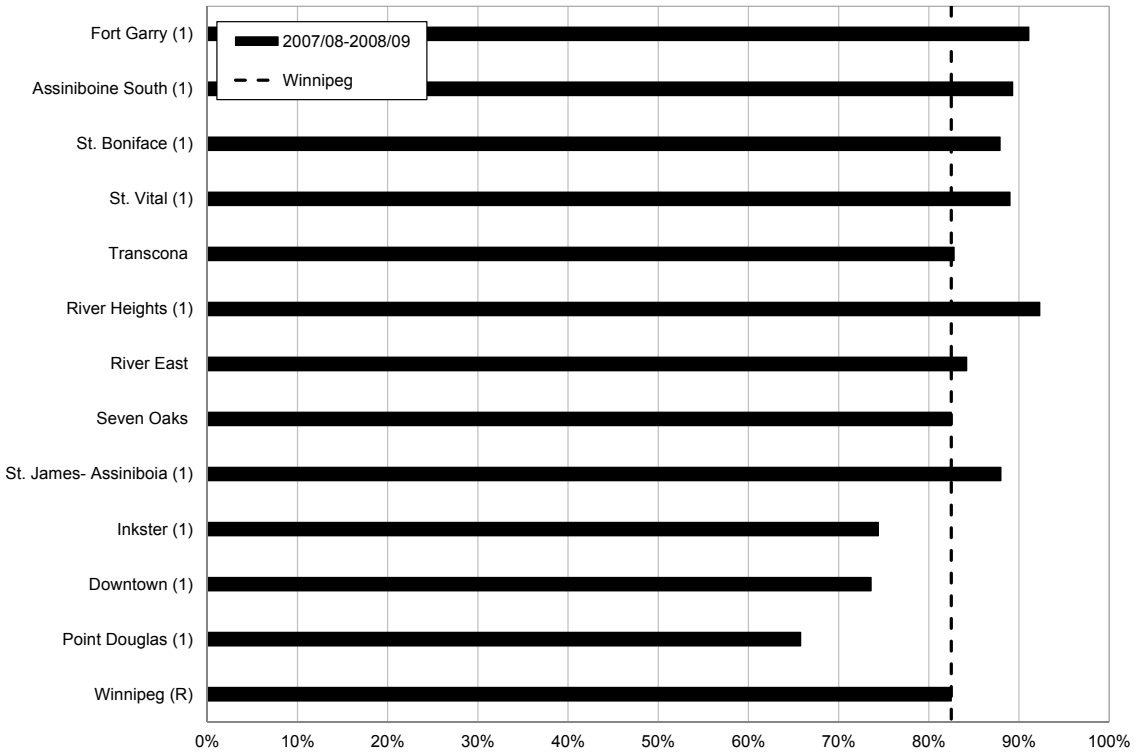


'1' indicates the area's rate was statistically different from the Manitoba rate ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

In the Winnipeg CA figures (e.g., Figure 5.1.3: Breastfeeding by Winnipeg CA), the dashed vertical line indicates the Winnipeg rate for that indicator. This allows for a visual comparison of the rates. Statistical testing was done to allow comparison between each CA's rate and the Winnipeg rate. The (R) next to Winnipeg indicates that this was the reference group for the statistical testing. A (1) next to a CA indicates that that CA's rate was significantly different from the Winnipeg rate at $p<0.01$ determined using a Chi–Square test. An (s) next to a CA's name indicates that the rate was suppressed due to small numbers.

Figure 5.1.3: Breastfeeding Initiation at Hospital Discharge by Winnipeg CA, 2007/08-2008/09

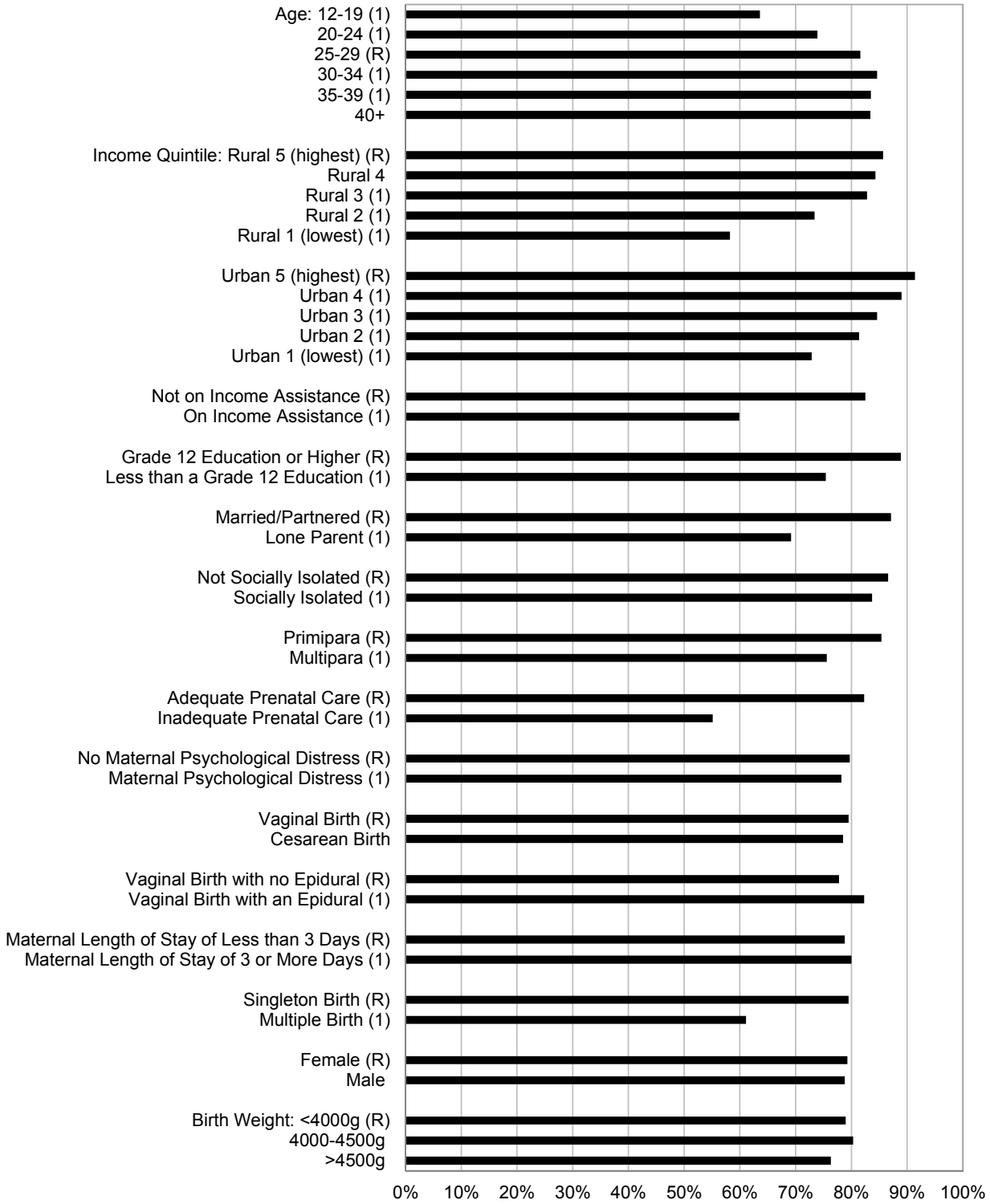


'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

In the "Sociodemographic and Other Characteristics" figures, a number of factors are listed. After consulting the literature and Advisory Group members and using the data sources available, we chose factors that were thought to be associated with the indicator. Refer to Appendix Table A.4 for a description of how these factors were defined and calculated. The (R) next to a particular group within a factor indicates that it was the reference group for that factor. The (1) next to a group indicates that the associated rate or proportion was significantly different from the reference group value at $p<0.01$. For each factor, the graph shows the proportion of people in each group that was "positive" for that indicator. For example (Figure 5.1.4) when looking at breastfeeding initiation and maternal age, the value associated with the age group 12 to 19 is the proportion (63.6%) of women aged 12 to 19 who initiated breastfeeding prior to hospital discharge. The (1) means that compared to the reference group (women aged 25 to 29, 81.6%), the proportion was significantly lower at $p<0.01$.

Figure 5.1.4: Breastfeeding Initiation at Hospital Discharge by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

1.6 Statistical Testing and Multiple Comparisons

Statistical testing indicates the degree of confidence that we have in the results. If a difference is "statistically significant," then we are confident that this difference is not just due to chance. In other words, if an RHA's rate is considered "significantly different" than the Manitoba rate, we would say that this difference (either higher or lower) is not due to the random fluctuation that occurs simply by chance; but rather, it is most likely that there is a real difference. The notation "$p<0.05$" means that the probability of seeing a difference as large as this by chance alone is less than 5%, so we say that there is a statistically significant difference—and we are 95% sure of the fact that this difference is real. Similarly, the notation "$p<0.01$" means that the probability of seeing a difference as large as this by chance alone is less than 1%. When a large difference is observed that is NOT statistically significant, it is telling us that these rates are considered similar, since it could fluctuate greatly from year to year. This is usually due to the rate being based on small numbers (either a small number of events or a small underlying population); it could change from year to year and may be higher, similar, or lower than the comparison the next time it is measured. In this report, the time trend test has been conducted using a significance level of $p<0.05$. The time trend test is a single test so this is appropriate. However, the RHA test has been conducted using a significance value of $p<0.01$ (1%) because each of the 11 RHAs are compared to the Manitoba rate. Similarly the Winnipeg CA test has been conducted using a significance value of $p<0.01$ (1%) because each of the 12 CAs are compared to the Winnipeg rate. This more conservative level was chosen to account for multiple comparisons (see section on multiple comparison). The problem of multiple comparisons happens when a large number of statistical tests are conducted as a set. While each individual test is evaluated at the appropriate error rate, the error rate for the set of tests is much higher. To address this problem it is common to use what is known as a **Bonferroni adjustment** to the error rate. For example, in the RHA analysis, to control the overall error rate at 5% one would divide the overall error rate by the number of comparisons (i.e. 0.05/12 = 0.00417; this means the corrected p value would be set at <.004). However this produces a very conservative error rate. To balance these two considerations the 1% error rate was chosen.

For selected indicators, the use of **multivariable logistic regression** was used to help determine the independent association of each explanatory variable or risk factor to the outcome of interest, after adjusting (or controlling) for other factors in the model. Refer to Chapter 7 for a more detailed explanation regarding logistic regression and the results that are presented for the following outcomes: cesarean birth, infant death, **preterm birth,** and maternal prenatal and postpartum psychological distress.

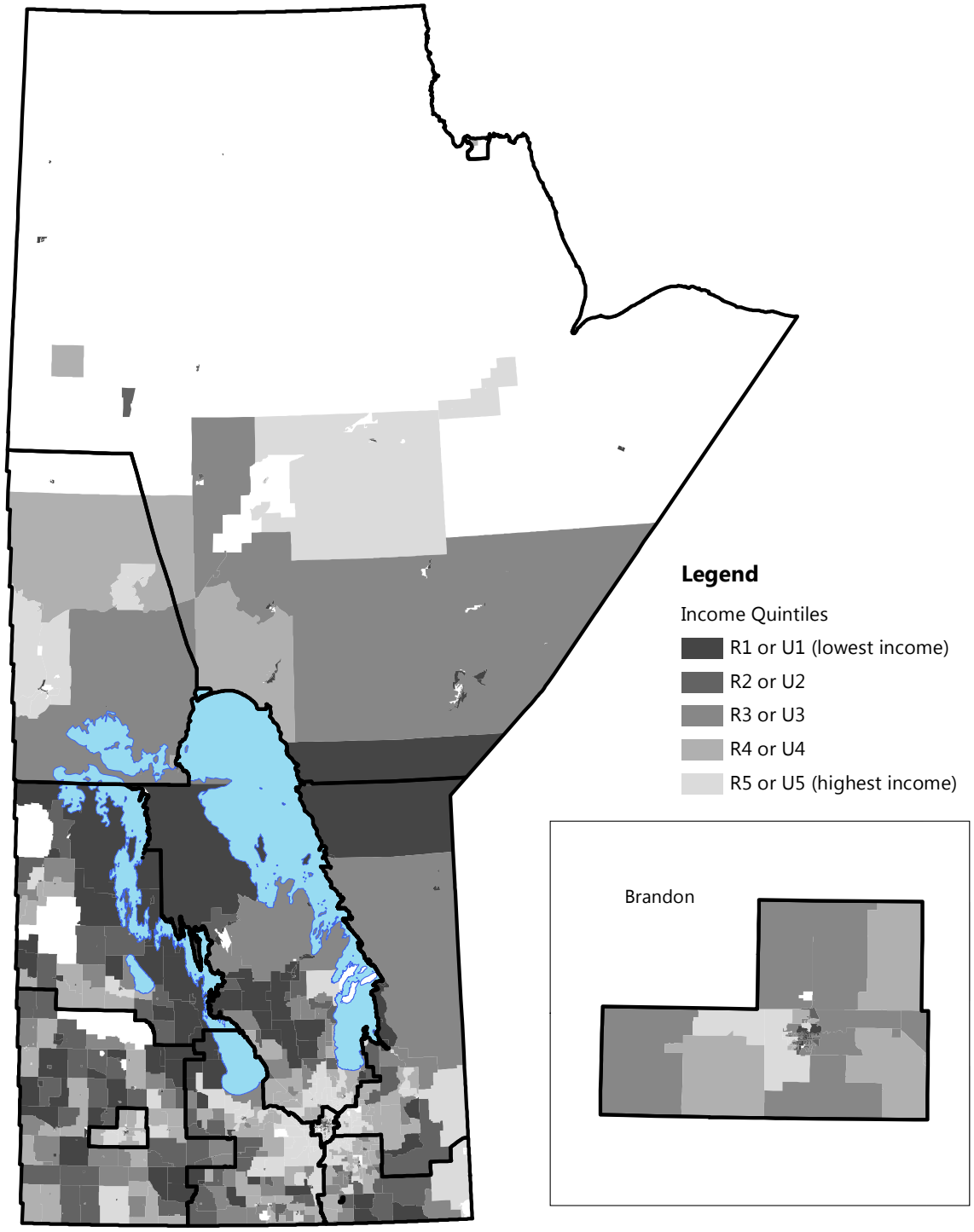
1.7 Income Quintiles

In some figures in this report, data are displayed according to area–level income quintiles. These income quintiles were developed by assigning **average household income** from the 2006 **Statistics Canada** Census to dissemination areas and then ranking these from highest to lowest. Dissemination areas were then grouped into five groups or quintiles (quintile 1 being poorest and quintile 5 being wealthiest), each containing approximately 20% of the total population. These were developed separately for urban (Winnipeg and Brandon) and rural (all other RHAs). The average household income of the **dissemination area** is attributed to each person; this is not an individual income but rather an area–level income measure. However, area–level measures are often used as a proxy for individual level measures of SES and have been found to provide a close approximation of individual level measures (Mustard & Frohlich, 1995).

Updated November 19, 2012

Maps of rural and urban quintile assignment by dissemination areas for Manitoba, Brandon, and Winnipeg can be found in Figures 1.4 and 1.5. Note: white areas in map indicate census areas which are not enumerated (such as park areas).

Figure 1.4: Distribution of Income Quintiles, 2006 Census Data Dissemination Areas
Quintile Breaks are at different points in Winnipeg and Brandon

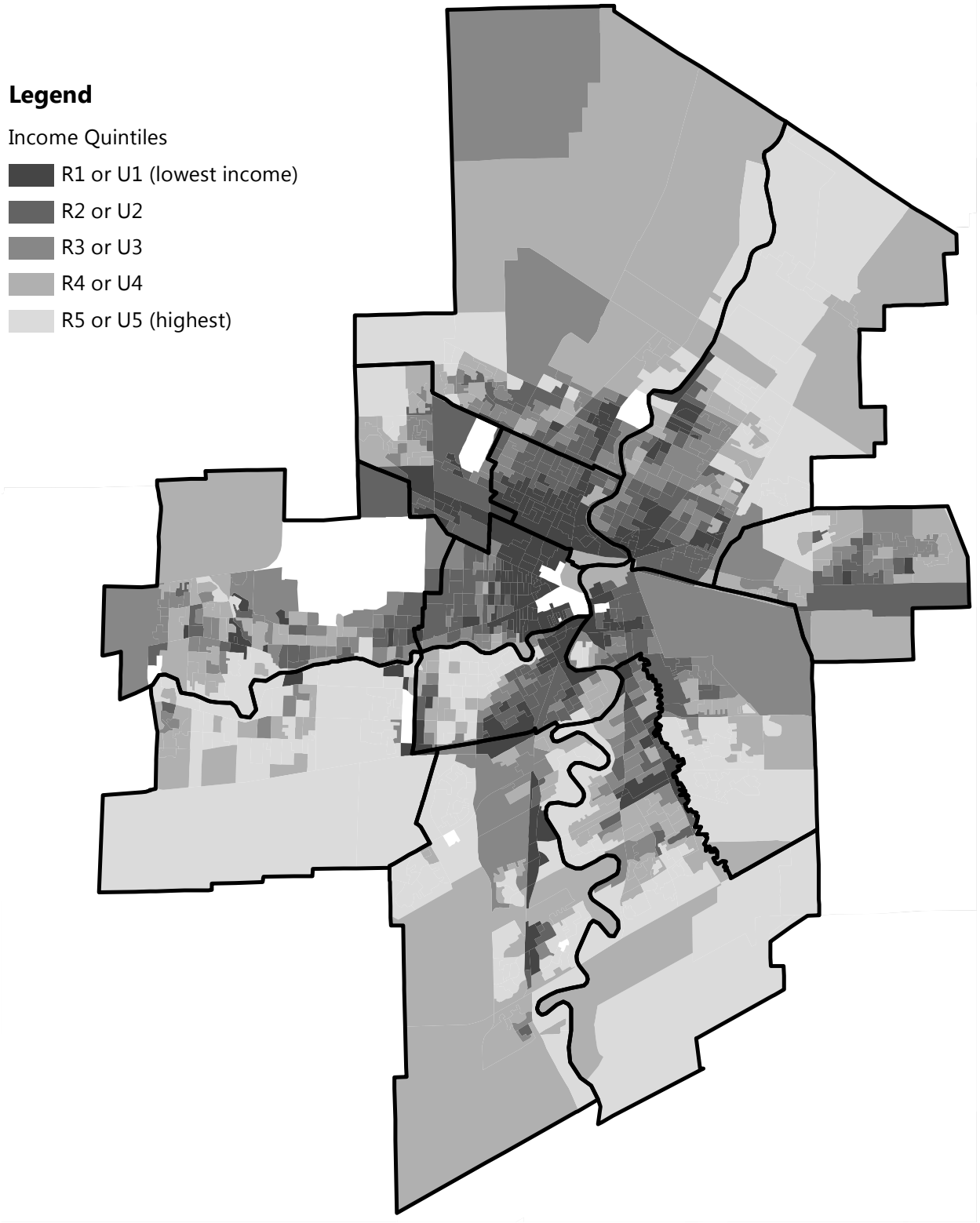


Charles Burchill, Manitoba Centre for Health Policy. January 2009
Based on 20% Population groups of Average Household Income by Census Dissemenination Areas. Census of Canada 2006.

Note: White areas in map indicate Census areas which are not enumerated (such as parks), are suppressed due to small numbers, or have not been reported for other reasons.

Updated November 19, 2012

Figure 1.5: Distribution of Urban Income Quintiles in Winnipeg, 2006 Census Data Dissemination Areas
Quintile breaks are at different points in Winnipeg



Charles Burchill, Manitoba Centre for Health Policy. January 2009
Based on 20% Population groups of Average Household Income by Census Dissemenination Areas. Census of Canada 2006.

Note: White areas in map indicate Census areas which are not enumerated (such as parks), are suppressed due to small numbers, or have not been reported for other reasons.

1.8 Exclusions

Each indicator has specific exclusions associated with it (Refer to Appendix Table A.4 for a description of how each indicator and factor was defined and calculated). Some overall exclusions were applied to all analyses in this report: births occurring outside of Manitoba were not included and mothers not registered with Manitoba Health during pregnancy were also excluded.

1.9 Additional Reports

Some key perinatal indicators have been left out of this report or are not covered to their fullest extent because they have been explored in other MCHP reports or are being included in upcoming MCHP reports. Readers are referred to these reports for additional information related to maternal and infant health in Manitoba. The name of the report and the perinatal indicators included in these reports are as follows:

2012

How are Manitoba's Children Doing? (Information on child mortality, hospital utilization (hospital episodes), physician visits, injury hospitalization, intentional versus unintentional injury hospitalization, teen pregnancy, teen births)

The Early Development Instrument (EDI) in Manitoba: Linking Socioeconomic Adversity and Biological Vulnerability at Birth to Children's Outcomes at Age 5 (Information on the association of EDI performance to five–minute Apgar scores, birth weight, **breastfeeding initiation**, premature birth, size for **gestational age**)

2011

Manitoba Immunization Study (Information on immunizations)

2010

Evaluation of the Healthy Baby Program (Information on the association between the Healthy Baby program and **adequate prenatal care**, small–for–gestational–age, **large–for–gestational–age**, low five–minute Apgar scores, low birth weight, high birth weight, preterm birth, breastfeeding initiation, children in care, congenital anomalies, continuity of care in infants, hospitalizations during the first year of life)

Health Inequities in Manitoba: Is the Socioeconomic Gap in Health Widening or Narrowing Over Time? (Information on breastfeeding initiation, teen pregnancy)

Profile of Metis Health Status and Healthcare Utilization in Manitoba: A Population–Based Study (Information on breastfeeding initiation, cesarean births, infant mortality, children whose families are on income assistance, newborn hospital readmissions, teen pregnancy)

2008

Manitoba Child Health Atlas Update (Information on teen pregnancy and birth, cesarean births, **vaginal birth after cesarean (VBAC)**, preterm birth and size for gestational age, breastfeeding initiation and duration, prenatal and family risk factors (including lone–parent families and low parental education), congenital anomalies, hospital readmissions for newborns, infant mortality)

What Works? A First Look at Evaluating Manitoba's Regional Health Programs and Policies at the Population Level (Information on breastfeeding initiation, cesarean births, teen pregnancy)

2003

The Manitoba RHA Indicators Atlas: Population–Based Comparison of Health and Healthcare Use (Information on preterm birth, teen pregnancy, cesarean births, low and high birth weight, breastfeeding initiation, infant mortality)

2002

The Health and Healthcare Use of Registered First Nations People Living in Manitoba: A Population–Based Study (Information on breastfeeding initiation, cesarean births)

1.10 Reference List

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Chapter 2: Profile of Women Giving Birth

2.1 Introduction

This report focuses on women giving birth in Manitoba between 2001/02 to 2008/09. In order to provide an appropriate time frame for follow–up (up to one year) for the births that occurred in 2008/09, we also used data from 2009/10 (e.g., to calculate **infant mortality rates**, maternal postpartum readmission rates). Tests for linear trends are conducted for 2001/02 to 2008/09.

Table 2.1.1 provides a summary of the total number of pregnancies by year and pregnancy outcomes by year (2001/02–2009/10) for women living in Manitoba. The number of pregnancies ranged from 18,008 in 2001/02 to 19,105 in 2009/10. Although the number of pregnancies has increased somewhat in recent years, the test for linear trend over time was not statistically significant. However, there has been a significant increase over time in the number of live born and stillborn deliveries, ranging from 13,411 in 2002/03 to 14,928 in 2008/09. Between 21% and 25% of pregnancies end in a pregnancy loss each year (i.e., molar pregnancy, **ectopic pregnancy**, **spontaneous abortion**, or induced abortion).

Table 2.1.2 provides a summary of birth outcomes by year for women living in Manitoba and giving birth in Manitoba. The number of live births has been steadily increasing from 13,706 in 2001/02 to 15,262 in 2009/10. This increase is statistically significant at $p<0.05$. Note: Deliveries are counted as one delivery per mother while births count every baby born (i.e., a triplet delivery would count for three births); therefore, the number of births exceeds the number of deliveries. For a listing of the congenital anomalies that were diagnosed at birth and included in the Birth Outcomes table, see the Appendix Table A.4.

As depicted in Figure 2.1.1, a majority of these deliveries occur in Winnipeg. For this map, only hospitals that had 20 or more deliveries are shown. Table 2.1.3 provides the number of women giving birth in all hospitals or medical facilities in Manitoba (2008/09) that had six or more deliveries. Further information on how far women had to travel to give birth can be found in Section 4.1 Travelling to Give Birth of Chapter 4.

As described in Chapter 1, no age–adjustment was done on the rates presented in this report. In order to assist in interpreting the results by region, we have provided pie charts (Figure 2.1.2) of the age distributions (by age groups 12 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 39, and 40 and older) of women giving birth by **Regional Health Authority** (RHA) and a table of the age distributions by RHA and Winnipeg Community Areas (CA) (Appendix Tables A.2 and A.3). Additionally statistical testing was done for each age group comparing it to the Manitoba (or in the case of the Winnipeg CA's, Winnipeg) level proportion for that age group. Those which were statistically significantly different than the Manitoba/Winnipeg proportion (at $p<0.01$) are indicated by an asterisk "*" next to the age group.

Table 2.1.1: Pregnancy Outcomes by Year, 2001/02-2009/10

Pregnancy Outcome	2001/02		2002/03		2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		2009/10	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Molar Pregnancy	20	0.1	16	0.1	18	0.1	40	0.2	36	0.2	17	0.1	12	0.1	17	0.1	19	0.1
Ectopic Pregnancy*	214	1.2	208	1.2	202	1.1	200	1.2	221	1.3	211	1.2	188	1.0	187	1.0	193	1.0
Spontaneous Abortion*	1,311	7.3	1,322	7.4	1,306	7.2	1,343	7.7	1,305	7.4	1,355	7.4	1,290	6.9	1,303	6.9	1,237	6.5
Induced Abortion*	2,874	16.0	2,917	16.3	2,915	16.1	2,401	13.8	2,223	12.7	2,544	13.8	2,539	13.5	2,542	13.4	2,465	12.9
Live/Stillborn Delivery*	13,589	75.5	13,411	75.0	13,629	75.4	13,417	77.1	13,763	78.4	14,250	77.5	14,804	78.6	14,928	78.7	15,191	79.5
Total Number of Pregnancies	18,008		17,874		18,070		17,401		17,548		18,377		18,833		18,977		19,105	

The counts in this table reflect the number of pregnancies, while the counts in Table 2.1.2 reflect the number of births
* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

Table 2.1.2: Birth Outcomes by Year 2001/02-2009/10

Birth Outcome	2001/02		2002/03		2003/04		2004/05		2005/06		2006/07		2007/08		2008/09		2009/10	
	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000	N	Rate per 1,000
Live Births - Singletons	13,321	973.0	13,121	975.1	13,333	971.2	13,167	975.8	13,534	975.0	13,989	974.4	14,575	974.1	14,788	974.0	14,754	971.9
Live Births - Multiples	369	27.0	335	24.9	396	28.8	326	24.2	347	25.0	367	25.6	388	25.9	395	26.0	426	28.1
Stillbirths*	92	6.7	89	6.6	99	7.1	90	6.6	82	5.9	82	5.7	75	5.0	104	6.8	76	5.0
Live Births that are less than 500 grams and 20	20	1.4	34	2.5	40	2.9	25	1.8	25	1.8	24	1.7	31	2.1	23	1.5	14	0.9
Neonatal Death (0-27 days)*	49	3.6	44	3.3	47	3.4	46	3.4	40	2.9	39	2.7	51	3.4	47	3.1	36	2.4
Post Neonatal Death (28-364 days)	33	2.4	24	1.8	35	2.6	21	1.6	22	1.6	33	2.3	35	2.3	24	1.6	24	1.6
Congenital Anomalies†	162	11.7	169	12.4	164	11.8	159	11.7	203	14.5	157	10.9	173	11.5	169	11.0	190	12.4

The linear trend over time for total livebirths (not shown) was statistically signficant overtime at p<0.05
'*' indicates that the linear trend over time is significant at p<0.05
's' indicates suppressed due to small numbers
'†' For a list of the Congenital Anomalies Diagnosed at birth see Appendix Table A.1
The denominator for the rate of live births, stillbirths, and congenital anomalies is total births (live birth plus still births)
The denominator for the rate of neonatal deaths (0-27 days) and postneonatal deaths (28-364 days) is live births
The counts in this table reflect the number of births, while the counts in Table 2.1.1 reflect the number of pregnancies

Source: Manitoba Centre for Health Policy, 2012

Table 2.1.3: Hospital and Medical Facilities Where Women Gave Birth, 2008/09

Hospital/Medical Facilities	Number of Women Giving Birth
St. Boniface Hospital	5,099
Health Sciences Centre	4,925
Brandon General Hospital	1,317
Thompson General Hospital	857
Boundary Trails Health Centre	811
Bethesda Hospital - Steinbach	410
Dauphin General Hospital	323
The Pas Health Complex Inc.	306
Portage District General Hospital	286
Selkirk & District General Hospital	189
Swan River Valley Hospital	97
Ste. Anne Hospital	66
Neepawa District Memorial Hospital	63
Flin Flon General Hospital Inc.	57
Carman Memorial Hospital	27
Altona Community Memorial Health Centre	20
Notre Dame Medical Nursing Unit	7

Source: Manitoba Centre for Health Policy, 2012

Figure 2.1.1: Map of Hospitals where Women Gave Birth, 2008/09
Only hospitals with 20 or more deliveries were mapped

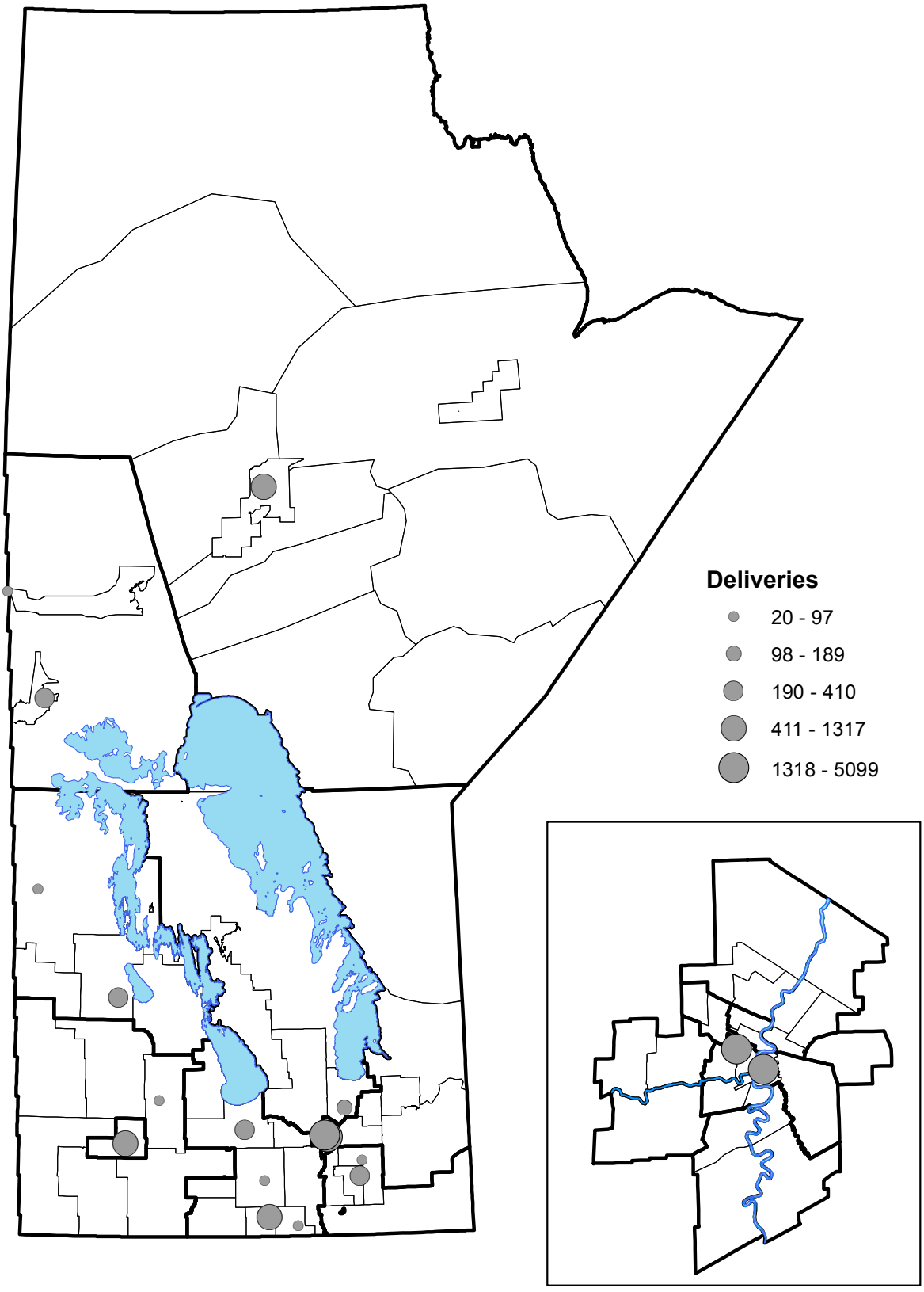
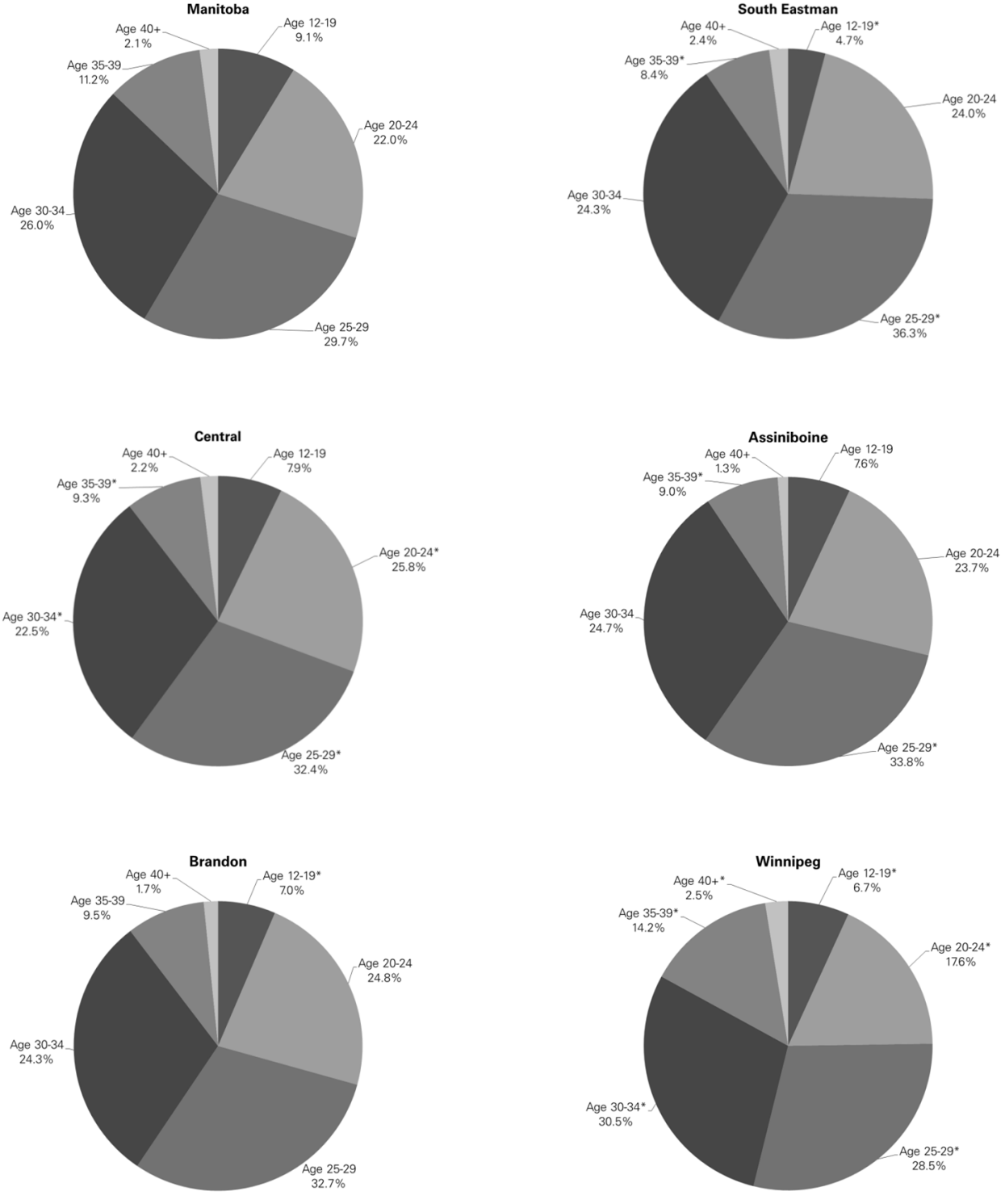
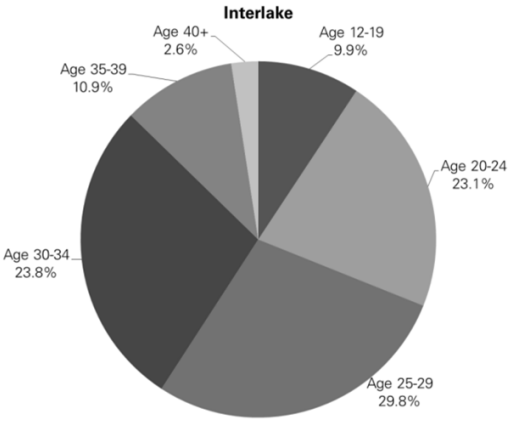
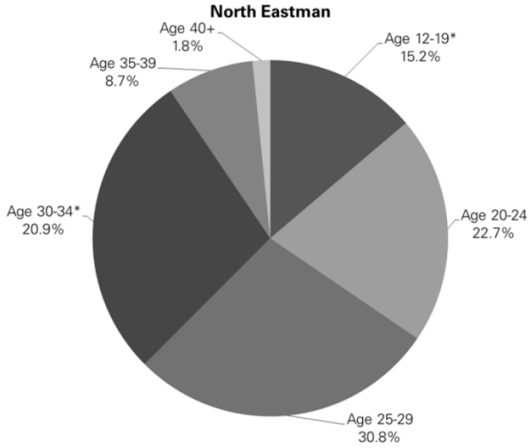


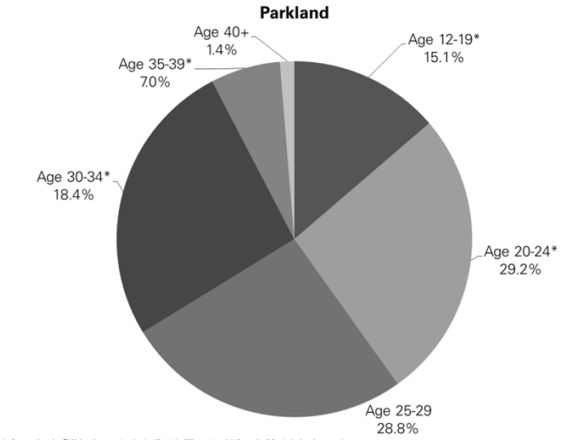
Figure 2.1.2: Women Who gave Birth in Each Age Group by RHA, 2007/08-2008/09



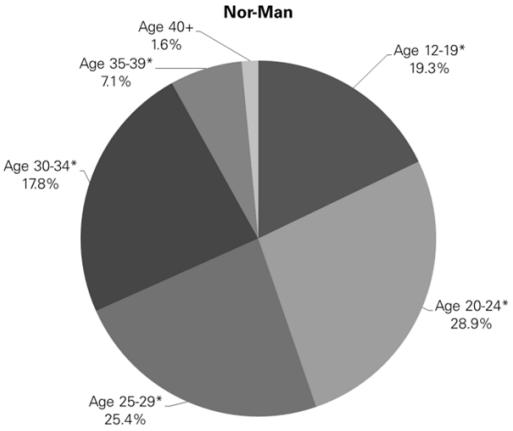
"*" indicates that the RHA level proportion is significantly different (p=.01) from the Manitoba level proportion

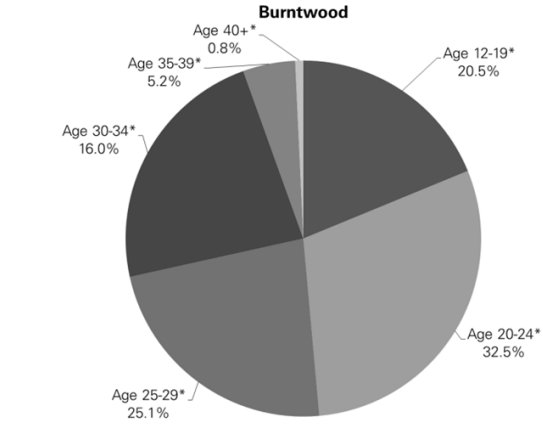






Churchill's distributions are suppressed due to small numbers





"*" indicates that the RHA level proportion is significantly different (p=.01) from the Manitoba level proportion

Source for All Pie Graphs: Manitoba Centre for Health Policy, 2012

2.2 Women Giving Birth with Less Than a Grade 12 Education

Background

Low education (generally defined as having less than Grade 12 education) among pregnant women and new mothers is consistently associated with a wide array of suboptimal behaviours and outcomes, including reduced use of pre–pregnancy folic acid supplementation (Miller, Liu, Wen, & Walker, 2011), shorter duration of breastfeeding (Al–Sahab, Lanes, Feldman, & Tamim, 2010), higher prevalence of physical abuse during pregnancy (Heaman, 2005), **inadequate prenatal care** (Heaman, Green, Newburn–Cook, Elliott, & Helewa, 2007), and higher rates of preterm and small–for–gestational–age births (Heaman M, et al., in press) and low birth weight (Ohlsson & Shah, 2008). Studies have also demonstrated that low maternal education is a predictor of long–term effects on child health (e.g., obesity) (Cassimos, Sidiropoulos, Batzios, Balodima, & Christoforidis, 2011) and child development (e.g., academic performance, language development) (Pati, Hashim, Brown, Fiks, & Forrest, 2011). As such, it represents an important indicator of both short– and long–term adverse maternal and child outcomes.

Calculation of the Indicator

The proportion of women with less than a Grade 12 education was calculated using the Families First Screening data by dividing the number of women with live births who had less than a Grade 12 education by the total number of live births in a given time and place. The Families First measure of maternal education shows substantial agreement with data from Manitoba Education (Brownell, Chartier, Au, & Schultz, 2010). The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality in the early years of the **Families First Screen**. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were not included in the analysis.

Key Observations

- Time Trend (2003/04–2008/09), Figure 2.2.1
  - The Manitoba rate ranged from 20.1% (2003/04) to 18.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 20.1% in 2003/04 to a low of 18.7% in 2008/09.
  - The rate for the Rural South ranged from 24.2% (2003/04) to 22.1% (2008/09); the linear trend was significant; the rate decreased over time from a high of 24.7% in 2004/05 to a low of 22.1% in 2008/09.
- RHA (2007/08–2008/09), Figure 2.2.2
  - The Manitoba rate was 18.9%.
  - South Eastman (13.9%) and Winnipeg (15.8%) were significantly lower than the Manitoba rate; while Central (30.6%), Assiniboine (22.4%), Parkland (25.3%), NOR–MAN (26.1%), and Burntwood (33.7%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 2.2.3
  - The Winnipeg rate was 15.8%.
  - Fort Garry (5.2%), Assiniboine South (5.0%), St. Boniface (7.9%), St. Vital (6.4%), Transcona (10.1%), River Heights (3.3%), Seven Oaks (11.4%), and St. James–Assiniboia (9.5%) were significantly lower than the Winnipeg rate; while Inkster (22.4%), Downtown (34.7%), and Point Douglas (43.6%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 2.2.4
  There was a statistically significant difference in the proportion of women giving birth with less than a Grade 12 education for the following characteristics:
  - Maternal Age – With each successive increase in maternal age, there were fewer women with less than a Grade 12 education.

- Income Quintile – With each successive decrease in area–level income, there was an increase in the number of women with less than a Grade 12 education. The gradient was much steeper in urban areas than in rural areas.
- Income Assistance – 61.7% of the women giving birth who were on income assistance had less than a Grade 12 education compared to 12.9% of the women who were not on income assistance.
- **Marital Status** – 54.7% of the women giving birth who were **lone parents** had less than a Grade 12 education compared to 14.2% of those who were married/partnered.
- Social Isolation – 33.6% of the women giving birth who were socially isolated had less than a Grade 12 education compared to 17.7% who were not socially isolated.
- **Parity** – 16.8% of the **primiparous** women had less than a Grade 12 education compared to 20.3% of **multiparous** women.

Comparison to Other Findings

The rate of new mothers in Canada with less than Grade 12 education decreased from 19.5% in 2000/01 to 14.8% in 2002/03 (Public Health Agency of Canada, 2008). The rate of new mothers with less than Grade 12 education in Manitoba during 2003/04 was 20.1%, which was 36% higher than the national rate of 14.8% for 2002/03 (Public Health Agency of Canada, 2008). The rate of mothers with less than Grade 12 education in both Canada and Manitoba has decreased over time.

Limitations

Those women living on First Nations communities were excluded from this analysis as the Families First Screen is not conducted in these communities. Additionally, cases where the variable was missing in the data set were excluded. Over the six years of analysis, there were 26,540 cases (or 31.3% of women giving birth) that were excluded for these reasons. There may be differences in characteristics between women for whom we have Families First Screening data for this variable and those for whom we do not.

Summary

The proportion of women who give birth with less than a Grade 12 education is an important indicator of short– and long–term maternal and child outcomes. Rates of low maternal education in Manitoba are higher than the national average, but demonstrated a declining trend from 2003/04 to 2008/09. Women with low education were more likely to be young, multiparous, a lone parent, on income assistance, socially isolated, or residing in lower income urban and rural areas.

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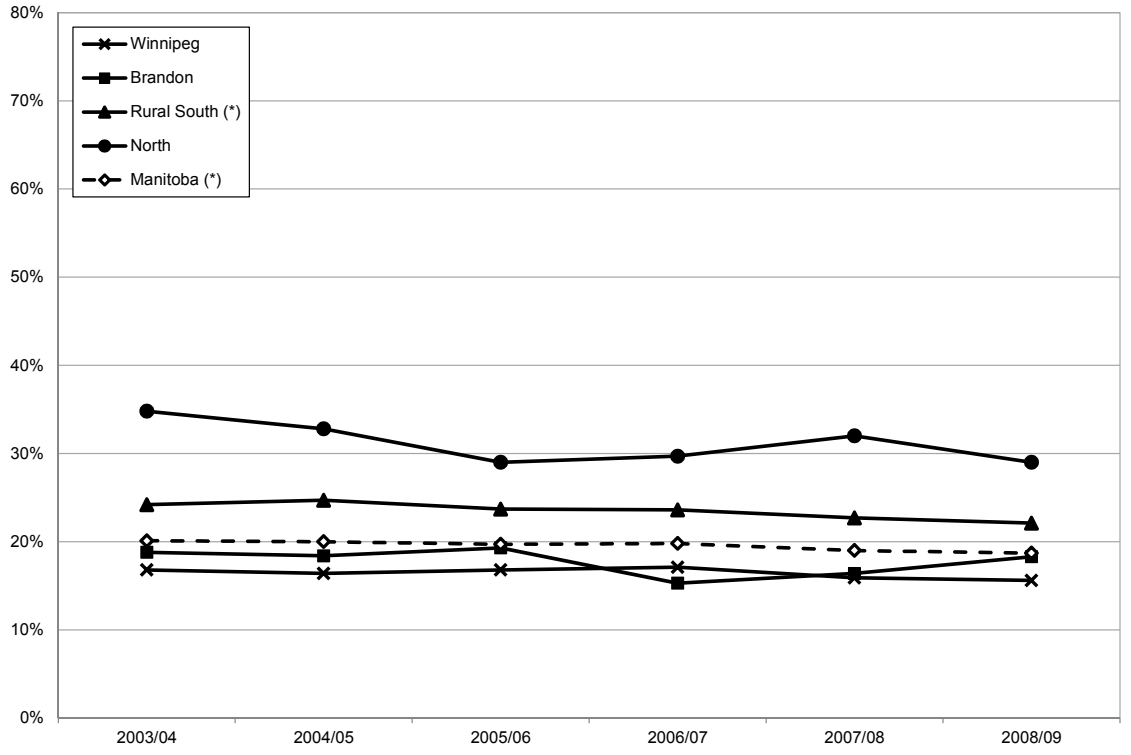
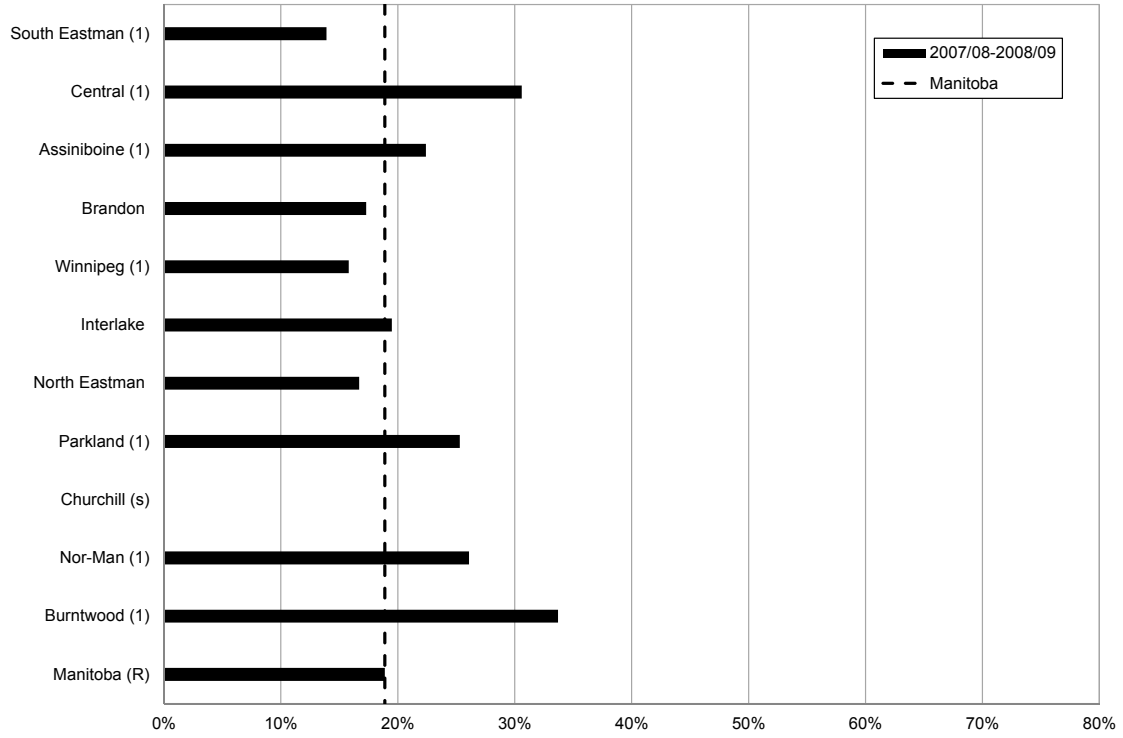
Figure 2.2.1: Proportion of Women with Less than a Grade 12 Education by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

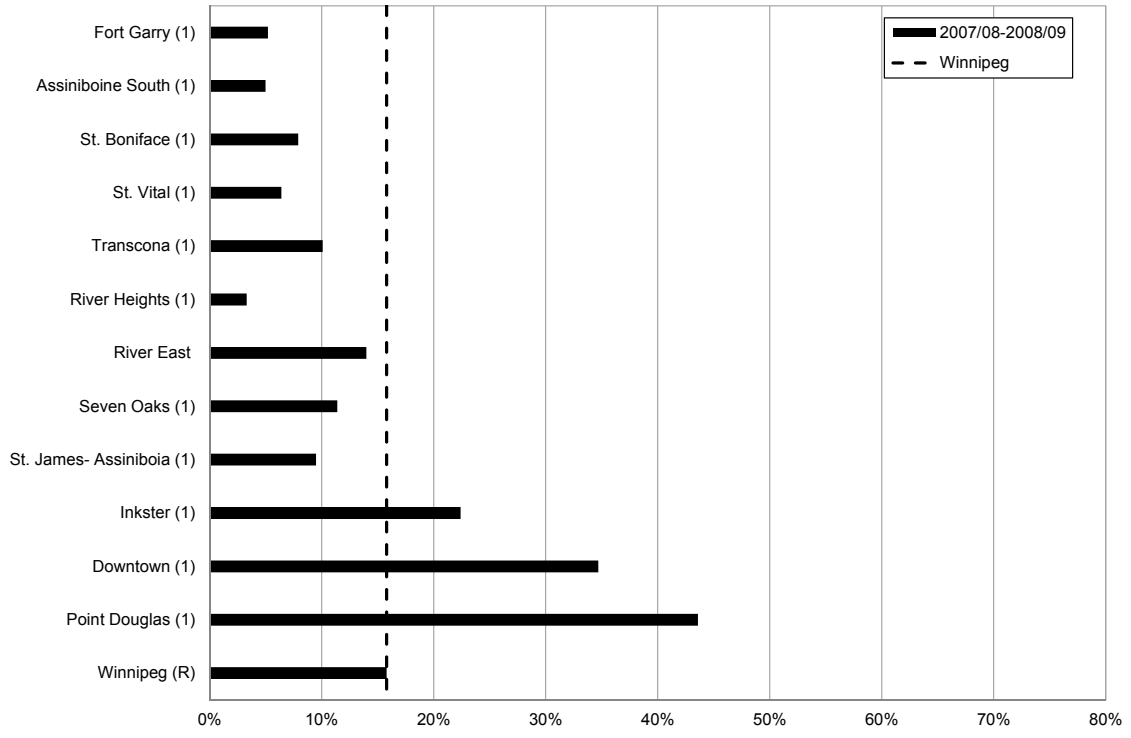
Figure 2.2.2: Proportion of Women with Less than a Grade 12 Education by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

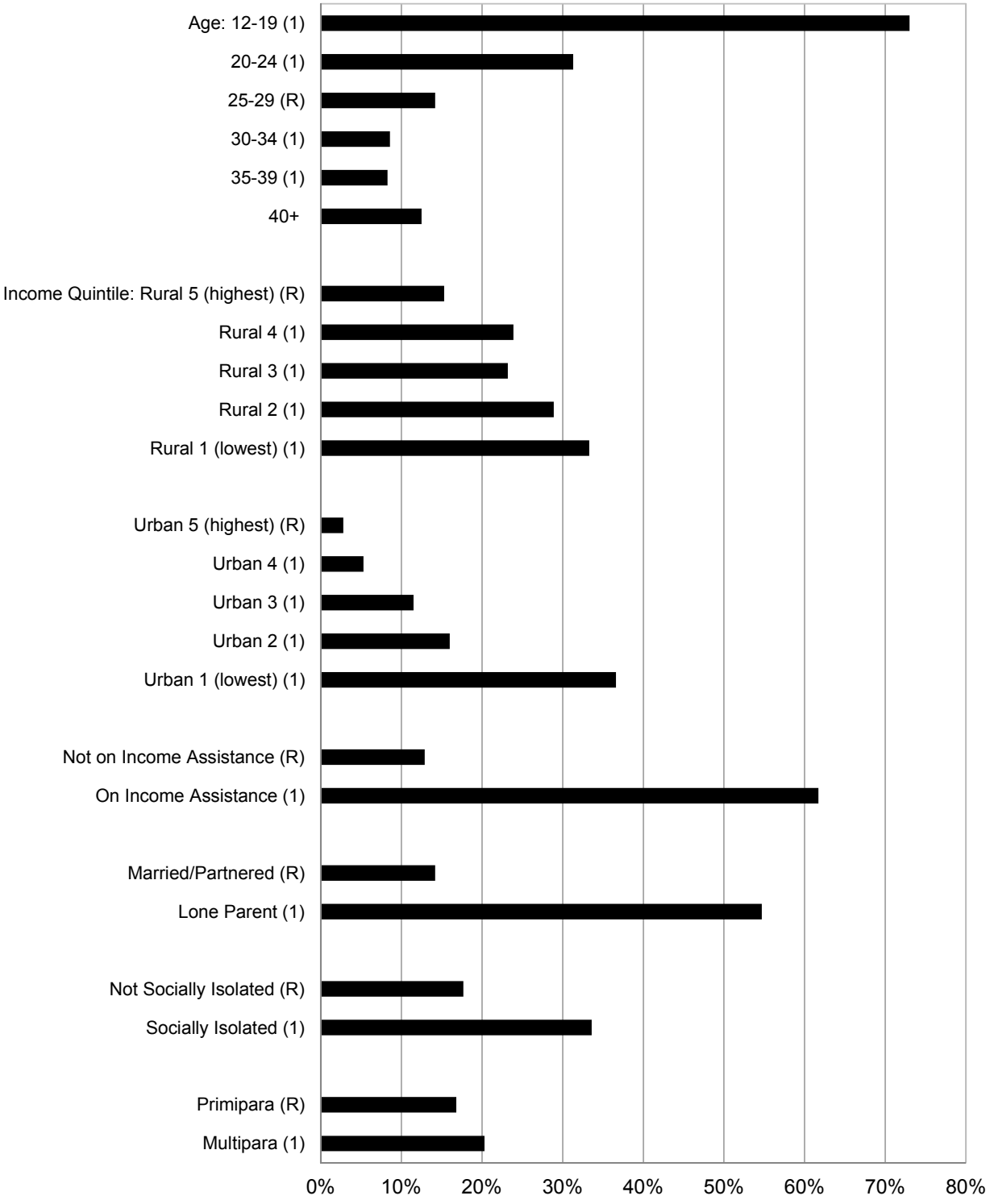
Figure 2.2.3: Proportion of Women with Less than a Grade 12 Education by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.2.4: Proportion of Women with Less than Grade 12 Education by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

2.3 Women Giving Birth Who are Lone Parents

Background

Women who are designated as lone parents are of single marital status. Single marital status is associated with a wide array of adverse pregnancy–related outcomes (Shah, Zao, Al–Wassia, & Shah, 2011) and therefore represents an important indicator of maternal and child health. It has been associated with higher rates of **depression** during pregnancy (Koleva, Stuart, O'Hara, & Bowman–Reif, 2011), smoking during pregnancy (Al–Sahab, Saqib, Hauser, & Tamim, 2010), **substance abuse** during pregnancy (El Marroun, et al., 2008), experiencing physical abuse during pregnancy (Heaman, 2005), preterm birth (Beeckman, van De Putte, Putman, & Louckx, 2009; Kirchengast, Mayer, & Voigt, 2007; Luo, Wilkins, & Kramer, 2004), low birth weight (Kirchengast et al., 2007; Luo et al., 2004), small–for–gestational–age birth (Luo et al., 2004; Raatikainen, Heiskanen, & Heinonen, 2005), and higher rates of neonatal and postneonatal mortality (Luo et al., 2004). Single marital status is also associated with early cessation of breastfeeding (Al–Sahab, Lanes, Feldman, & Tamim, 2010), as well as poor child health in school–aged children (Belsky, Bell, Bradley, Stallard, & Stewart–Brown, 2007).

Calculation of the Indicator

The proportion of women who are lone parents was calculated by dividing the number of women with live births who were lone parents by the total number of women with live births in a given time and place. A woman was considered a lone parent if according to the Families First Screen she was a single parent. If the single parent variable was missing in the Families First Screen and no marriage was reported to Manitoba Health, the cases were excluded. A woman giving birth was considered married/partnered if either a marriage was reported to Manitoba Health OR, if according to the Families First Screen, she was not a single parent. The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality in the early years of the Families First Screen. Stillbirths were not included in this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2003/04–2008/09), Figure 2.3.1
  - The Manitoba rate ranged from 12.0% (2005/06) to 11.0% (2007/08) and was relatively stable.
- RHA (2007/08–2008/09), Figure 2.3.2
  - Manitoba rate was 11.2%.
  - South Eastman (3.2%), Central (5.8%), Assiniboine (7.2%), and North Eastman (5.5%) were significantly lower than the Manitoba rate; while Winnipeg (13.3%), Parkland (14.9%), NOR–MAN (19.0%), and Burntwood (20.5%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 2.3.3
  - Winnipeg rate was 13.3%.
  - Fort Garry (6.3%), Assiniboine South (5.5%), St. Boniface (7.2%), St. Vital (6.7%), Transcona (9.1%), River Heights (5.5%), River East (10.5%), Seven Oaks (9.5%), and St. James–Assiniboia (9.9%) were significantly lower than Winnipeg rate; while Inkster (19.9%), Downtown (28.3%), and Point Douglas (30.9%) were significantly higher than Winnipeg rate (13.3%).
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 2.3.4
  There was a statistically significant difference in the proportion of women giving birth who were lone parents for the following characteristics:
  - Maternal Age – With each successive increase in maternal age, there were fewer lone parents.
  - Income Quintile –With each successive increase in urban area–level income, there was a decrease in the number of lone parents.
  - Income Assistance – 53.7% of the women giving birth who were on income assistance were lone parents compared to 5.1% of the women who were not on income assistance.

- Maternal Education – 32.1% of the women giving birth, who had less than a Grade 12 education, were lone parents compared to 6.1% of those who had a Grade 12 education.
- Social Isolation – 23.9% of the women giving birth who were socially isolated were lone parents compared to 9.9% who were not socially isolated.
- Parity – 13.3% of the primiparous women were lone parents compared to 9.0% of multiparous women.

Comparison to Other Findings

National rates of lone parent status for new mothers are not available (Luo et al., 2004).

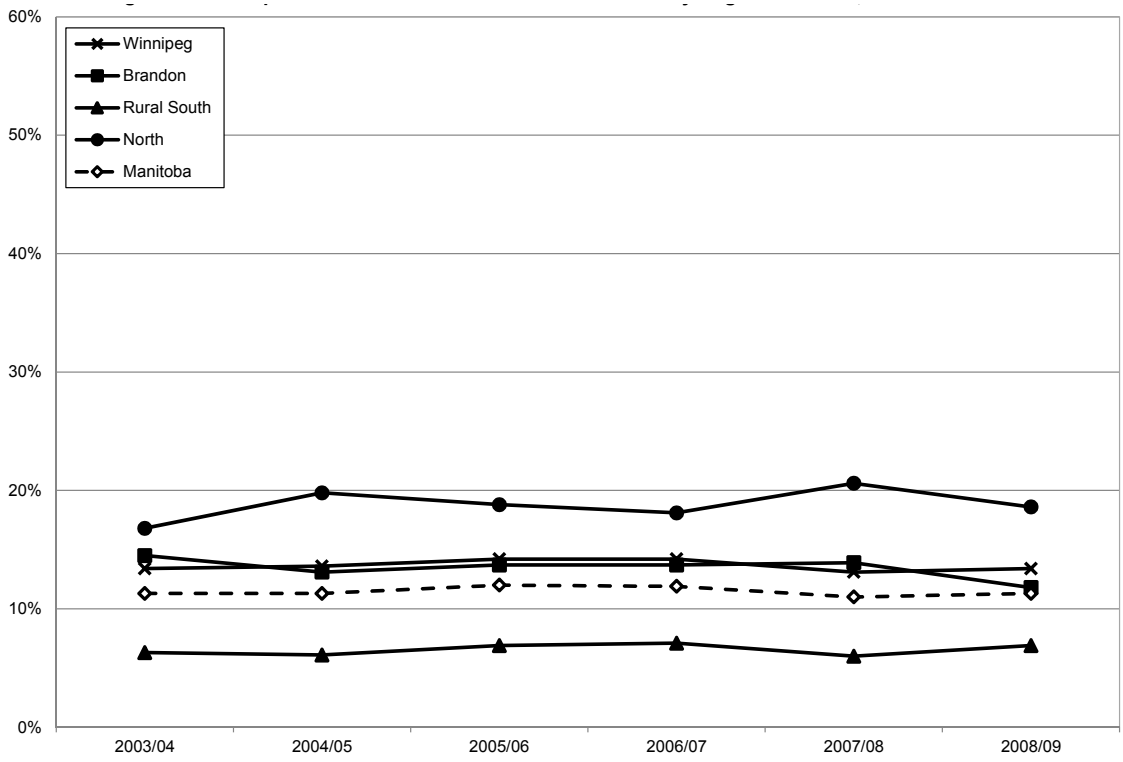
Limitations

Changes in marital status are not always reported to Manitoba Health; therefore, the rates of lone parents may be over– or under–estimated. Over the six years of analysis, there were 22,804 cases (approximately 26.5% of women having a live birth) that were excluded. There may be differences in characteristics between women for whom we have Families First Screening data for this variable and those for whom we do not.

Summary

The rate of lone parents was stable over the study period and was 11.2% in 2007/08–2008/09. This rate is higher among women who had less than Grade 12 education or were younger, primiparous, socially isolated, on income assistance, or living in socioeconomically disadvantaged areas. The proportion of lone parents varied widely across CAs in Winnipeg (5.5%–30.9%) and RHAs in Manitoba (3.2%–20.5%).

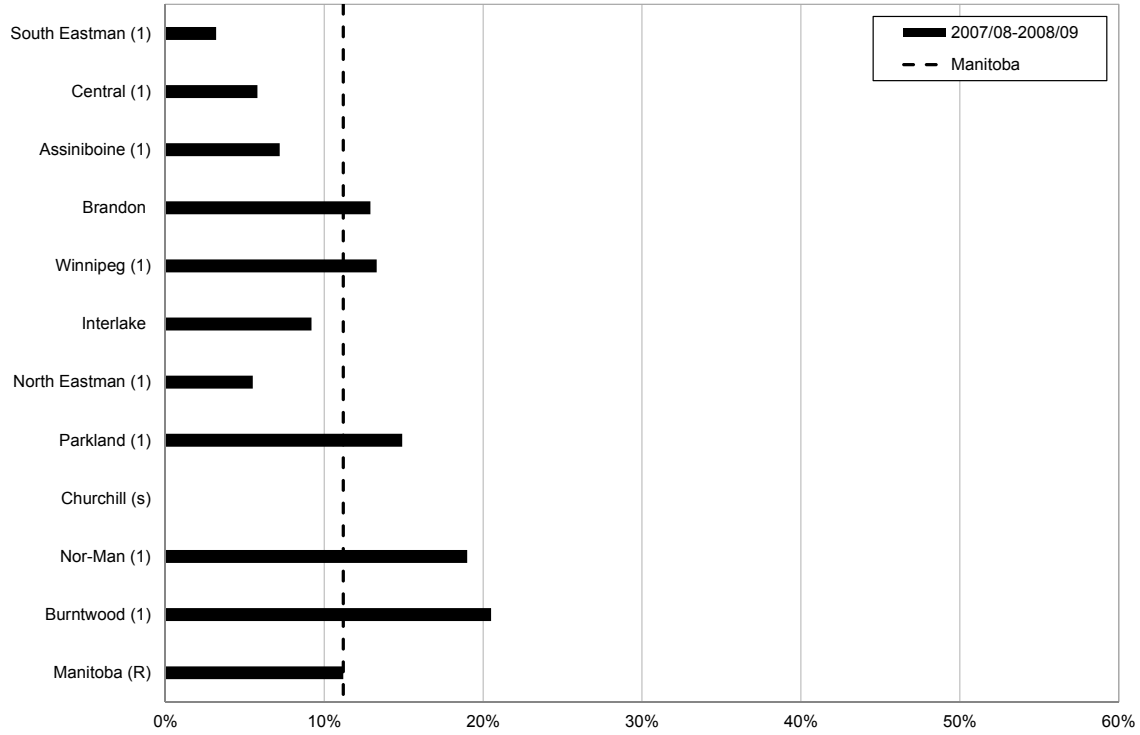
Figure 2.3.1: Proportion of Women who were Lone Parents by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

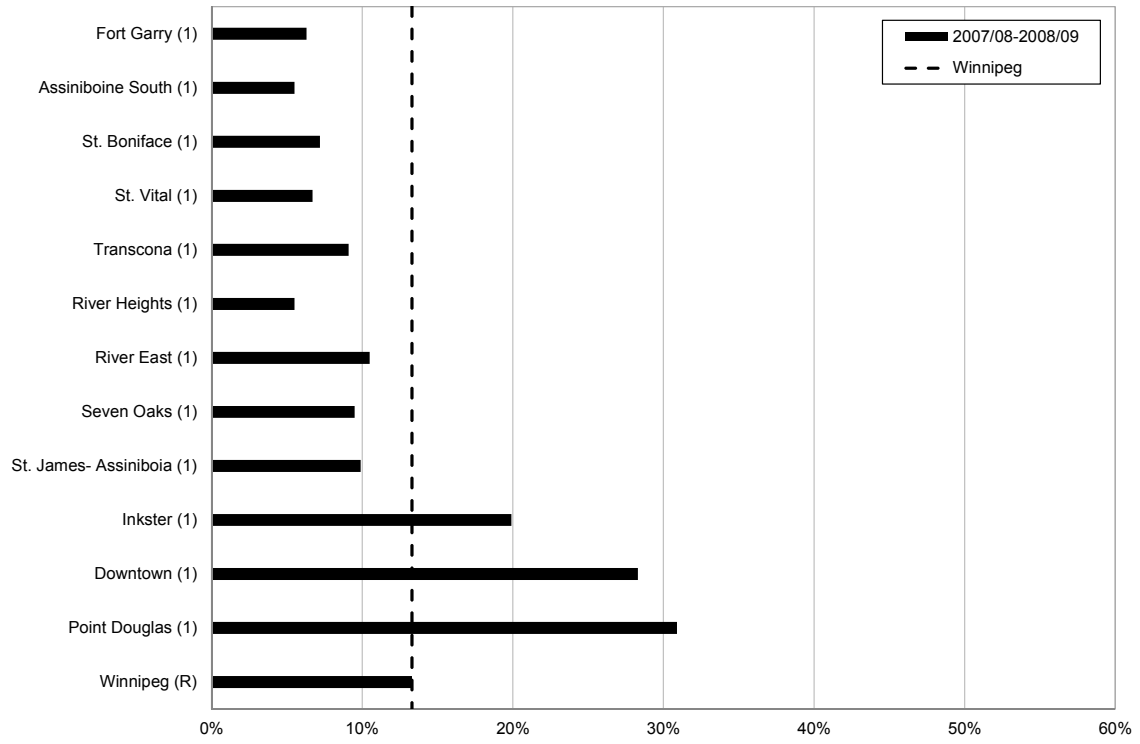
Figure 2.3.2: Proportion of Women who were Lone Parents by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policv. 2012

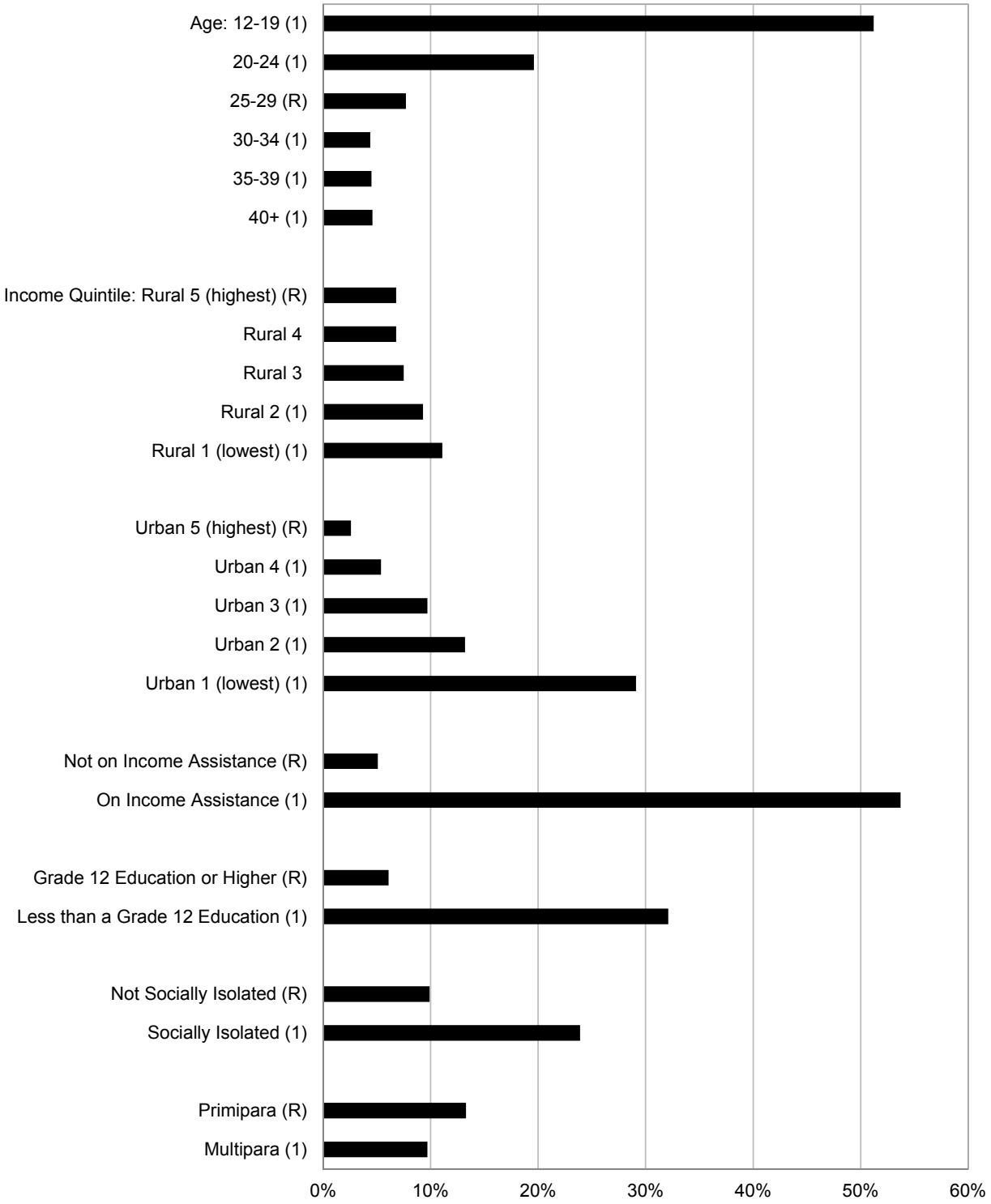
Figure 2.3.3: Proportion of Women who were Lone Parents by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.3.4: Proportion of Women who were Lone Parents by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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2.4 Social Isolation

Background

Inadequate social support is a potentially modifiable risk factor that has been related to adverse pregnancy and postpartum outcomes. During pregnancy, inadequate social support has been associated with preterm birth (Rauchfuss & Maier, 2011), smoking during pregnancy (Maxson, Edwards, Ingram, & Miranda, 2012), and antenatal depression (Leigh & Milgrom, 2008). Lack of social support during the postpartum period has consistently been linked to postpartum depression (Milgrom et al., 2008). Women's perception of social support may vary by parity (Hung, Yu, Chang, & Stocker, 2011) and immigrant status (Kingston et al., 2011).

Calculation of the Indicator

The proportion of women who were socially isolated was calculated by dividing the number of women with live births who were socially isolated by the total number of women with live births in a given time and place. Social isolation was determined using the Families First Screening data. The social isolation question addresses whether the mother/couple has enough support. Specifically the public health nurses assess whether there is a lack of social support and/or isolation related to culture, language, or geography. The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality concerns in the early years of the Families First Screen. The time trends were calculated across 2003/04–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2003/04–2008/09), Figure 2.4.1
    - The Manitoba rate ranged from 3.9% (2003/04) to 4.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.9% in 2003/04 to a high of 4.9% in 2007/08.
    - The Brandon rate ranged from 2.9% (2003/04) to 10.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.9% in 2003/04 to a high of 10.2% in 2008/09.
- RHA (2007/08–2008/09), Figure 2.4.2
    - Manitoba rate was 4.8%.
    - South Eastman (2.9%) and Winnipeg (4.2%) were significantly lower than the Manitoba rate; while Central (6.4%), Brandon (9.4%), and Interlake (7.7%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 2.4.3
    - Winnipeg rate was 4.2%.
    - Downtown (8.4%) was significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 2.4.4
  There was a statistically significant difference in the proportion of women giving birth who were socially isolated for the following characteristics:
    - Maternal Age – 10% of women who gave birth and were aged 40 and over were socially isolated; 3.6% of the women who gave birth and were aged 30 to 34 were socially isolated. These groups were significantly different from the reference group (aged 25 to 29, 4.8%).
    - Income Quintile – There was a significant relationship with area–level income in urban and rural areas of Manitoba. In rural areas, there were significantly more women who were socially isolated in Rural 1 to Rural 4 (6.1%–4.8%) compared to the reference group (Rural 5, 3%). In urban areas with each successive increase in area–level income, there was a decrease in the proportion of women who were socially isolated.

- Income Assistance – 9.2% of the women giving birth who were on income assistance were socially isolated compared to 4.2% of the women who were not on income assistance.
- Maternal Education – 8.2% of the women giving birth who had less than a Grade 12 education were socially isolated compared to 3.6% of those who had a Grade 12 education.
- Marital Status – 10.7% of the women giving birth who were lone parents were socially isolated compared to 4.0% of those who were married/partnered.
- Parity – 4.3% of the primiparous women were socially isolated compared to 5.1% of multiparous women.

Comparison to Other Findings

The rate of women who were assessed as being socially isolated in Manitoba (4.8%, 2007/08–2008/09) is similar to that reported in the Canadian Maternity Experiences Survey regarding the availability of support "none of the time" or "a little of the time" since the birth of the baby (5.2%). Other national surveys of maternity experiences (Declercq, Sakala, Corry, & Applebaum, 2006; Redshaw & Heikkila, 2010) did not assess social support during pregnancy or postpartum.

Limitations

Women living in First Nations communities were excluded from this analysis as the Families First Screen is not conducted in these communities. Additionally, cases where the variable was missing were excluded. Over the six years of analysis, 25,451 cases (or 30% of women having a live birth) were excluded for these reasons. There may be differences in characteristics between women for whom we have Families First Screening data on this variable and those for whom we do not. Changes over time in this variable may be the result of increased level of comfort on the part of public health nurses in exploring this issue.

Summary

Overall, 4.8% of women in Manitoba reported being socially isolated in 2007/08–2008/09, with higher rates reported in Central (6.4%), Brandon (9.4%), and Interlake (7.7%). During the period of 2003/04–2008/09, this rate increased almost 20% in Manitoba with a much greater increase, from 2.9% to 10.2%, observed in the region of Brandon. The reason for the sudden increase in rate of social isolation in Brandon in 2007/08 and 2008/09 is unknown and needs further investigation. Within Winnipeg, the Downtown area had almost twice the proportion of women reporting social isolation (8.4%) as compared to the Winnipeg rate (4.2%). The highest rates of social isolation were reported among women who had less than Grade 12 education, were older (40+) or were on income assistance, lone parents, or multiparous. The rates of social isolation differed by area–level income, with higher rates observed in lower income areas particularly in urban areas.

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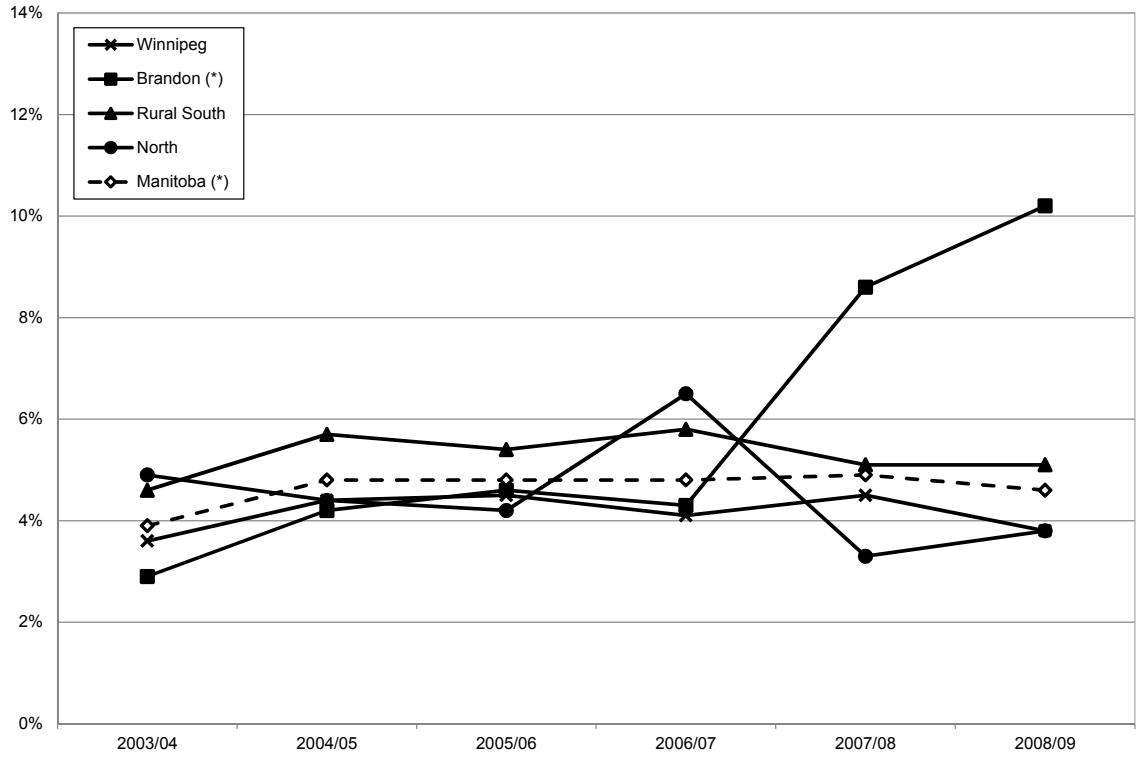
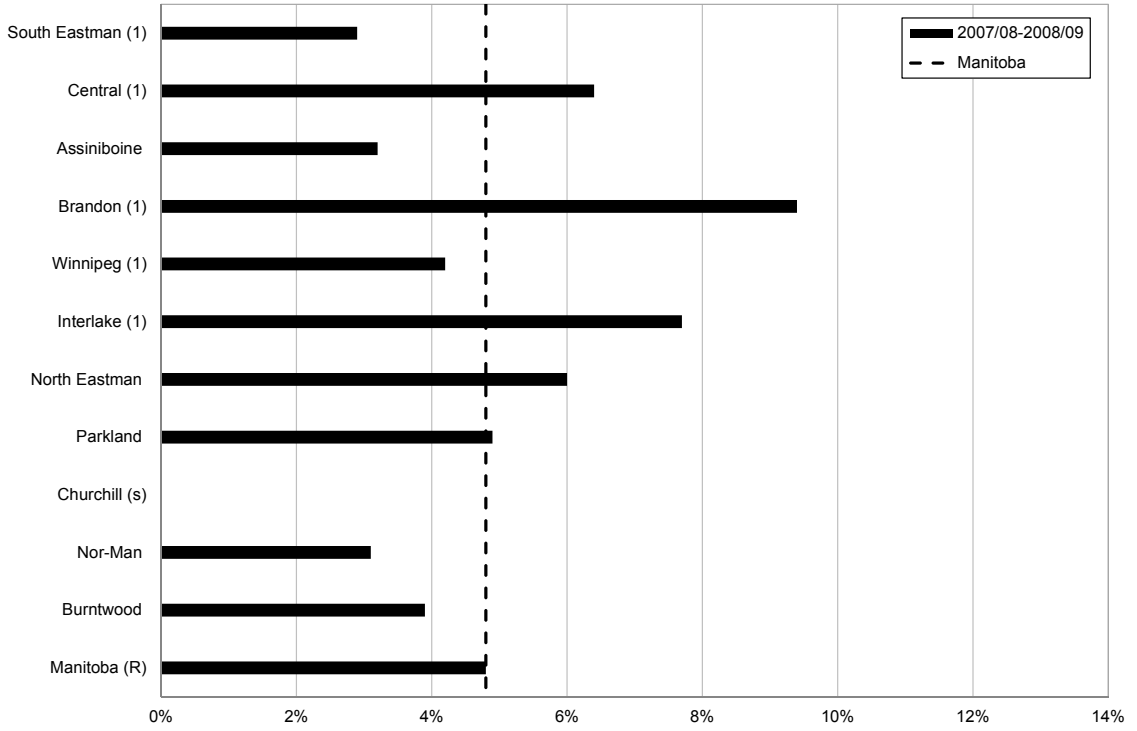
Figure 2.4.1: Proportion of Women who were Socially Isolated by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

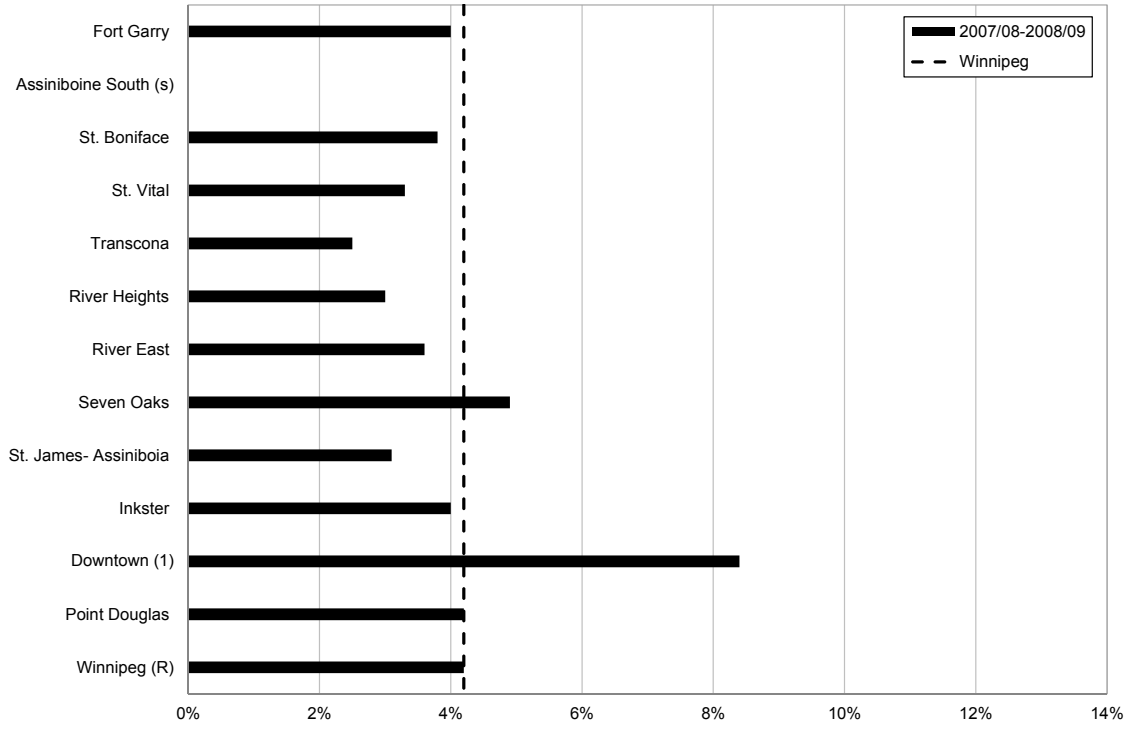
Figure 2.4.2: Proportion of Women who were Socially Isolated by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

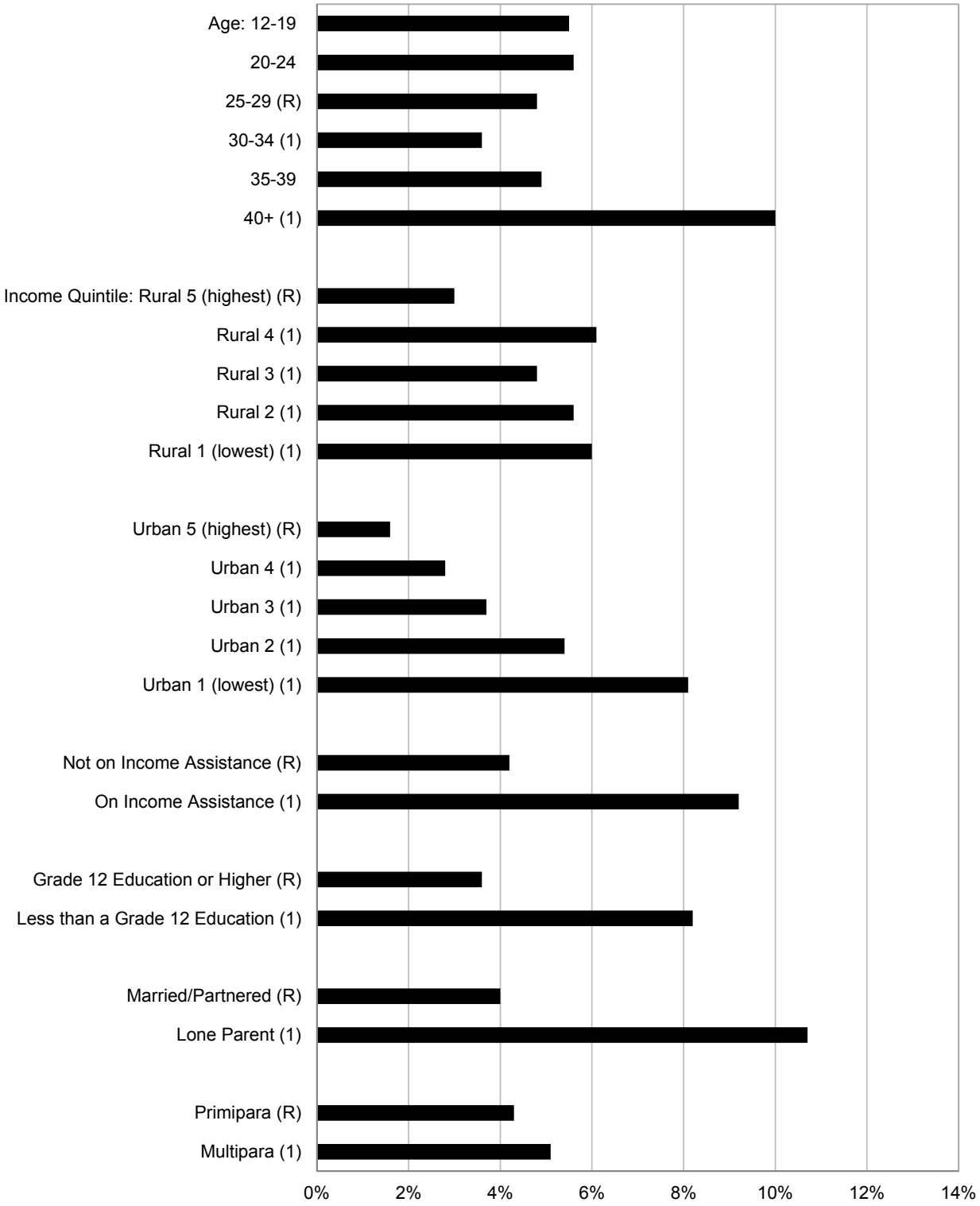
Figure 2.4.3: Proportion of Women who were Socially Isolated by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.4.4: Proportion of Women who were Socially Isolated by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

2.5 Women Giving Birth who Received Income Assistance

Background

Receipt of income assistance is a measure of low socioeconomic status at an individual/family level. Families that receive income assistance may still experience incomes that are substantially below the Canadian poverty line (Canadian Council on Social Development (CCSD), 2002) and therefore child and family poverty remain significant concerns in Canada (Bryant, Raphael, Schrecker, & Labonte, 2011). Socioeconomic differences in health and development are apparent early in infancy and persist through childhood (Ruijsbroek et al., 2011). Children of low income women tend to exhibit greater risks for being born preterm and small–for–gestational–age, delayed cognitive development, poor academic performance, and behavior problems (Beard et al., 2009; Larson, 2007). Women of low income are also more likely to have inadequate prenatal care (Heaman, Green, Newburn–Cook, Elliott, & Helewa, 2007), greater rates of smoking in pregnancy (Webb, Culhane, Mathew, Bloch, & Goldenberg, 2011), excessive weight gain in pregnancy (Gould Rothberg, Magriples, Kershaw, Rising, & Ickovics, 2011), and reduced initiation and duration of breastfeeding (Ibanez et al., 2011).

Calculation of the Indicator

The proportion of women giving birth who received income assistance was calculated by dividing the number of women with live births who received income assistance by the total number of live births in a given time and place. A woman was considered to have received income assistance if she received income assistance any time during the period of seven months prior to the month of the baby's delivery to one month after the baby's delivery. Stillbirths were not included in the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 2.5.1
    - The Manitoba rate ranged from 14.9% (2001/02) to 13.9% (2008/09); the linear trend was significant; the rate decreased over time from a high of 16.0% in 2003/04 to a low of 13.9% in 2008/09.
    - The Winnipeg rate ranged from 18.8% (2001/02) to 17.5% (2008/09); the linear trend was significant; the rate decreased over time from a high of 20.7% in 2003/04 to a low of 17.5% in 2008/09.
- RHA (2007/08–2008/09), Figure 2.5.2
    - The Manitoba rate was 14.0%.
    - South Eastman (3.3%), Central (6.8%), Assiniboine (7.0%), Interlake (8.9%), and North Eastman (6.6%) were significantly lower than the Manitoba rate; while Winnipeg (17.7%), Parkland (23.1%), and NOR–MAN (21.9%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 2.5.3
    - The Winnipeg rate was 17.7%.
    - Fort Garry (7.2%), Assiniboine South (5.7%), St. Boniface (6.5%), St. Vital (9.1%), Transcona (6.2%), River Heights (6.1%), River East (13.6%), Seven Oaks (9.3%), and St. James–Assiniboia (9.2%) were significantly lower than the Winnipeg rate; while Inkster (28.7%), Downtown (37.7%), and Point Douglas (47.3%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 2.5.4
  There was a statistically significant difference in the proportion of women giving birth who received income assistance for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, there were fewer women receiving income assistance.

- Income Quintile – There was a significant relationship with area–level income in both urban and rural areas of Manitoba. With each successive decrease in area–level income in urban areas, there was an increase in the number of women receiving income assistance. In rural areas, a gradient is not as evident, though Rural 1 (10.8%), Rural 2 (9.8%) and Rural 4 (8.2%) all have higher rates of income assistance compared to Rural 5 (8.2%).
- Maternal Education – 39.9% of the women giving birth who had less than a Grade 12 education received income assistance compared to 5.8% of those with a Grade 12 education.
- Marital Status – 58.6% of the women giving birth who were lone parents received income assistance compared to 6.6% of those who were married/partnered.
- Social Isolation – 23.5% of the women giving birth who were socially isolated received income assistance compared to 11.6% who were not socially isolated.
- Parity – 9.6% of the primiparous women received income assistance compared to 16.7% of multiparous women.

Limitations

First Nations families living in First Nations communities are not eligible for the provincial income assistance program but may receive assistance from federally funded programs which are not captured in the income assistance data available at MCHP. Therefore the rates of income assistance reported here do not include First Nations women living in First Nations communities. This might influence the association between rural income quintiles and income assistance.

Summary

Rates of women on income assistance giving birth in Manitoba ranged from 14.9% in 2001/02 to 13.9% in 2008/09 with a high of 16.0% in 2003/04 and a low of 13.9% in 2008/09. The rates varied widely by CAs within Winnipeg (5.7%–47.3%) and by RHA (3.3%–23.1%). A 1% decrease in the Manitoba rate was observed during 2001/02 to 2008/09. Women on income assistance were more likely to be young, multiparous, a lone parent, or socially isolated; have less than Grade 12 education; or reside in urban areas with low incomes.

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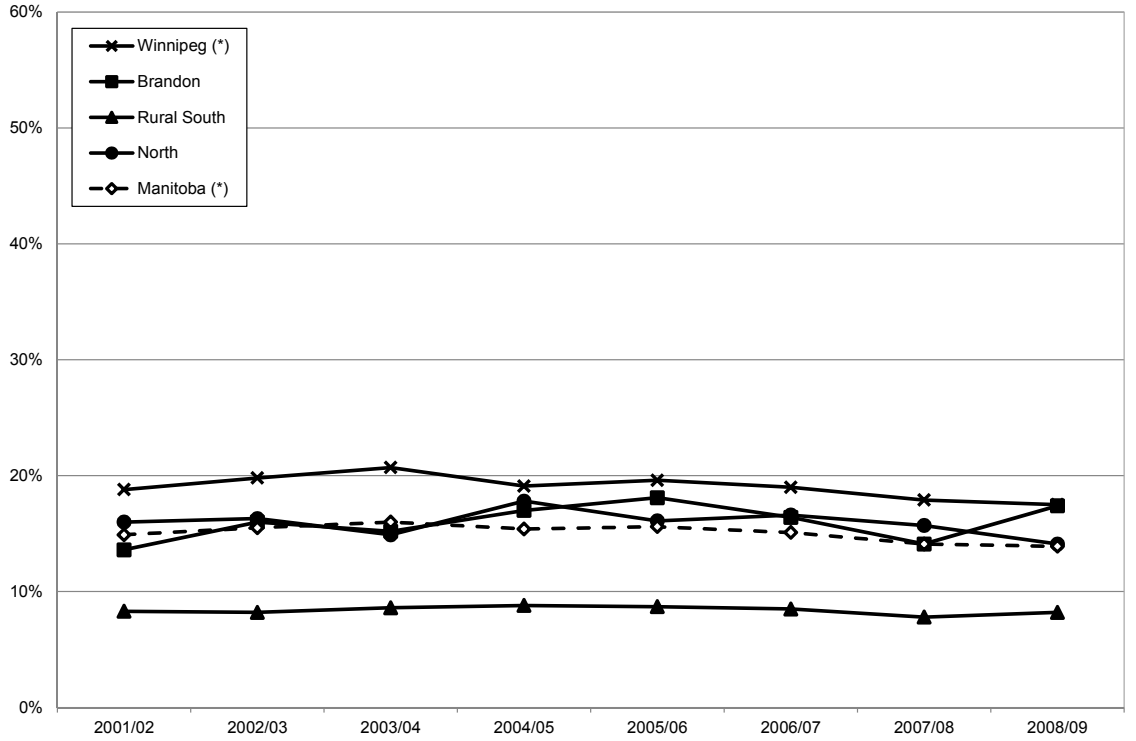
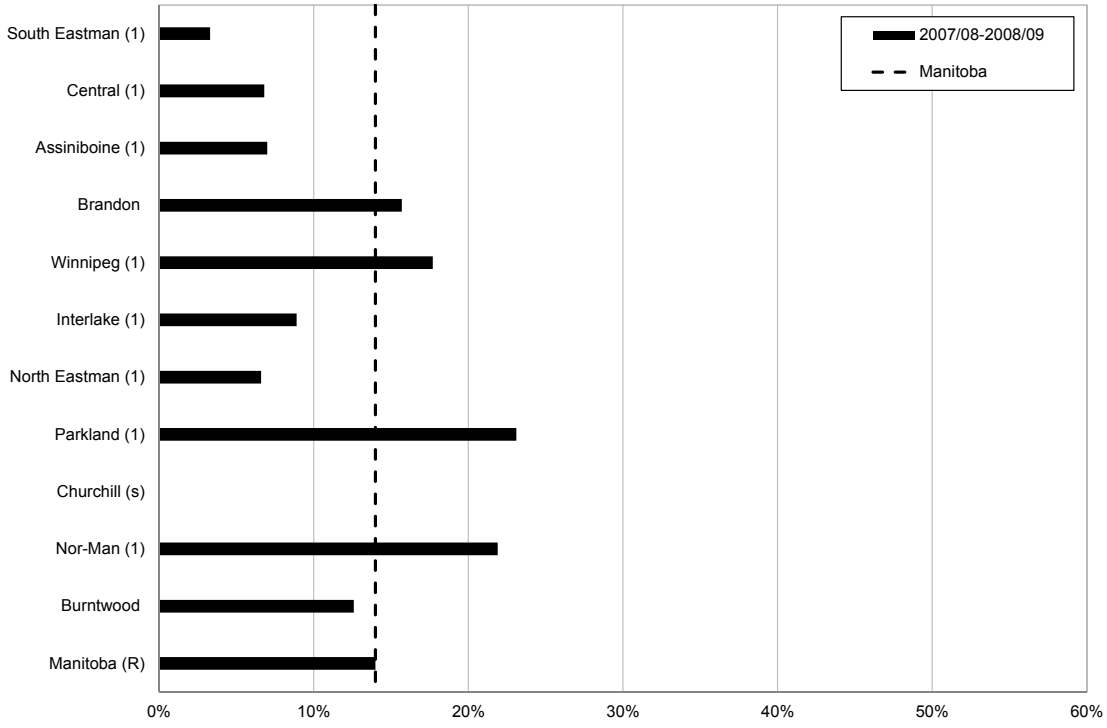
Figure 2.5.1: Proportion of Women Giving Birth who were on Income Assistance by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

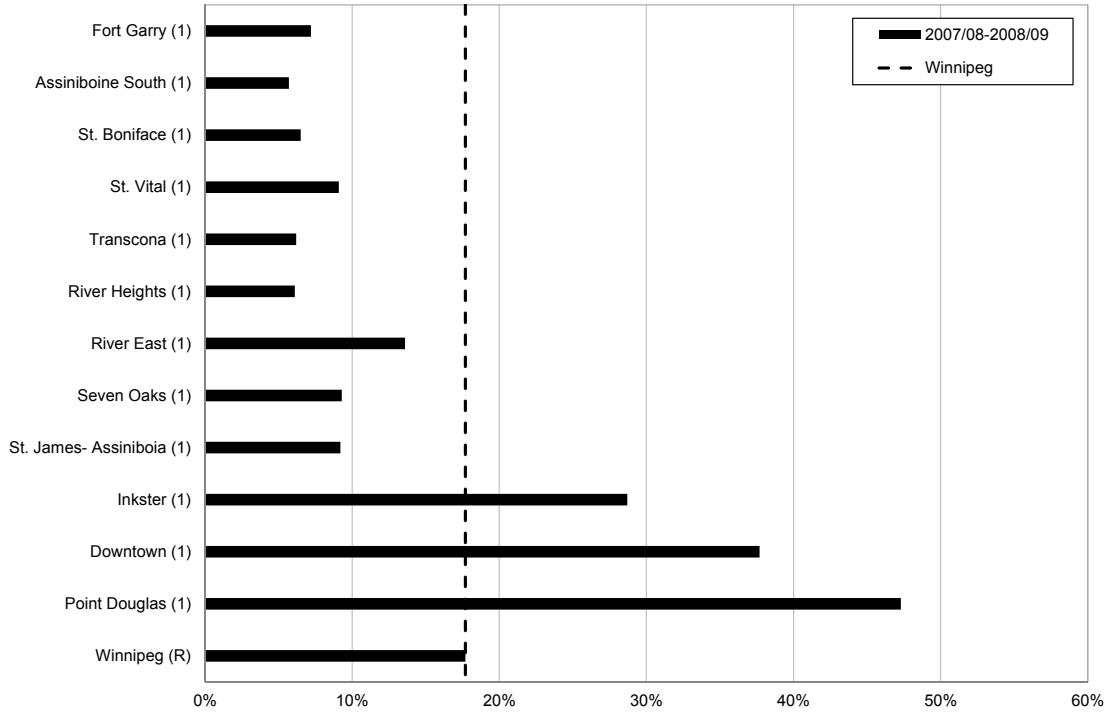
Figure 2.5.2: Proportion of Women Giving Birth who were on Income Assistance by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

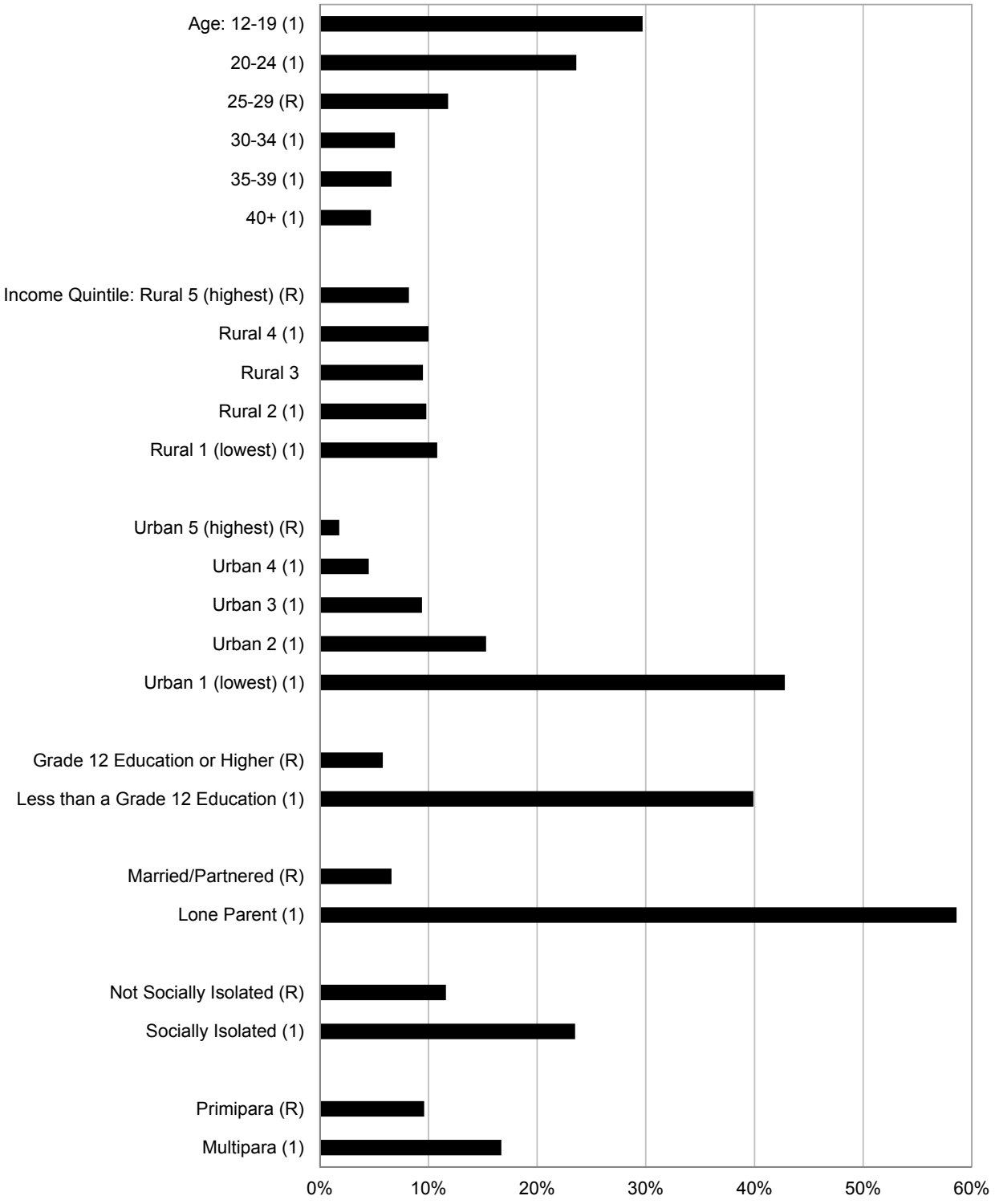
Figure 2.5.3: Proportion of Women Giving Birth who were on Income Assistance by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.5.4: Proportion of Women Giving Birth who were on Income Assistance by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

2.6 Healthy Baby Prenatal Benefit

Background

The Healthy Baby Program was introduced in Manitoba in 2001 by **Healthy Child Manitoba Office (HCMO)**, with the goal to promote prenatal and perinatal health. One component of the program is the Healthy Baby Prenatal Benefit, which consists of a monthly cheque provided during pregnancy, starting in the second **trimester.** The prenatal benefit is available to women whose annual net family income is less than $32,000. The maximum monthly amount is $81.41—almost 90% of those receiving the prenatal benefit receive this amount (Brownell et al., 2010). Along with the monthly cheque, information is provided regarding the benefits of good prenatal nutrition; the consequences of smoking, drinking, and/or taking drugs during pregnancy; the importance of regular prenatal healthcare; the benefits of exercise and stress reduction; and information on the importance of early child development including information on the benefits of breastfeeding. More information is available in the report *Evaluation of the Healthy Baby Program* (Brownell et al., 2010).

Calculation of the Indicator

The proportion of women who received the Healthy Baby Prenatal Benefit was calculated by dividing the number of women who received the benefit by the number of women giving birth in a given time and place. A woman was considered to have received the prenatal benefit if at any time during the eligibility period she received the benefit. These data were only available from 2001/02–2007/08, limiting the time trend analysis to these years. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2006/07–2007/08. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2007/08), Figure 2.6.1
    - The Manitoba rate ranged from 19.1% (2001/02) to 27.8% (2007/08); the linear trend was significant; the rate increased over time from a low 19.1% in 2001/02 to a high of 30.5% in 2005/06.
    - The Winnipeg rate ranged from 18.5% (2001/02) to 25.5% (2007/08); the linear trend was significant; the rate increased over time from a low 18.5% in 2001/02 to a high of 28.1% in 2005/06.
    - The rate for the Rural South ranged from 17.6% (2001/02) to 27.1% (2007/08); the linear trend was significant; the rate increased over time from a low 17.6% in 2001/02 to a high of 29.7% in 2005/06.
    - The rate for the North ranged from 25.8% (2001/02) to 40.8% (2007/08); the linear trend was significant; the rate increased over time from a low 25.8% in 2001/02 to a high of 45.8% in 2006/07.
- RHA (2006/07–2007/08), Figure 2.6.2
    - The Manitoba rate was 28.9%.
    - Parkland (44.3%), NOR–MAN (45.3%), and Burntwood (42.9%) were significantly higher than the Manitoba rate (28.9%); while South Eastman (16.5%), Central (26.2%), and Winnipeg (26.6%) were lower.
- Winnipeg CA (2006/07–2007/08), Figure 2.6.3
    - The Winnipeg rate was 26.6%.
    - Inkster (41.0%), Downtown (48.2%), and Point Douglas (49.3%) were significantly higher than the Winnipeg rate (26.6%); while Fort Garry (16.8%), Assiniboine South (10.9%), St. Boniface (14.7%), St. Vital (17.4%), Transcona (14.3), River Heights (16.3%), Seven Oaks (20.7%), and St. James–Assiniboia (18.1%) were lower.

- Sociodemographic and Other Characteristics (2006/07–2007/08), Figure 2.6.4
  There was a statistically significant difference in the proportion of women giving birth who received the Healthy Baby Prenatal Benefit for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. Younger woman were more likely to receive the prenatal benefit than older women.
  - Income Quintile – There was a significant relationship with income quintile; with each successive decrease in income, more women received the prenatal benefit.
  - Income Assistance – 69.9% of the women giving birth who were on income assistance also received the prenatal benefit compared to 21.9% of the women who were not on income assistance.
  - Maternal Education – 51.0% of the women giving birth, who had less than a Grade 12 education, received the prenatal benefit compared to 15.7% of those with a Grade 12 education.
  - Marital Status – 65.3% of women giving birth who were lone parents received the prenatal benefit compared to 18.2% of those who were married/partnered.
  - Social Isolation – 39.6% of women giving birth who were socially isolated received the prenatal benefit compared to 21.8% of those who were not socially isolated.
  - Parity – 27.3% of the primiparous women received the prenatal benefit compared to 30% of multiparous women.

Comparison to Other Findings

Our results are similar to those reported in the Healthy Baby report published in 2010. "Close to a third of all births (29%) were to women who received the Healthy Baby Prenatal Benefit during pregnancy. The Prenatal Benefit was received by over half of women living in lower income neighbourhoods and teen mothers and almost three–quarters of women receiving income assistance during pregnancy—potential target groups for the program". (Brownell et al., 2010).

Limitations

When looking at the data for 2001/02 and 2007/08, it appears that the data may not be complete for these years. The data for 2001/02 began in July 2001, but the counts for July (1162) and August (600) of this year are higher than the other months (approximately 364) and may represent past enrolments in 2001/02. In 2007/08, the enrolments began dropping off in October (229) with counts in November (133), December (69), January (26), and February (17) getting progressively smaller. No data are available for March of 2008. Additionally data for 2008/09 were not available for this analysis.

Summary

Rates of women receiving the prenatal benefit in Manitoba ranged from 19.1% in 2001/02 to 27.8% in 2007/08 and varied widely by CAs within Winnipeg (10.9%–49.3%) and by RHA (16.5%–45.3%). Women who received the prenatal benefit were more likely to be young, receiving income assistance, multiparous, a lone parent, or socially isolated; have less than Grade 12 education; or reside in urban and rural areas with low average incomes.

Reference List

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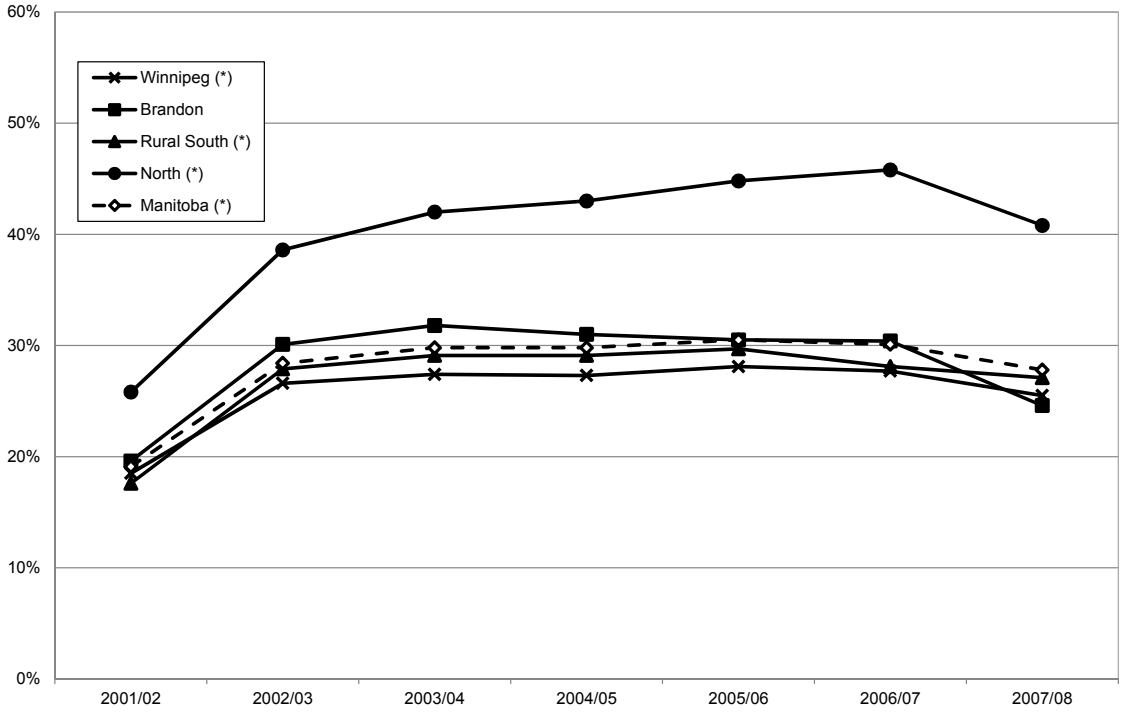
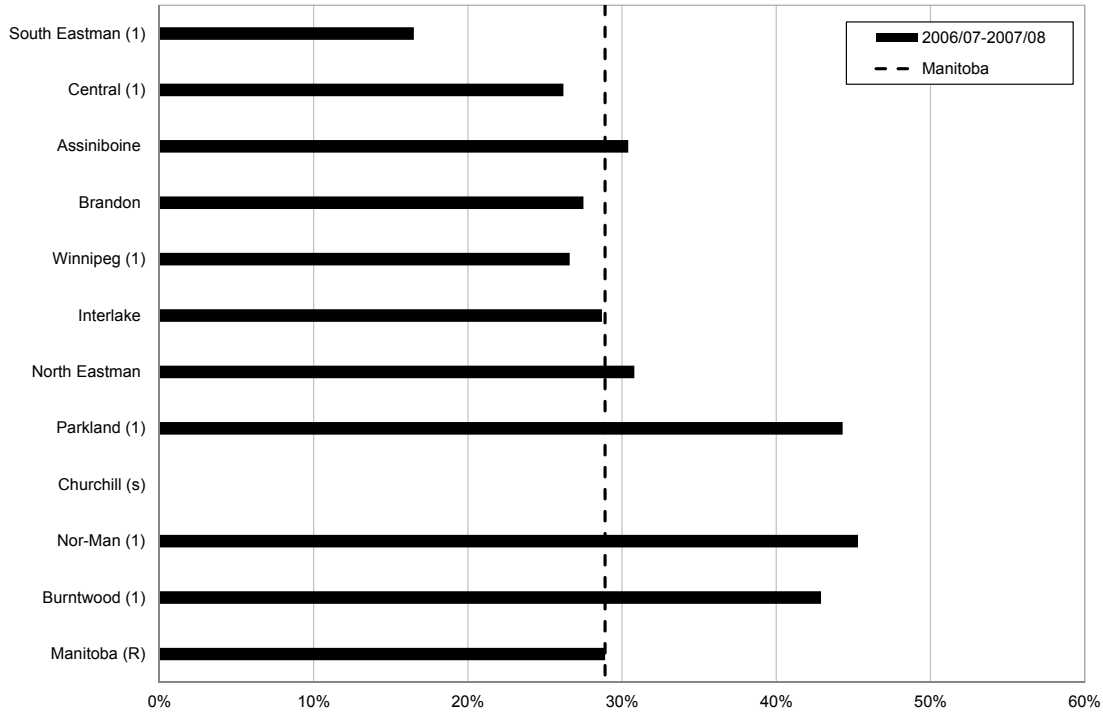
Figure 2.6.1: Proportion of Women who Received the Healthy Baby Prenatal Benefit by Region and Year, 2001/02-2007/08



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

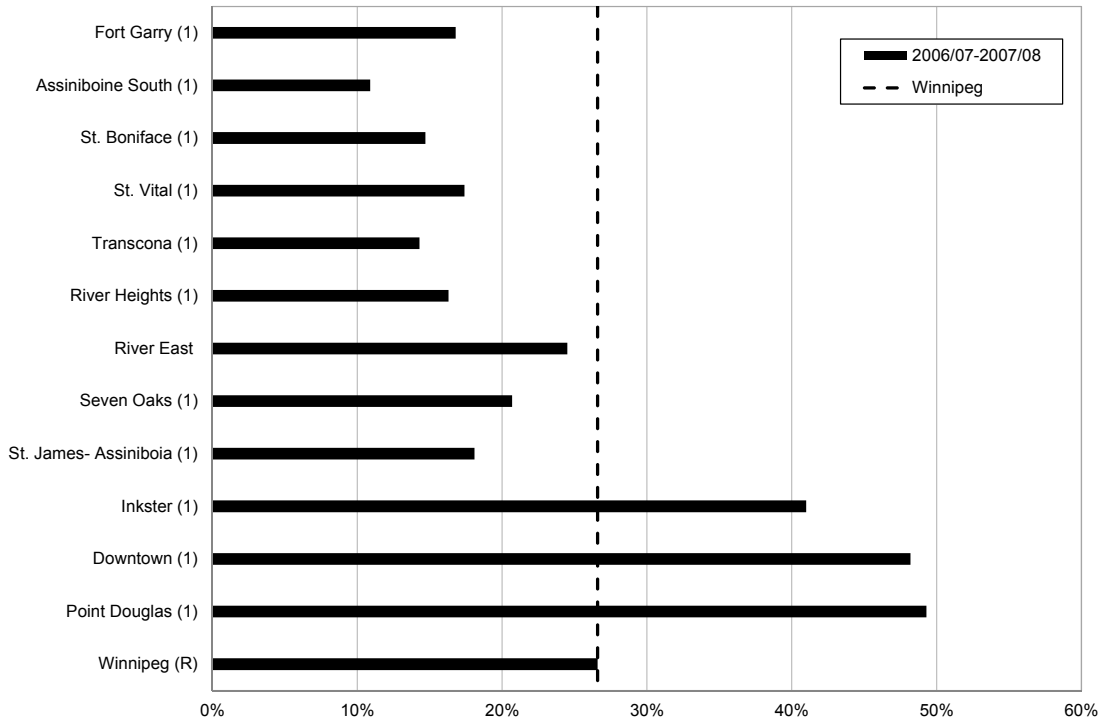
Figure 2.6.2: Proportion of Women who Received the Healthy Baby Prenatal Benefit by RHA, 2006/07-2007/08



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

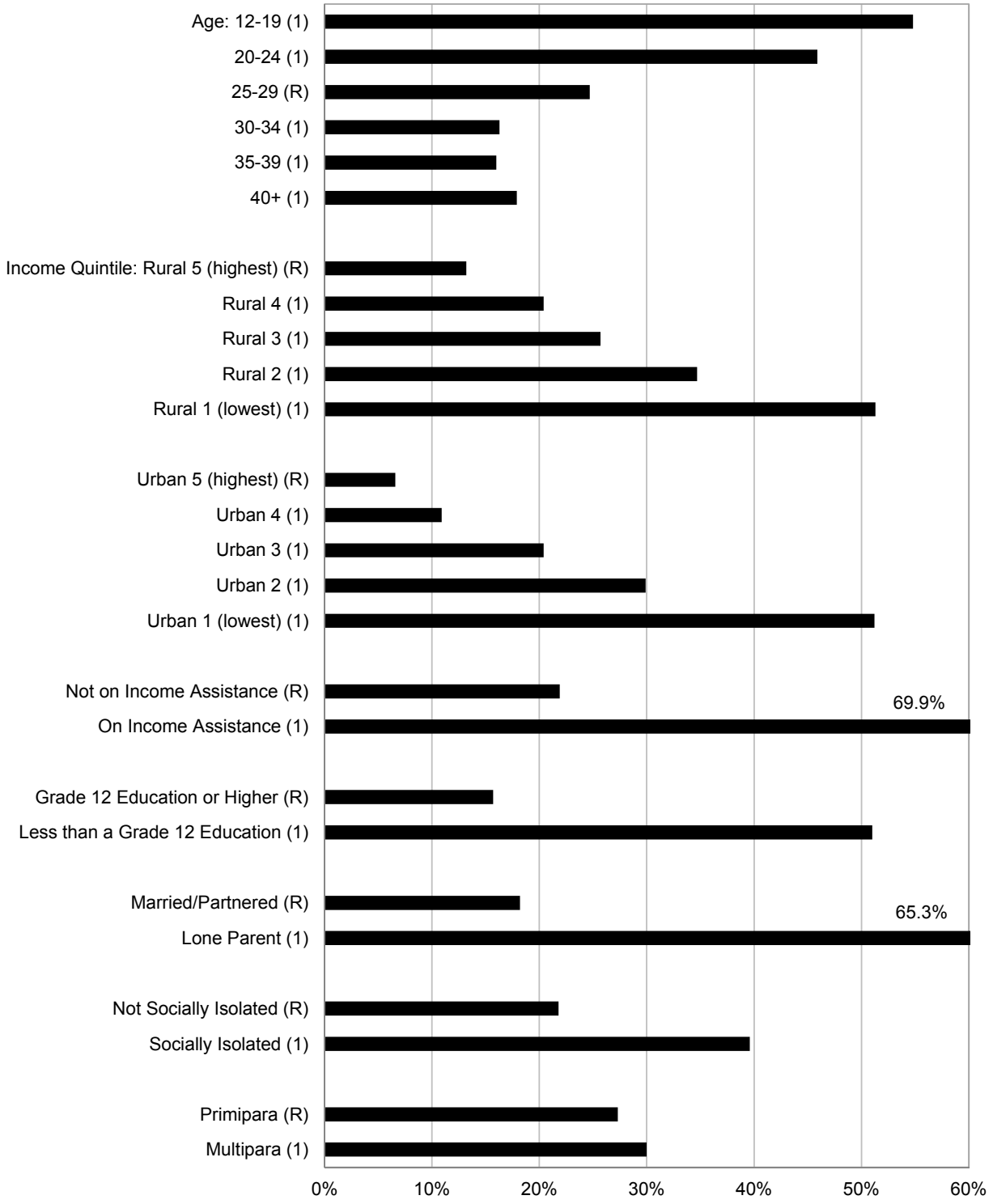
Figure 2.6.3: Proportion of Women who Received the Healthy Baby Prenatal Benefit by Winnipeg CA, 2006/07-2007/08



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.6.4: Proportion of Women who Received the Healthy Baby Prenatal Benefit by Sociodemographic and Other Characteristics, 2006/07-2007/08



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

2.7 Participation in a Healthy Baby Community Support Program

Background

The Healthy Baby Program was introduced in Manitoba in 2001, by Healthy Child Manitoba, with the goal to promote prenatal and perinatal health. The second component of the program is Healthy Baby Community Support Programs, which are educational and supportive groups available to all women from the prenatal period through to an infant's first birthday. These programs encourage early, regular prenatal care, as well as promote healthy infant development. Most community support programs offer groups on a weekly basis; however in remote communities, they are sometimes only offered on a bi–weekly or monthly basis. The program content may differ across sites but generally includes information on prenatal nutrition and health, as well as information on parenting and infant development. The programs offer social support, milk coupons (during pregnancy and up to six months postnatal), bus tickets (to attend programs), and on–site child care. All expectant mothers and mothers of infants are eligible for the community support programs, which are offered free of charge regardless of family income. More information is available in the report *Evaluation of the Healthy Baby Program* (Brownell et al., 2010).

Calculation of the Indicator

The proportion of women who participated in a community support program was calculated using the Healthy Baby Community Support Program data. A woman was considered to have participated if she attended a community support program either in the prenatal or postnatal period. These data were from 2004/05–2007/08, limiting the time trend analysis to these years. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2006/07–2007/08. Refer to Appendix Table A.4 for more details.

- Key Observations
- Time Trend (2004/05–2007/08), Figure 2.7.1
    - The Manitoba rate ranged from 9.5% (2004/05) to 13.2% (2007/08); the linear trend was significant; the rate increased over time from a low 9.5% in 2004/05 to a high of 14.9% in 2006/07.
    - The Winnipeg rate ranged from 8.0% (2004/05) to 10.6% (2007/08); the linear trend was significant; the rate increased over time from a low 8.0% in 2004/05 to a high of 12.6% in 2006/07.
    - The rate for the Rural South ranged from 13.1% (2004/05) to 19.1% (2007/08); the linear trend was significant; the rate increased over time from a low 13.1% in 2004/05 to a high of 19.6% in 2006/07.
    - The rate for the North ranged from 6.2% (2004/05) to 11.6% (2007/08); the linear trend was significant; the rate increased over time from a low 6.2% in 2004/05 to a high of 16.8% in 2005/06.
- RHA (2006/07–2007/08), Figure 2.7.2
    - The Manitoba rate was 14.1%.
    - South Eastman (19.0%), Assiniboine (30.7%), Interlake (19.0%), North Eastman (26.4%), Parkland (24.7%), and Churchill (35.5%) were significantly higher than the Manitoba rate, while Central (12.1%) and Winnipeg (11.6%) were significantly lower.
- Winnipeg CA (2006/07–2007/08), Figure 2.7.3
    - The Winnipeg rate was 11.6%.
    - Downtown (19.0%) and Point Douglas (17.1%) were significantly higher than the Winnipeg rate; while Fort Garry (9.2%), River Heights (8.9%), River East (8.8%), Seven Oaks (6.5%), and St. James–Assiniboia (7.9%) were significantly lower.

- Sociodemographic and Other Characteristics (2006/07–2007/08), Figure 2.7.4
  There was a statistically significant difference in the proportion of women giving birth who participated in a Healthy Baby Community Support Program for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, fewer women attended a community support program.
  - Income Quintile – There was a significant relationship with income quintile, with more women in lower income quintiles attending community support programs. The gradient was much steeper in urban areas than in rural areas.
  - Income Assistance – 25.2% of the women giving birth who were on income assistance attended a community support program compared to 12.0% of the women who were not on income assistance.
  - Maternal Education – 19.7% of the women giving birth who had less than a Grade 12 education attended a community support program compared to 13.2% of those with a Grade 12 education.
  - Marital Status – 26.7% of women giving birth who were lone parents attended a community support program, compared to 12.5% of those who were married/partnered.
  - Social Isolation – 25.5% of women giving birth who were socially isolated, attended a community support program compared to 13.8% of those who were not socially isolated.
  - Parity – 17.7% of the primiparous women attended a community support program compared to 11.5% of multiparous women.

Comparison to Other Findings

Brownell et al (2010), in the report *Evaluation of the Healthy Baby Program*, found that less than 13% of births were to women who participated in any Healthy Baby Community Support Programs from 2004/05 to 2007/08. "Just over one–fifth of women receiving income assistance during pregnancy and teens participated in any Community Support Programs, and over 80% of women living in the lowest income areas did not participate in the Community Support Programs" (Brownell et al., 2010). The proportion of women participating in Community Support Program has remained fairly stable.

Limitations

At the time of production of this report, data for this indicator were only available to 2007/08.

Healthy Baby Community Support Programs are run by the Canada Prenatal Nutrition Program (CPNP) in First Nations communities, Steinbach, and Pine Falls. Unfortunately, CPNP does not collect information on who participates in these programs, so women living in those areas were excluded from analyses (approximately 16% of cases). Additionally women who indicated on the program participant survey (completed on program entry) that they did not want to share their information were excluded. A previous report at Manitoba Centre for Health Policy found that 8.3% of all community support program participants elected not to share their information (Brownell et al., 2010). The missing data on community support program participation in programs run by CPNP means that women in First Nations communities and two small rural communities could not be included in this analysis. Thus some of the results reported above for rural RHAs and income quintiles should be interpreted with caution.

Summary

Rates of women participating in Healthy Baby Community Support Programs in Manitoba ranged from 9.5% in 2004/05 to 13.2% in 2007/08 and varied widely by Winnipeg CAs (6.5%–19.0%) and by RHA (11.6%–35.5%). Women who participated in community support programs were more likely to be young, receiving income assistance, primiparous, a lone parent, or socially isolated; have less than Grade 12 education; or reside in urban and rural areas with low average incomes.

Reference List

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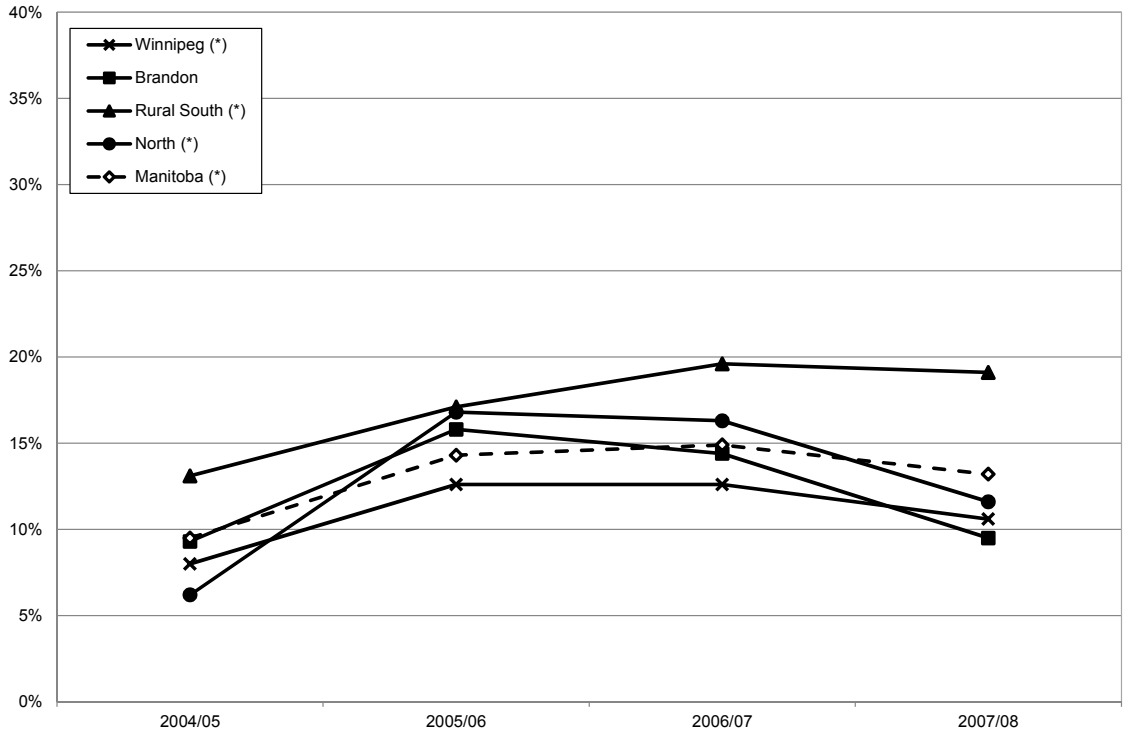
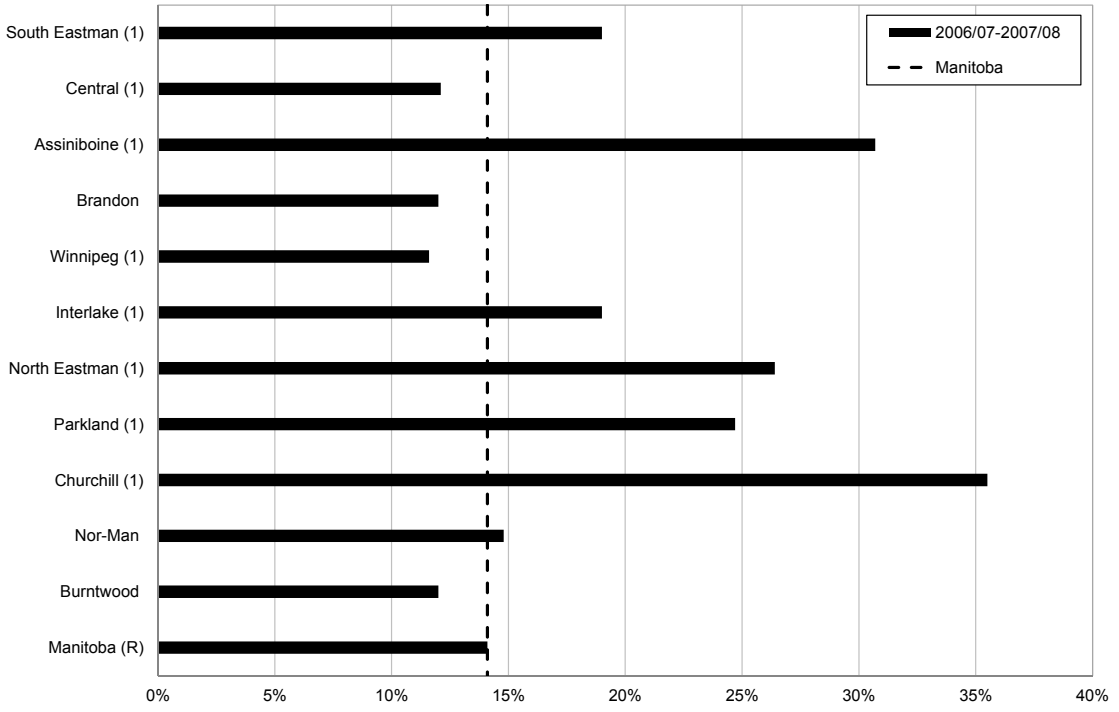
Figure 2.7.1: Proportion of Women who Participated in the Healthy Baby Community Support Programs by Region and Year, 2004/05-2007/08



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

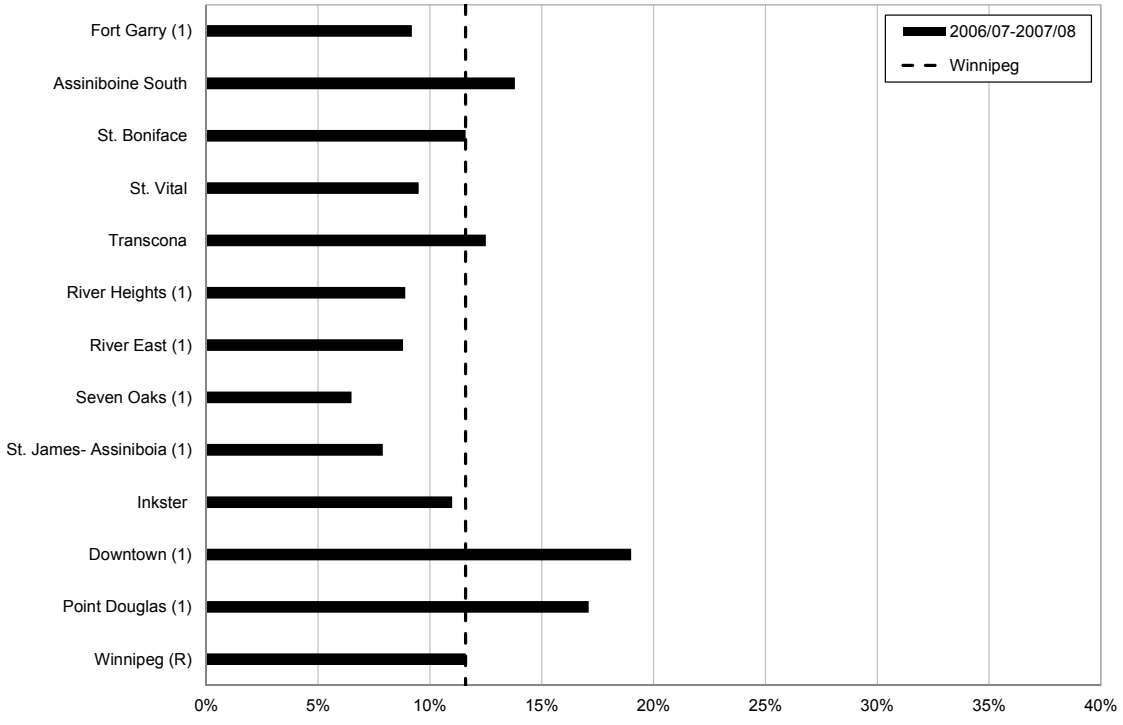
Figure 2.7.2: Proportion of Women who Participated in the Healthy Baby Community Support Programs by RHA, 2006/07-2007/08



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

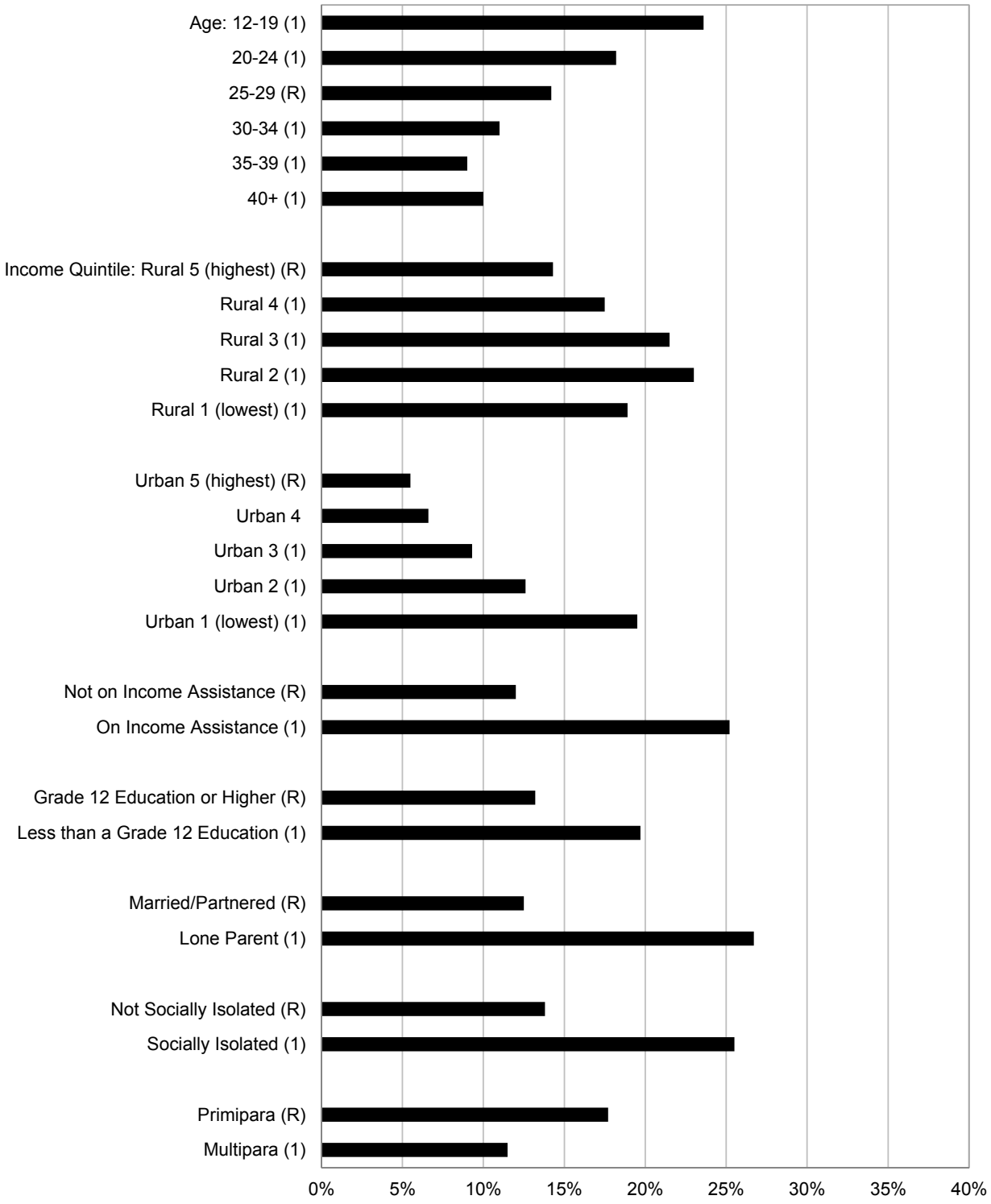
Figure 2.7.3: Proportion of Women who Participated in the Healthy Baby Community Support Programs by Winnipeg CA, 2006/07-2007/08



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.7.4: Proportion of Women who Participated in the Healthy Baby Community Support Programs by Sociodemographic and Other Characteristics, 2006/07-2007/08



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

2.8 Live Births to Teen Mothers

Background

Although the proportion of live births to teen mothers has been decreasing in Canada since 1995, "teenage motherhood is still an important public health issue due to its association with various adverse maternal and infant health outcomes" (Public Health Agency of Canada, 2008). Compared to older mothers, some studies have found that teen mothers have greater risks for delivering preterm, low birth weight, and small–for–gestational–age infants (Chen et al., 2007), postpartum depression (Figueiredo, Pacheco, & Costa, 2007), intimate partner violence (Wiemann, Agurcia, Berenson, Volk, & Rickert, 2000), lower breastfeeding initiation rates and durations (Wambach & Cole, 2000), and late initiation of prenatal care (Hueston, Geesey, & Diaz, 2008). An analysis of data from the Canadian Maternity Experiences Survey found that teen mothers were more likely to initiate prenatal care late, experience physical abuse during or after pregnancy, not take folic acid before or during pregnancy, have lower rates of breastfeeding initiation and breastfeeding at three months, experience postpartum depression symptoms, and rate their postpartum health and that of their infant as sub–optimal as compared to mothers aged 25 and older (Kingston, Heaman, Fell, & Chalmers, 2012). A large body of evidence also suggests that children of adolescent mothers may be at greater risk for educational disabilities (Brownell et al., 2010; Gueorguieva et al., 2001; Jutte et al., 2010; Santos, Brownell, Ekuma, & Soodeen, 2012), mental health disorders (Brooks–Gunn & Furstenberg, 1986), and having an adolescent pregnancy (Furstenberg, Jr., Levine, & Brooks–Gunn, 1990).

Calculation of the Indicator

The number of live births to females aged 19 and younger was divided by the total number of live births in a given time and place. Time trends were calculated across for 2001/02–2008/09. The time trends were further divided into two age groups—18 to 19 and 17 and younger. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09)
  - All births to teen mothers aged 19 and younger, Figure 2.8.1
    - The Manitoba rate ranged from 9.5% (2001/02) to 8.8% (2004/05) and was relatively stable.
    - The Winnipeg rate ranged from 7.8% (2001/02) to 6.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 7.8% in 2001/02 to a low of 6.7% in 2008/09.
    - The Brandon rate ranged from 9.8% (2001/02) to 8.4% (2008/09); the linear trend was significant; the rate decreased over time from a high of 9.8% in 2001/02 to a low of 5.5% in 2007/08.
  - Births to teen mothers aged 18 and 19, Figure 2.8.2
    - The Manitoba rate ranged from 6.0% (2002/03) to 5.4% (2005/06) and was relatively stable.
    - The Winnipeg rate ranged from 4.9% (2001/02) to 4.2% (2008/09); the linear trend was significant; the rate decreased over time from a high of 5.3% in 2002/03 to a low of 4.2% in 2008/09.
    - The Brandon rate ranged from 7.4% (2001/02) to 6.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 7.4% in 2001/02 to a low of 3.9% in 2007/08.
  - Births to teen mothers aged 17 and younger, Figure 2.8.3
    - The Manitoba rate ranged from 3.6% (2001/02) to 3.1% (2003/04) and was relatively stable.
- RHA (2007/08–2008/09), Teen mothers aged 19 and younger, Figure 2.8.4
  - The Manitoba rate was 9.1%.

    - South Eastman (4.7%), Brandon (6.9%), and Winnipeg (6.7%) were significantly lower than the Manitoba rate; while North Eastman (15.1%), Parkland (15.1%), NOR–MAN (19.4%), and Burntwood (20.6%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Teen mothers aged 19 and younger, Figure 2.8.5
    - The Winnipeg rate was 6.7%.
    - Fort Garry (2.5%), Assiniboine South (3.1%), St. Boniface (2.8%), St. Vital (2.7%), River Heights (2.6%), and Seven Oaks (3.6) were significantly lower than Winnipeg rate; while Inkster (10.6%), Downtown (13.5%), and Point Douglas (15.3%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Teen mothers aged 19 and younger, Figure 2.8.6
  There was a statistically significant difference in the proportion of women giving birth who were aged 19 and younger for the following characteristics:
    - Income Quintile – There was a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive decrease in area–level income, there was an increase in birth to teens.
    - Income Assistance – 19.2% of the women giving birth who were on income assistance were under the age of 19 compared to 7.4% of the women who were not on income assistance.
    - Maternal Education – 24% of the women giving birth who had less than a Grade 12 education were under the age of 19 compared to 2.1% of those with a Grade 12 education.
    - Marital Status – 27.9% of the women giving birth who were lone parents were under the age of 19 compared to only 3.3% of those who were married/partnered.
    - Parity – 18.8% of the primiparous women were under the age 19 of compared to 3.1% of multiparous women.

Comparison to Other Findings

The proportion of live births to teen mothers aged 19 and younger in Manitoba was substantially higher (9.1% in 2007/08–2008/09) than the proportion in Canada (4.8% in 2004) (Public Health Agency of Canada, 2008). In Canada from 1995 to 2004, there was a decline in the proportion of live births to teen mothers aged 18 to 19 (from 4.6% to 3.46%), aged 15 to 17 (from 2.2% to 1.4%), and 10 to 14 (from 0.08% to 0.04%) (Public Health Agency of Canada, 2008). In Manitoba, the proportion of live births to teen mothers remained relatively stable from 2001/02–2008/09, ranging from 5.4% to 6.0% for the 18 to 19 group and 3.1% to 3.6% for those under 17.

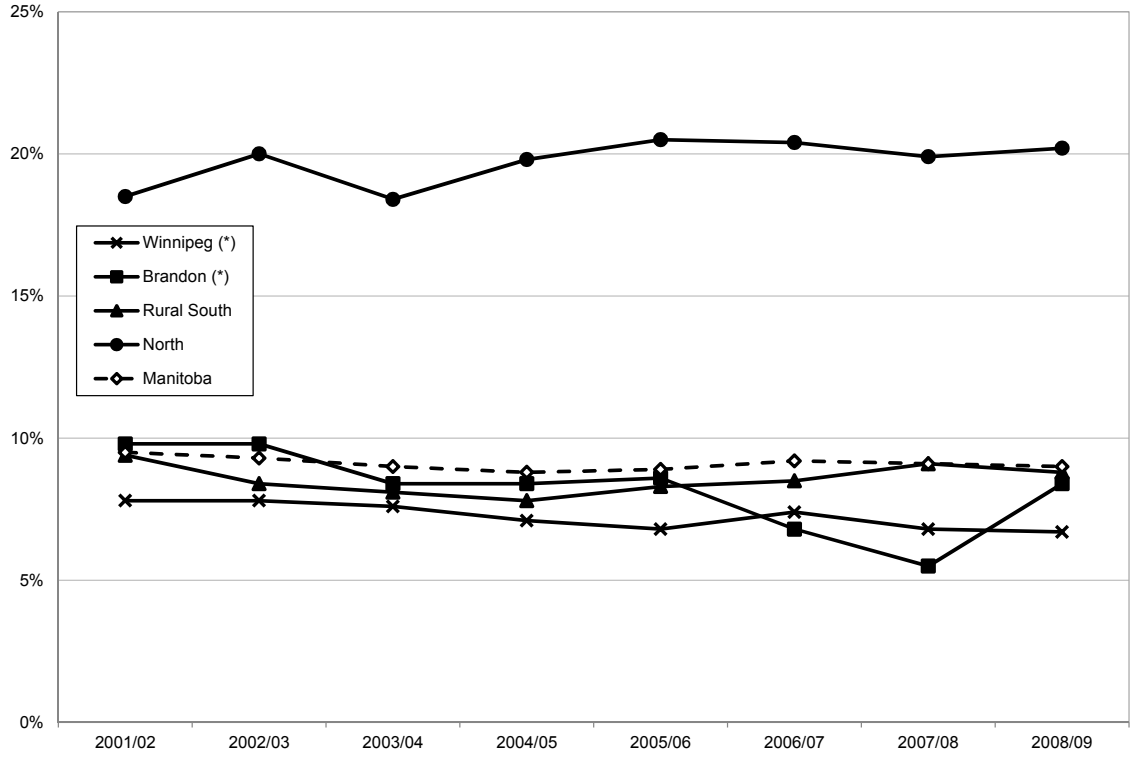
Limitations

The proportion of live births to teen mothers needs to be differentiated from a related indicator: the age–specific rate of live births to teen mothers defined as the number of live births to mothers aged 10 to 14, 15 to 17, or 18 to 19 per 1,000 females in the same age category (in a given place and time) and the teen pregnancy rate, which would include spontaneous and induced abortions, ectopic pregnancies, and stillbirths (Public Health Agency of Canada, 2008). In this report we did not report age–specific rates of live births to teen mothers or teen pregnancy rates. Refer to the *Manitoba Child Health Atlas Update* (Brownell et al., 2008) and to the report *How are Manitoba's Children Doing?* (Brownell et al., 2012) for age–specific teen pregnancy and birth rates.

Summary

In Manitoba, the proportion of live births to teen mothers (aged 19 and younger) in 2007/08–2008/09 was 9.1%. Although the rate for Manitoba overall was stable from 2001/02–2008/09, there were significant declines in proportions observed in this period for both Brandon and Winnipeg RHAs. During 2007/08–2008/09, the proportion of live births to teen mothers varied widely across RHAs (4.7% – 20.6%) and Winnipeg CAs (2.5%–15.3%). Teen mothers were more likely to be a lone parent, primiparous, or on income assistance; have less than a Grade 12 education; or live in lower income rural and urban areas.

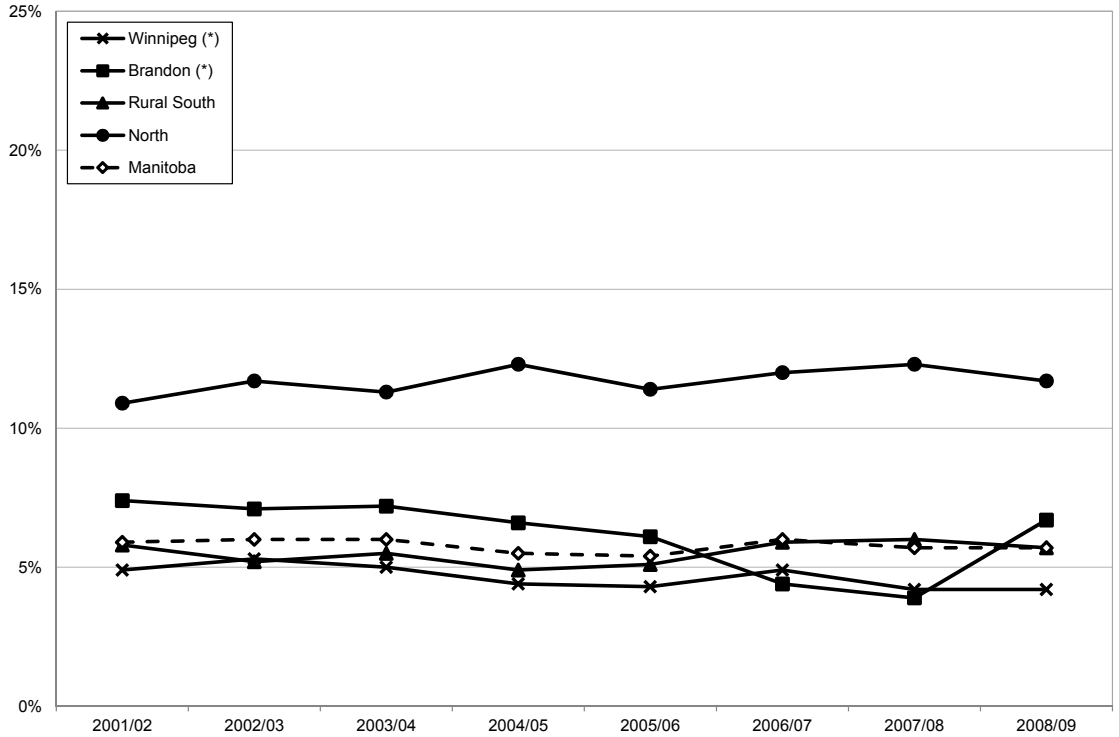
Figure 2.8.1: Proportion of Births to Women Aged 19 and Younger by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

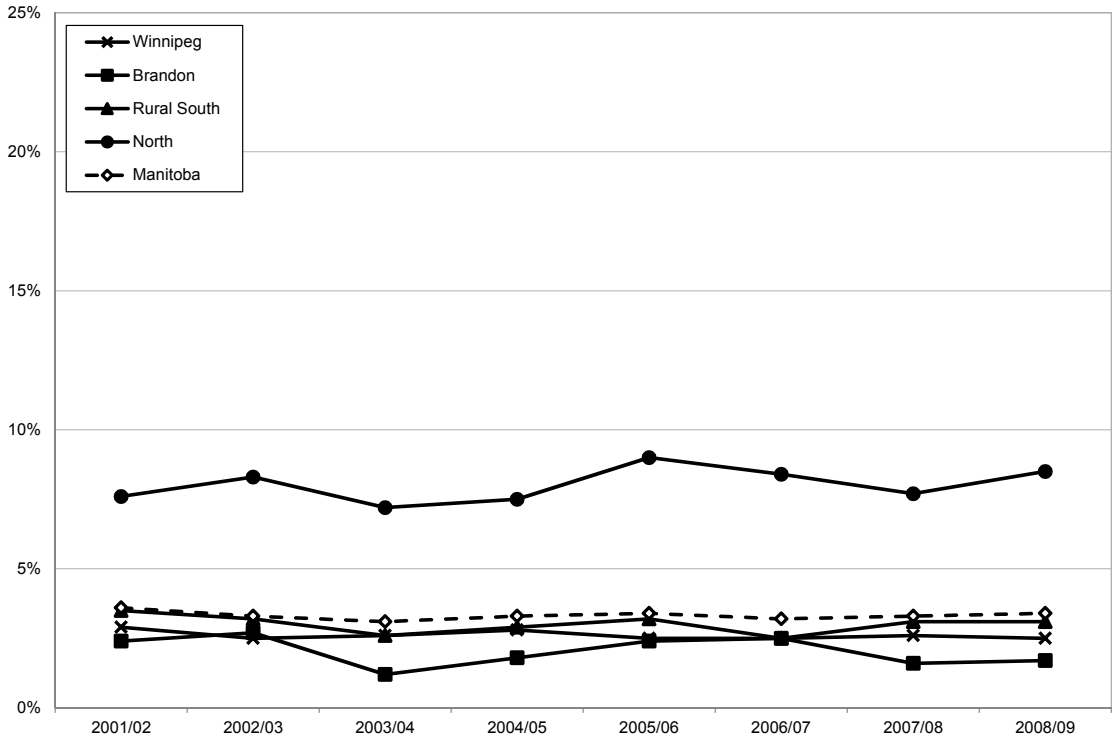
Figure 2.8.2: Proportion of Births to Women Aged 18-19 by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

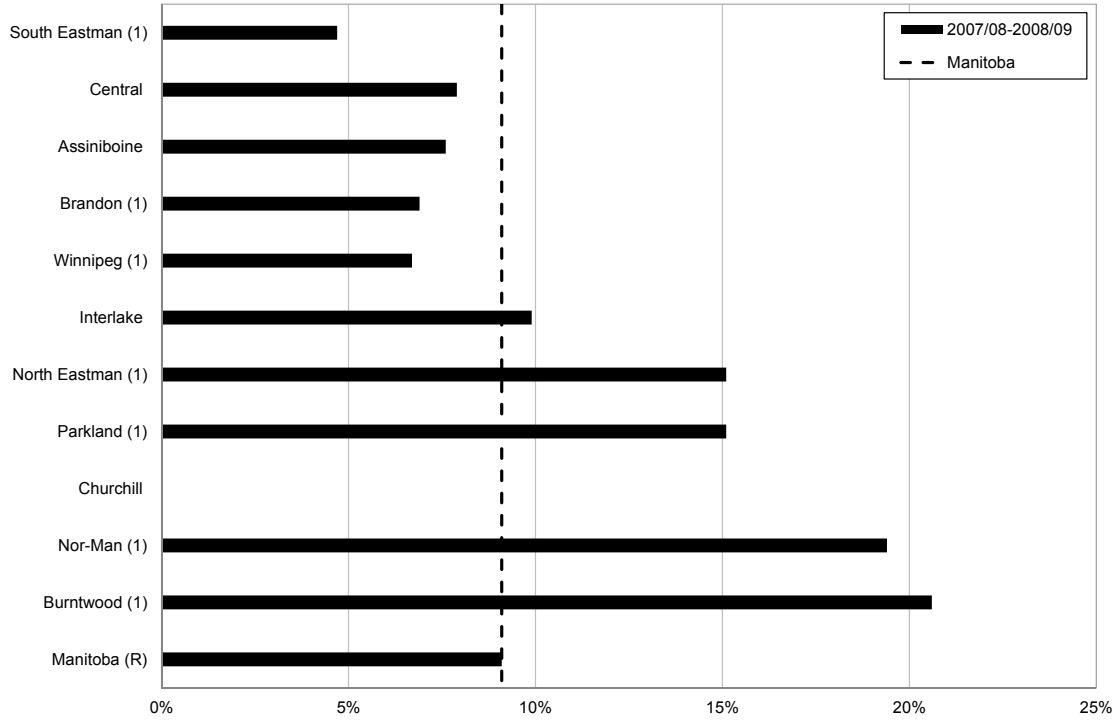
Figure 2.8.3: Proportion of Births to Women Aged 17 and Younger by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

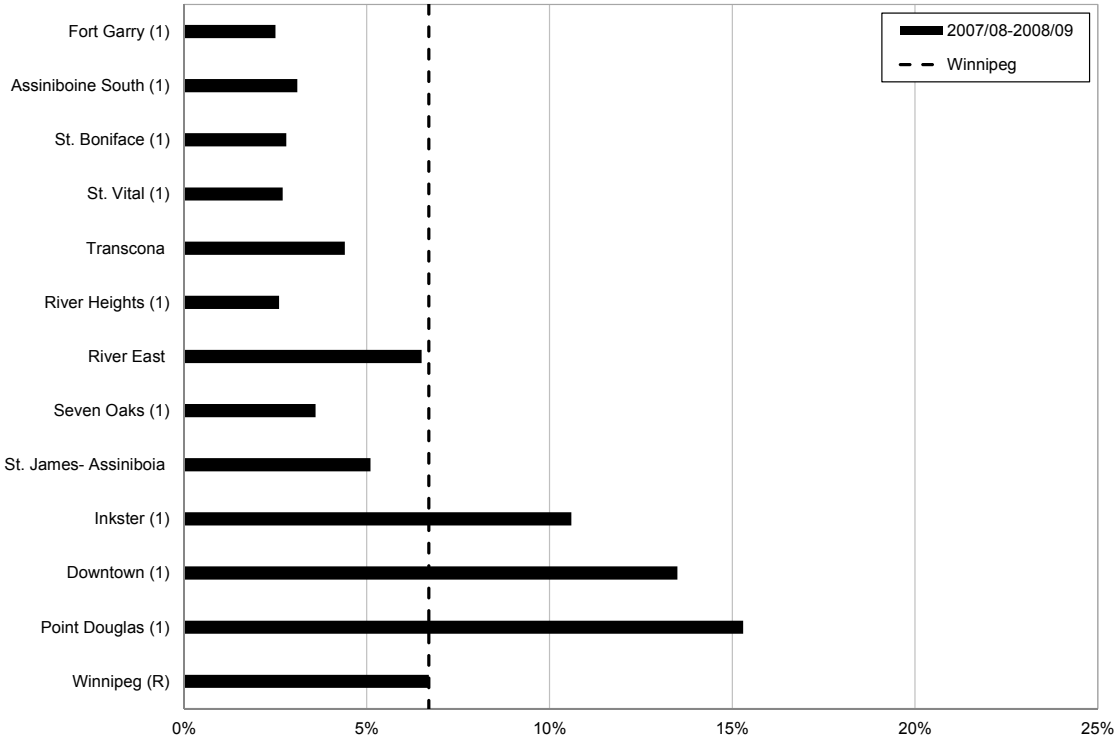
Figure 2.8.4: Proportion of Births to Women Aged 19 and Younger by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

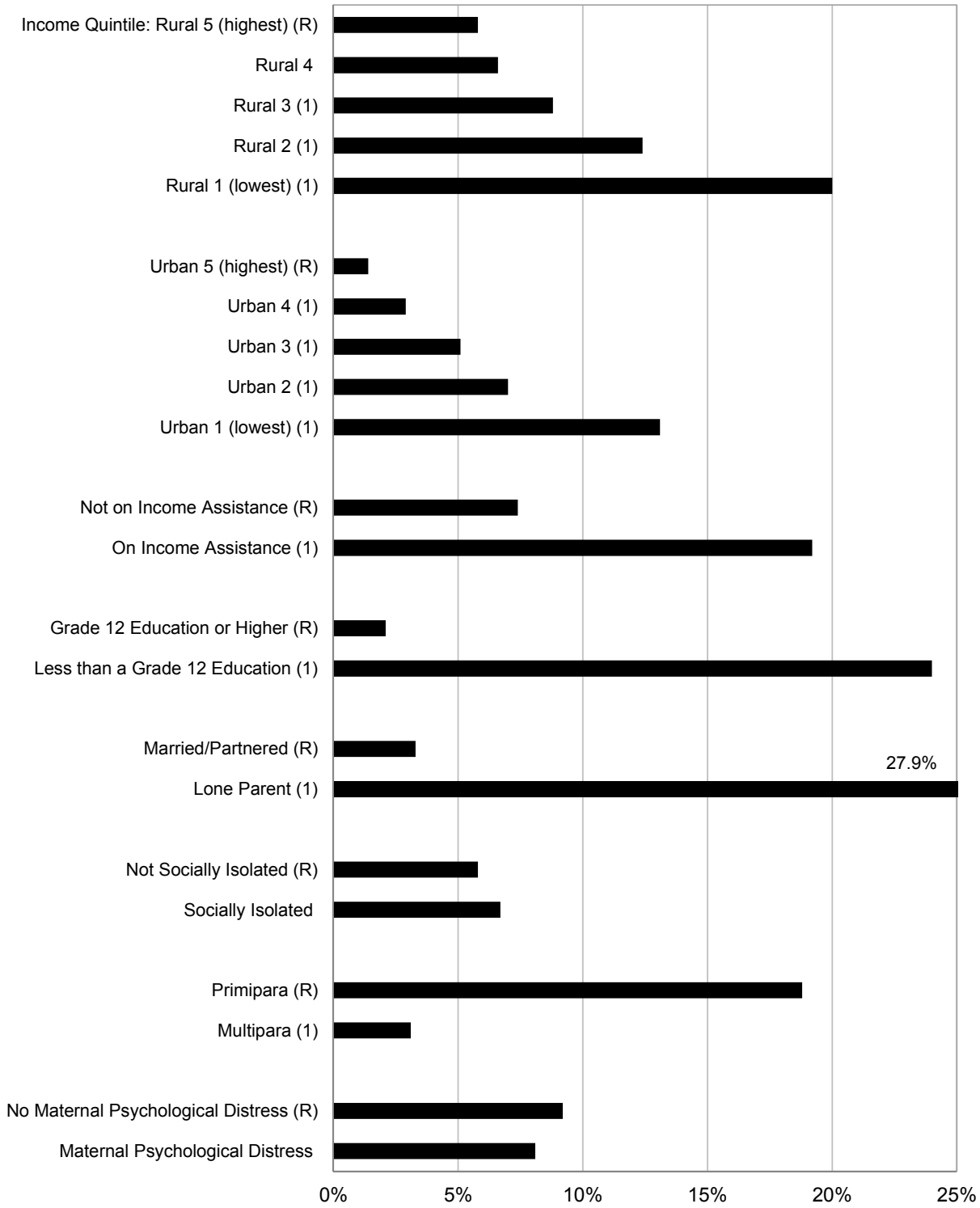
Figure 2.8.5: Proportion of Births to Women Aged 19 and Younger by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.8.6: Proportion of Births to Women Aged 19 and Younger by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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2.9 Live Births to Women Aged 35 and older

Background

The proportion of women giving birth in their mid–thirties and early forties has increased over the past few decades. In Canada, the proportion of live births to women aged 35 to 39 and 40 to 49 as a proportion of all live births increased from 9.8% and 1.4%, respectively, in 1995 to 13.7% and 2.6% in 2008 (Public Health Agency of Canada, 2008; Public Health Agency of Canada, 2012). Pregnancies at age 35 and older are associated with a higher risk of pregnancy and birth complications, such as **hypertension, diabetes**, and **placenta previa** (**Canadian Institute for Health Information (CIHI)**, 2011) and cesarean birth (Bayrampour & Heaman, 2010). Women giving birth at age 35 and older are also at higher risk of several adverse pregnancy outcomes including chromosomal abnormalities, preterm birth, low birth weight, stillbirth, and multiple births (Cleary–Goldman et al., 2005; Huang, Sauve, Birkett, Fergusson, & Walraven, 2008; Jacobsson, Ladfors, & Milsom, 2004; Joseph et al., 2005).

Calculation of the Indicator

The proportion of live births to women aged 35 and older was calculated by dividing the number of live births to females, aged 35 and older, by the total number of live births in a given time and place. Time trends were calculated across 2001/02–2008/09. The time trends were further divided into two age groups—35 to 39 and 40 and older. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09)
  - Women aged 35 and older, Figure 2.9.1
    - The Manitoba rate ranged from 12.6% (2001/02) to 13.8% (2008/09); the linear trend was significant; the rate increased over time from a low of 12.4% in 2004/05 to a high of 13.8% in 2008/09.
    - The Winnipeg rate ranged from 15.3% (2001/02) to 17.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 14.4% in 2004/05 to a high of 17.2% in 2008/09.
    - The Brandon rate ranged from 8.0% (2001/02) to 12.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 7.4% in 2005/06 to a high of 12.9% in 2008/09.
  - Women aged 35 to 39, Figure 2.9.2
    - The Manitoba rate ranged from 10.9% (2001/02) to 11.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 10.3% in 2004/05 to a high of 11.6% in 2008/09.
    - The Winnipeg rate ranged from 13.1% (2001/02) to 14.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 12.1% in 2002/03 to a high of 14.6% in 2008/09.
    - The Brandon rate ranged from 7.2% (2001/02) to 10.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 6.5% in 2002/03 to a high of 10.7% in 2008/09.
  - Women aged 40 and older, Figure 2.9.3
    - The Manitoba rate ranged from 1.7% (2001/02) to 2.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.7% in 2001/02 to a high of 2.2% in 2003/04.
- RHA (2007/08–2008/09), Women aged 35 and older, Figure 2.9.4
  - Manitoba rate was 13.3% and was largely driven by the Winnipeg rate (16.7%).
  - South Eastman (10.7%), Central (11.4%), Assiniboine (10.1%), North Eastman (10.4%), Parkland (8.4%), NOR–MAN (8.6%), and Burntwood (6.0%) were significantly lower than the Manitoba rate; while Winnipeg (16.7%) was significantly higher.

- Winnipeg CA (2007/08–2008/09), Women aged 35 and older, Figure 2.9.5
  - Winnipeg rate was 16.7%.
  - Fort Garry (23.5%), Assiniboine South (23.2%), St. Vital (19.9%), and River Heights (22.0%) were significantly higher than Winnipeg rate; while Downtown (14.0%) and Point Douglas (8.9%) were significantly lower.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Women aged 35 and older, Figure 2.9.6
  There was a statistically significant difference in the proportion of women giving birth who were aged 35 and older for the following characteristics:
  - Income Quintile – There was a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive increase in area–level income, there was an increase in births to older mothers.
  - Income Assistance – 6.0% of the women giving birth who were on income assistance were 35 and older compared to 14.5% of the women who were not on income assistance.
  - Maternal Education – 6.9% of the women giving birth who had less than a Grade 12 education were 35 and older compared to 16.3% of those with a Grade 12 education.
  - Marital Status – 5.8% of the women giving birth who were lone parents were 35 and older compared to 15.9% of those who were married/partnered.
  - Social Isolation – 17.3% of the women giving birth who were socially isolated were 35 and older compared to 14.4% who were not socially isolated.
  - Parity – 7.3% of primiparous women were 35 and older compared to 17.0% of multiparous women.
  - **Ovulation Induction** – 27.2% of the women who used any drug for ovulation induction or **controlled ovarian hyperstimulation** in the two years prior to giving birth were 35 and older compared to 13.1% of the women who did not.

Comparison to Other Findings

In Manitoba, the proportion of live births for women aged 35–39 has increased significantly from 10.9% in 2001/02 to 11.6% in 2008/09. Similarly, the proportion of live births for women aged 40 and older has increased from 1.7% in 2001/2 to 2.1% in 2008/9. The recent report of the Canadian Institute for Health Information (2006–2007 through 2008–2009), showed similar rates in Manitoba for the proportion of live births for women aged 35 to 39 and 40 and older, 11.3% and 2.1% respectively (Canadian Institute for Health Information, 2011). Although these increasing trends are consistent with national trends, rates in Manitoba are lower than the national average: In 2008 in Canada, the proportions of live births to women aged 35 to 39 and 40 to 49 were 13.7% and 2.6% respectively (Public Health Agency of Canada, 2012). Based on the CIHI report, these proportions were 15.0% and 2.9%, respectively for Canada.

Limitations

Rates of live births to women aged 35 and older do not reflect the total number of pregnancies to older women (Public Health Agency of Canada, 2012).

Summary

Data demonstrated an increasing trend for births to older mothers in Manitoba from 2001/02 to 2008/09, particularly in cities of Winnipeg and Brandon. In Winnipeg, statistically significant variations were apparent across CAs. A higher proportion of births to older women was evident among women who were multiparous, not on income assistance, married/partnered, or socially isolated; had completed Grade 12 education; lived in higher income rural/urban areas; or had undergone ovulation induction two years prior to giving birth.

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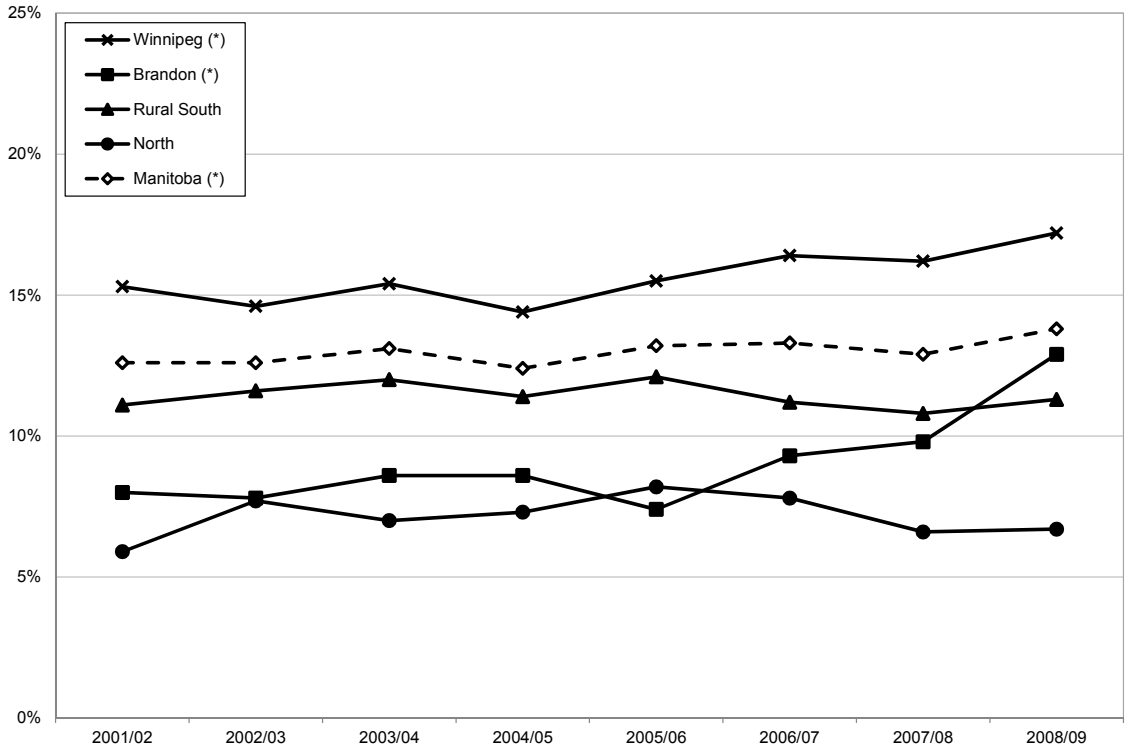
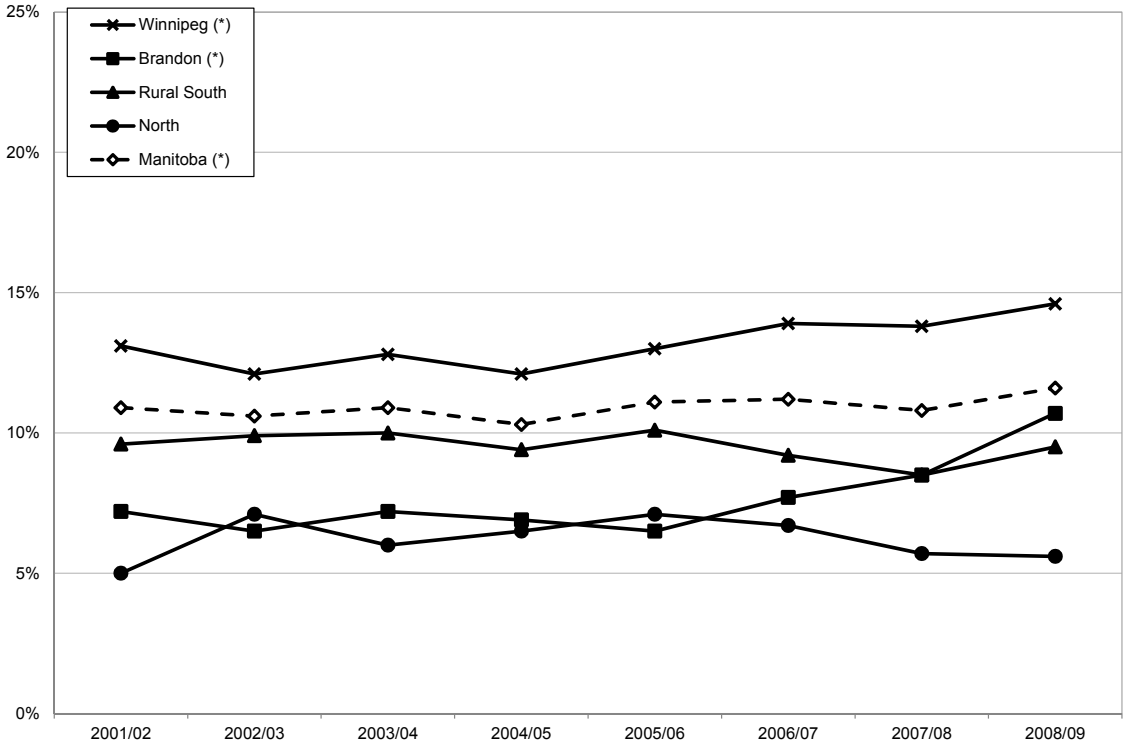
Figure 2.9.1: Proportion of Births to Women Aged 35 and Older by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

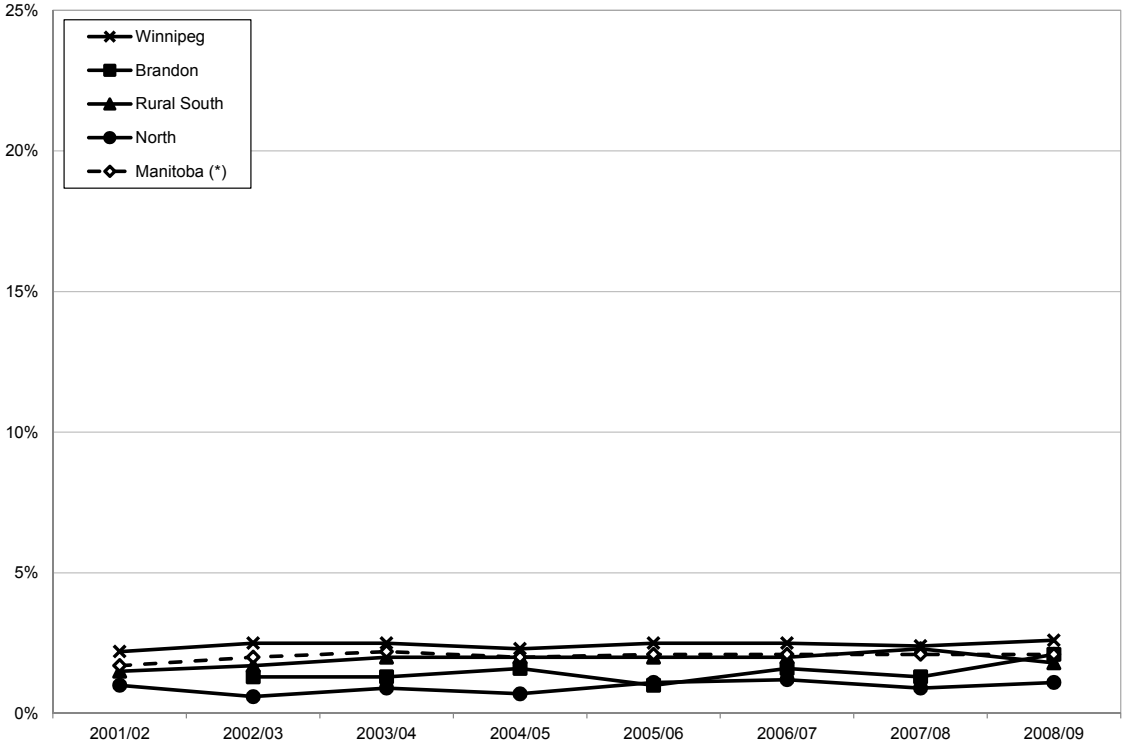
Figure 2.9.2: Proportion of Births to Women Aged 35-39 by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

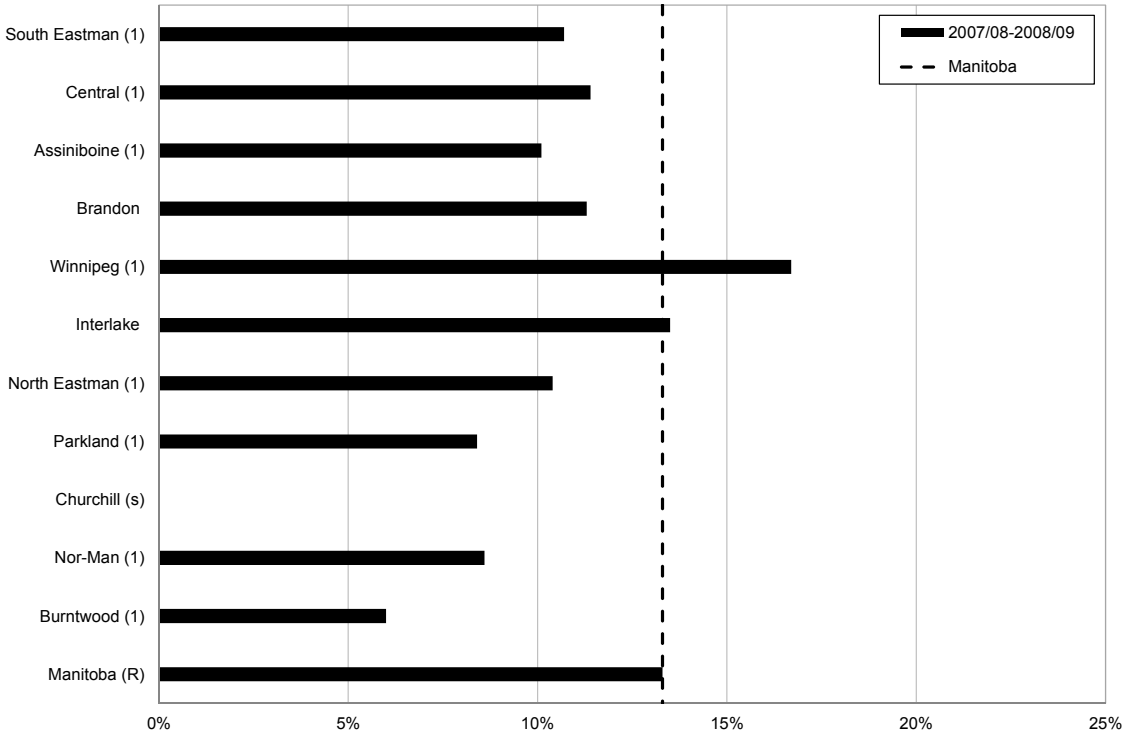
Figure 2.9.3: Proportion of Births to Women Aged 40 and Older by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

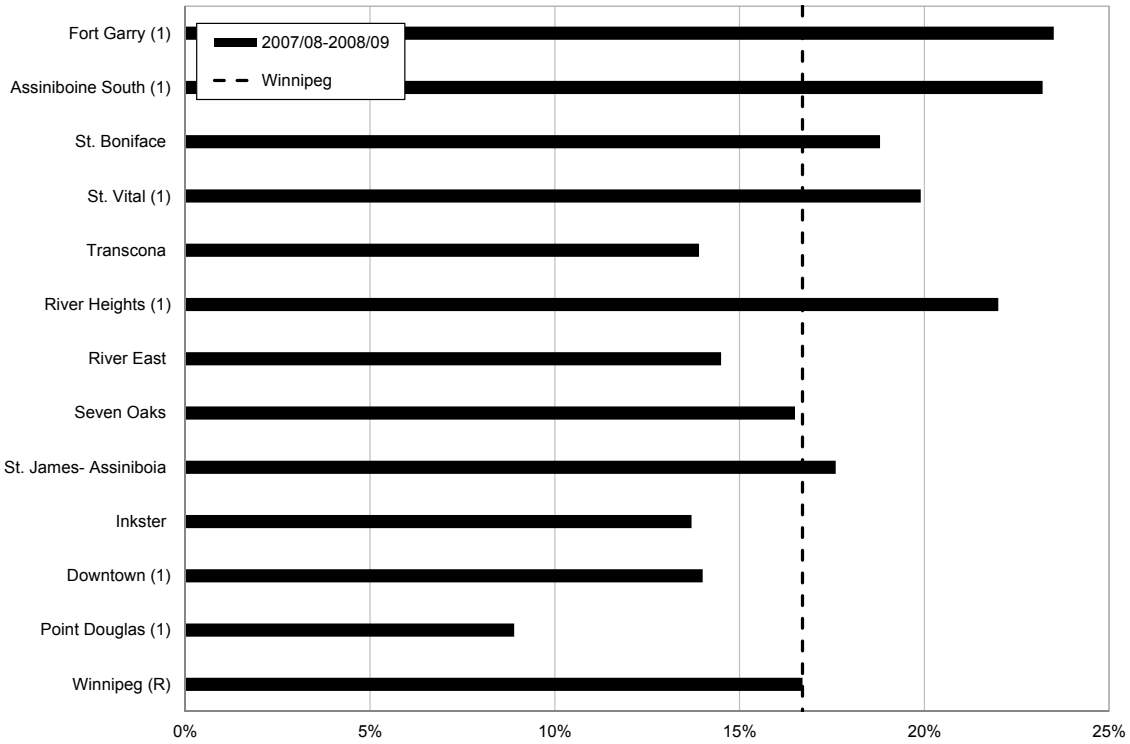
Figure 2.9.4: Proportion of Births to Women Aged 35 and Older by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

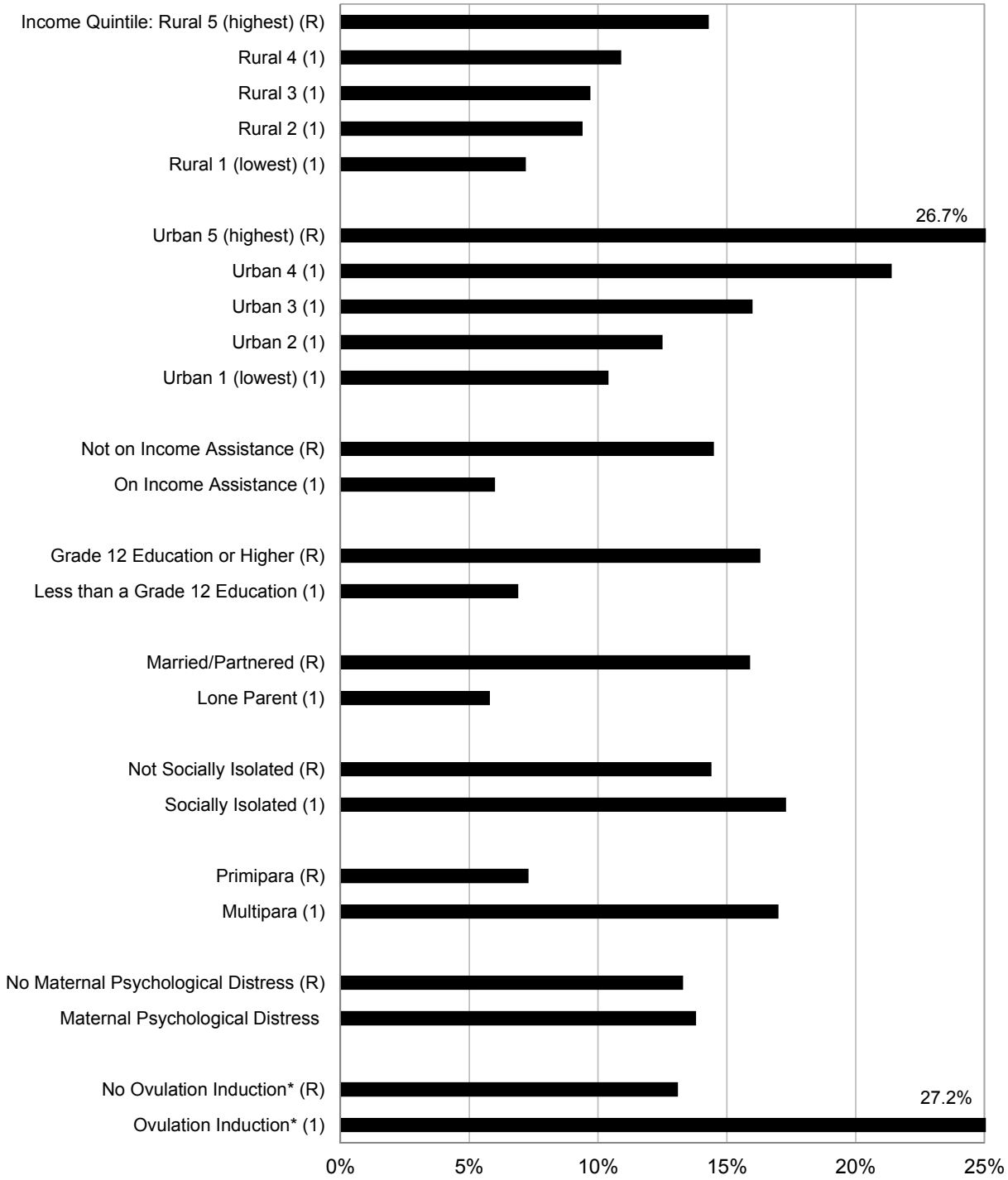
Figure 2.9.5: Proportion of Births to Women Aged 35 and Older by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.9.6: Proportion of Births to Women Aged 35 and Older by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers
'*' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

Source: Manitoba Centre for Health Policy, 2012

2.10 Delayed Childbearing

Background

The proportion of first births in women aged 35 and older has been steadily increasing in Canada (Johnson, Tough & SOGC, 2012). Delayed childbearing may be the result of availability of more effective contraceptive techniques, modern **infertility treatments**, developments in obstetric care, and recent changes in societal values (Carolan, 2003; Delbaere et al., 2007; Tudiver, 2005; Windridge & Berryman, 1999). In a survey of first–time mothers in Alberta, those women who gave birth at age 35 and older identified the following factors as influencing the timing of childbearing: being in a secure relationship (94.9%), feeling in control of one's life (81.6%), feeling prepared to parent (77.7%), being in a stable job (59.5%), and being financially secure (55.5%) (Tough, Vekved, & Newburn–Cook, 2012). Canadian primiparous women aged 35 and older are more likely to be better educated, have higher incomes, be employed, be more informed about pregnancy, and practice healthy behaviors than women aged 20 to 29 (Bayrampour & Heaman, 2011). However, first time mothers aged 35 and older have higher rates of many labour complications, interventions, and adverse outcomes, such as assisted vaginal delivery, cesarean birth, placental abruption, and **small–for–gestational age** infants (Canadian Institute for Health Information, 2011). In Canada, one of every two first–time mothers aged 40 and older with singleton pregnancies between 2006/07 and 2008/09 had a cesarean birth (Canadian Institute for Health Information, 2011). Unfortunately, a survey of women in Alberta who had given birth to their first live–born infant found that many women were unaware of the potential consequences of delayed childbearing (Tough et al., 2006).

Calculation of the Indicator

The proportion of live births to women aged 35 and older giving birth for the first time was calculated by dividing the number of the live births to primiparous women, aged 35 and older, by the total number of live births in a given time and place. Time trends were calculated across 2001/02–2008/09. The time trends were further divided into two age groups: 35 to 39 and 40 and older. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2005/06–2008/09. Stillbirths and births occurring at less than 20 weeks were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09)
  - Women aged 35 and older, Figure 2.10.1
    - The Manitoba rate ranged from 3.2% (2006/07) to 2.5% (2007/08) and was relatively stable.
    - The Winnipeg rate ranged from 4.1% (2001/02) to 4.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.6% in 2004/05 to a high of 4.9% in 2006/07.
    - The Brandon rate ranged from 1.9% (2001/02) to 3.8% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.9% in 2001/02 to a high of 3.8% in 2008/09.
  - Women aged 35 to 39, Figure 2.10.2
    - The Manitoba rate ranged from 2.2% (2002/03) to 2.8% (2006/07) and was relatively stable.
    - The Winnipeg rate ranged from 3.5% (2001/02) to 3.8% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.0% in 2004/05 to a high of 4.3% in 2006/07.
    - The Brandon rate ranged from 1.7% (2001/02) to 3.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.5% in 2004/05 to a high of 3.1% in 2008/09.

    - Women aged 40 and older, Figure 2.10.3
        - The Manitoba rate ranged from 0.5% (2005/06) to 0.3% (2007/08) and was relatively stable.
- RHA (2005/06–2008/09), Women aged 35 and older, Figure 2.10.4
    - Manitoba rate was 2.9% and was largely driven by the Winnipeg rate (4.4%).
    - South Eastman (1.4%), Central (1.3%), Assiniboine (1.6%), North Eastman (1.6%), Parkland (0.8%), NOR–MAN (0.7%), and Burntwood (0.4%) were significantly lower than the Manitoba rate; while Winnipeg (4.4%) was significantly higher.
- Winnipeg CA (2005/06–2008/09), Women aged 35 and older, Figure 2.10.5
    - Winnipeg rate was 4.4%.
    - Fort Garry (5.8%), Assiniboine South (6.2%), St. Boniface (5.6%), St. Vital (5.9%), River Heights (7.3%), and St. James–Assiniboia (6.1%) were significantly higher than Winnipeg rate; while River East (3.3%), Inkster (2.2%), and Point Douglas (1.3%) were significantly lower.
- Sociodemographic and Other Characteristics (2005/06–2008/09), Women aged 35 and older, Figure 2.10.6
  There was a statistically significant difference in the proportion of women giving birth who were primiparous and aged 35 and older for the following characteristics:
    - Income Quintile – There is a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive increase in area–level income, there was an increase in birth to primiparous women aged 35 and older.
    - Income Assistance – 0.3% of the women giving birth who were on income assistance were **primiparas** aged 35 and older compared to 3.4% of the women who were not on income assistance.
    - Maternal Education – 0.5% of the women giving birth who had less than a Grade 12 education were primiparas aged 35 and older compared to 4.1% of those with a Grade 12 education.
    - Marital Status – 1.4% of the women giving birth who were lone parents were primiparas aged 35 and older compared to 3.6% of those who were married/partnered.
    - Ovulation Induction – 14.5% of the women who used drugs for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth were primiparas aged 35 and older compared to 2.7% of the women who did not use such drugs.

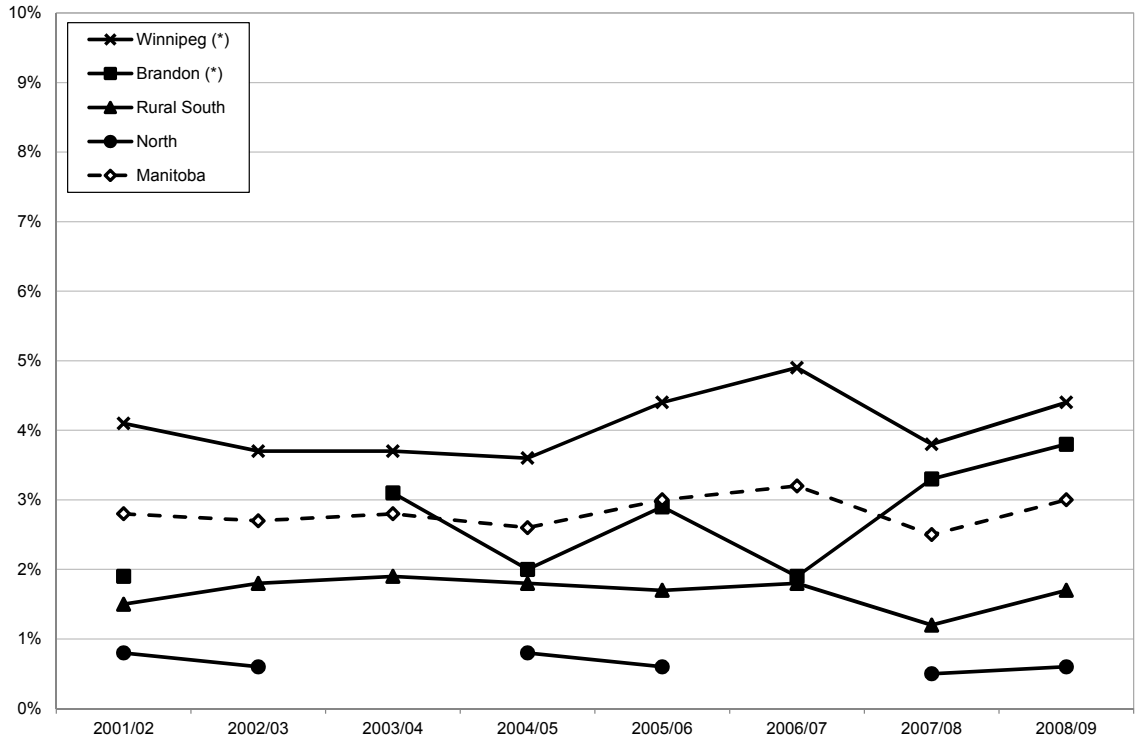
Comparison to Other Findings

Based on the sample from the National Longitudinal Survey of Children and Youth (NLSCY), 10.8% of first–born Canadian children were born to mothers aged 35 and older in the survey years 1998, 2000, 2002, and 2004 (Bushnik & Garner, 2008). In addition, Vital Statistics Birth Data from Statistics Canada shows an upward trend over time in the proportion of first births among mothers aged 35 and older: this group represented only 4% of Canadian births in 1987; by 2005 the group represented 11% of births (Bushnik & Garner, 2008). Both the Manitoba rate of first births in women aged 35 and older (2.9% in 2005/06–2008/09) and the Winnipeg rate (4.4%) are considerably lower than the rate of 11% for Canada (2005).

Summary

The overall rate of women having their first live birth at age 35 and older remains low for Manitoba at 2.9%; the rate was higher for Winnipeg at 4.4%. The rate has been increasing among women living in Winnipeg and Brandon. Relatively few women have first births at aged 40 and over, ranging from 0.3% to 0.5%. Women of higher socioeconomic status, those who have completed Grade 12, or those who were married/partnered were more likely to delay childbearing. In addition, 14.5% of women who received drugs for ovulation induction or controlled ovarian hyperstimulation had their first live birth at age 35 and older.

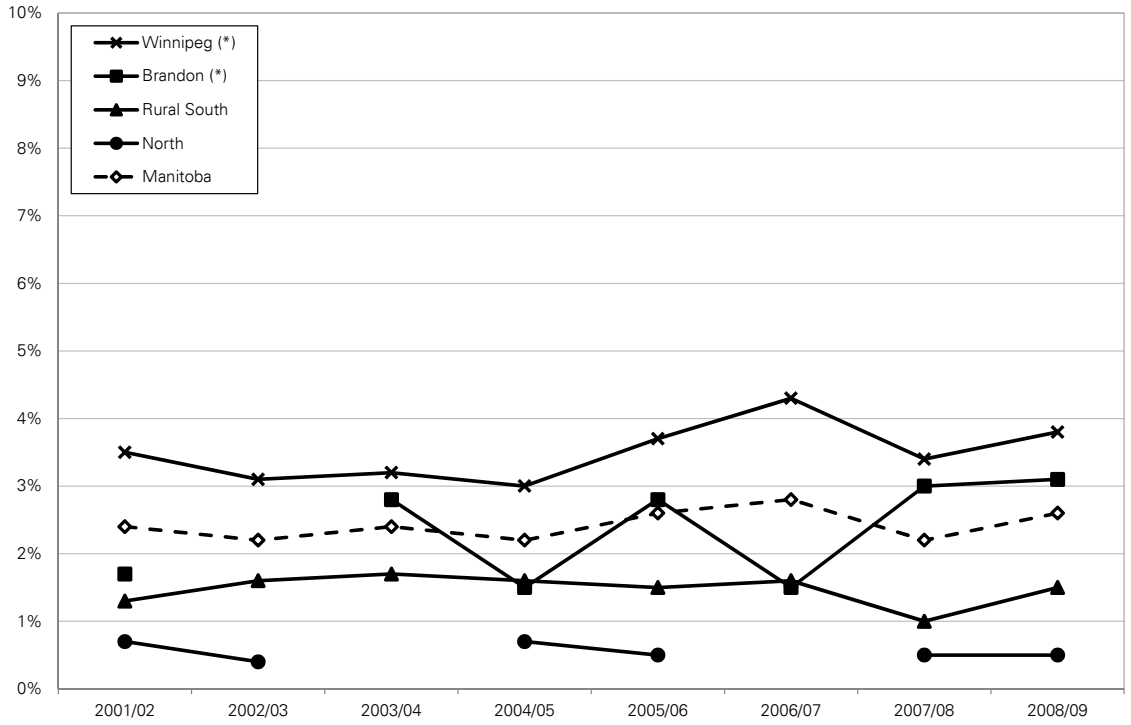
Figure 2.10.1: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 35 and Older by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

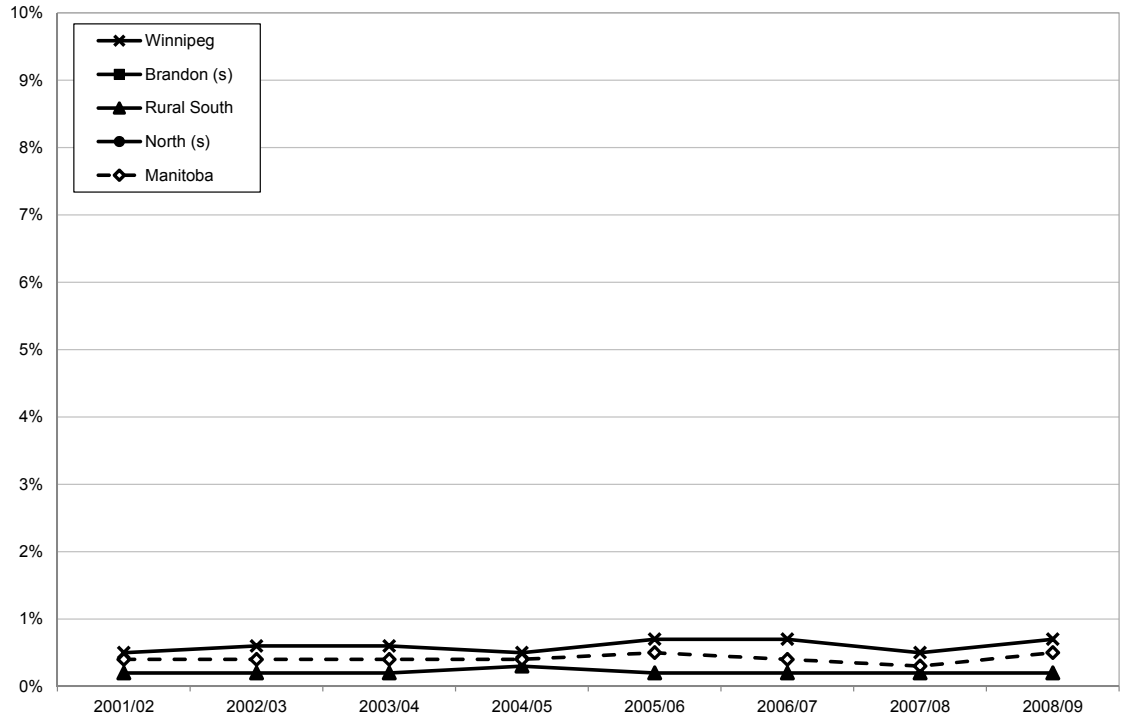
Figure 2.10.2: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 35-39 by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

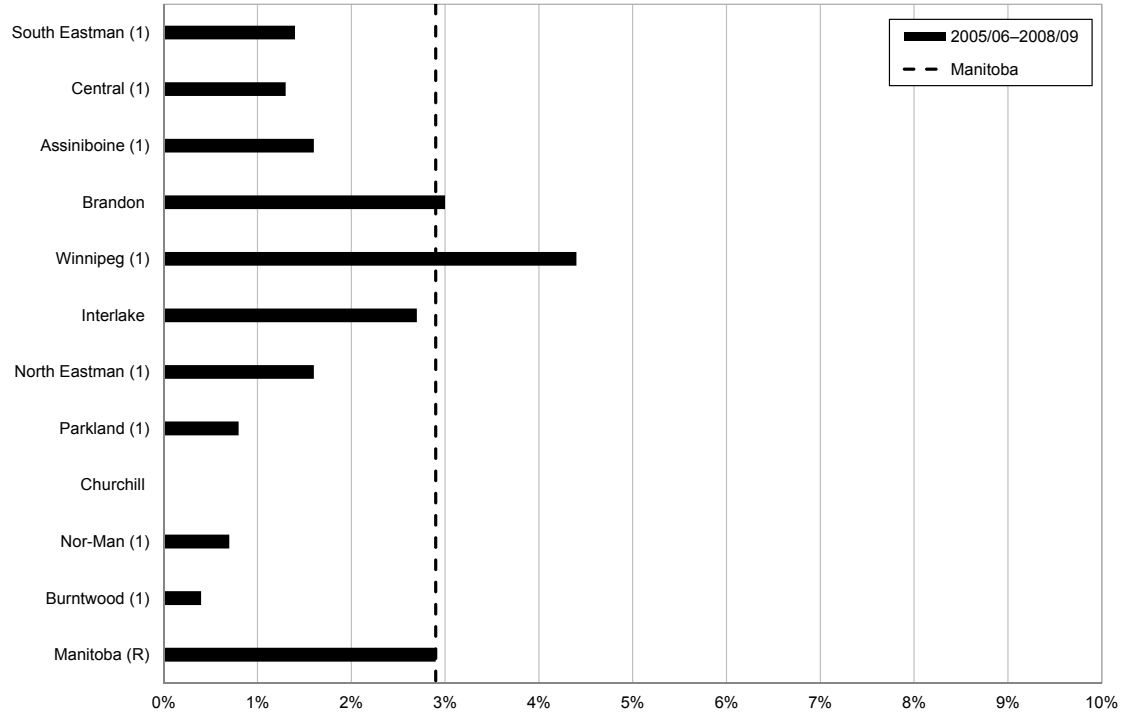
Figure 2.10.3: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 40 and Older by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

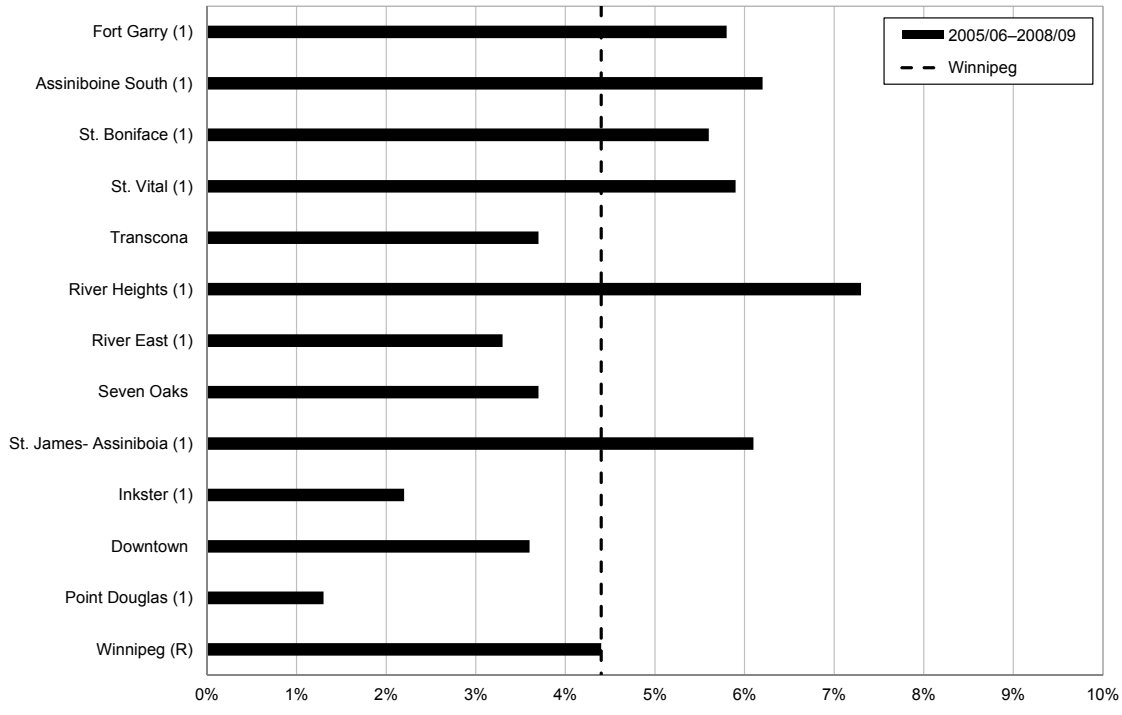
Figure 2.10.4: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 35 and Older by RHA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

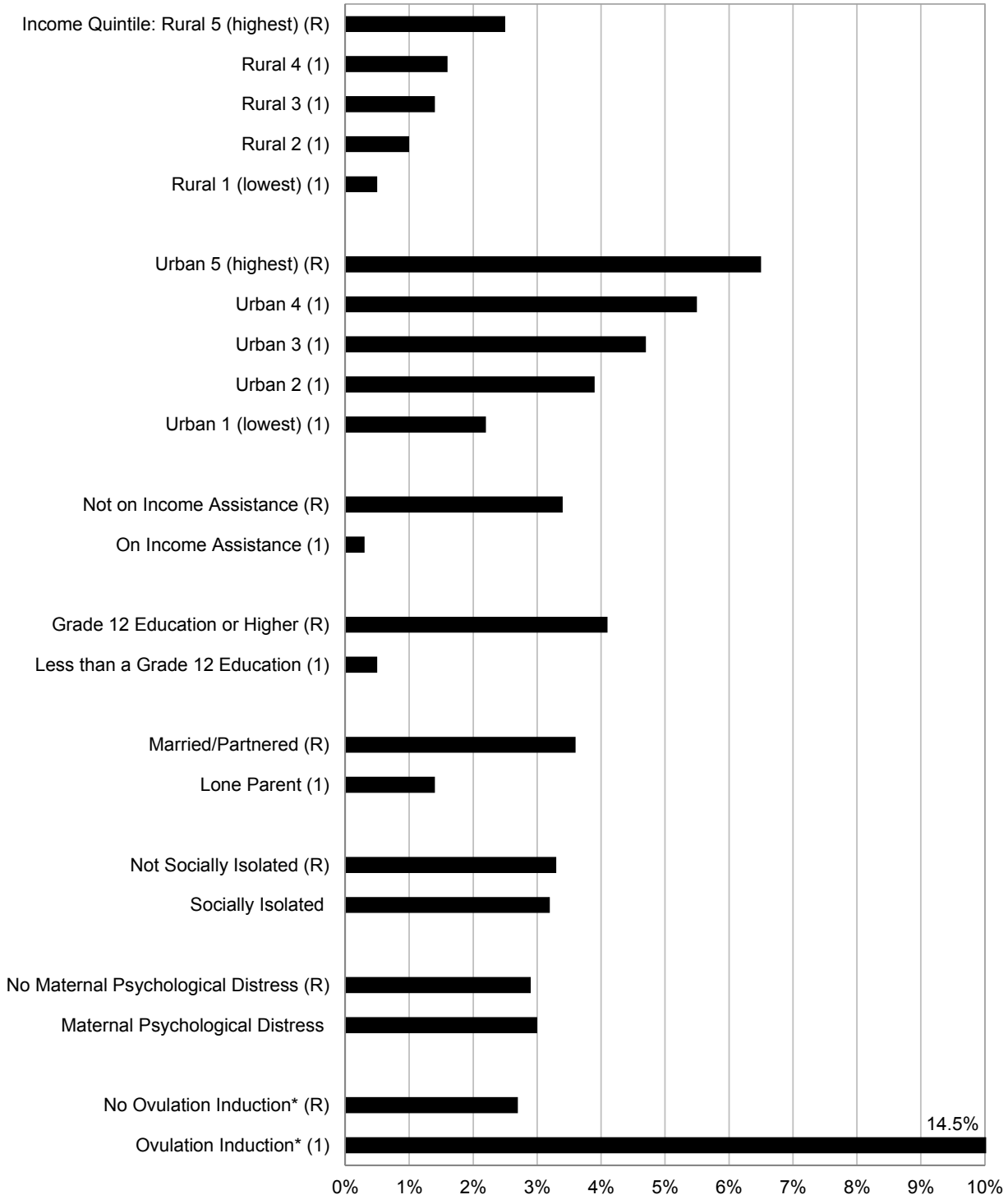
Figure 2.10.5: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 35 and Older by Winnipeg CA, 2005/06–2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.10.6: Delayed Childbearing—Proportion of Live Births to Primiparas Aged 35 and Older by Sociodemographic and Other Characteristics, 2005/06–2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers
'*' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

Source: Manitoba Centre for Health Policy, 2012

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2.11 Primiparas

Background

A nullipara is a woman who has not had a previous birth at 20 weeks' gestation or later, while a primipara is a woman who has had one birth at 20 weeks' gestation or later, regardless of whether the infant is born alive or dead (Olds, London, Wieland, & Davidson, 2004; Public Health Agency of Canada, 2008). Adverse pregnancy outcomes have been associated with both nulliparity and high parity. For example, nulliparity status prior to first birth has been related to lower rates of breastfeeding initiation (Hauck, Fenwick, Dhaliwal, & Butt, 2011); and low birth weight and preterm births (Shah, Zao, Al–Wassia, & Shah, 2011); whereas high parity has been associated with inadequate prenatal care (Heaman, Green, Newburn–Cook, Elliott, & Helewa, 2007) and higher rates of labour dystocia, cesarean births, fetal distress, and neonatal care intensive unit admission (Shechter, Levy, Wiznitzer, Zlotnik, & Sheiner, 2010). Patterns of health behavior, health service utilization, and maternity experiences also differ by parity (Public Health Agency of Canada, 2009), making it an important indicator of maternal and child health.

Calculation of the Indicator

The proportion of births to primiparas was calculated by dividing the number of the live births to women giving birth at more than 20 weeks' gestation for the first time, regardless of whether the infant was born alive or dead, by the total number of births in a given time and place. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

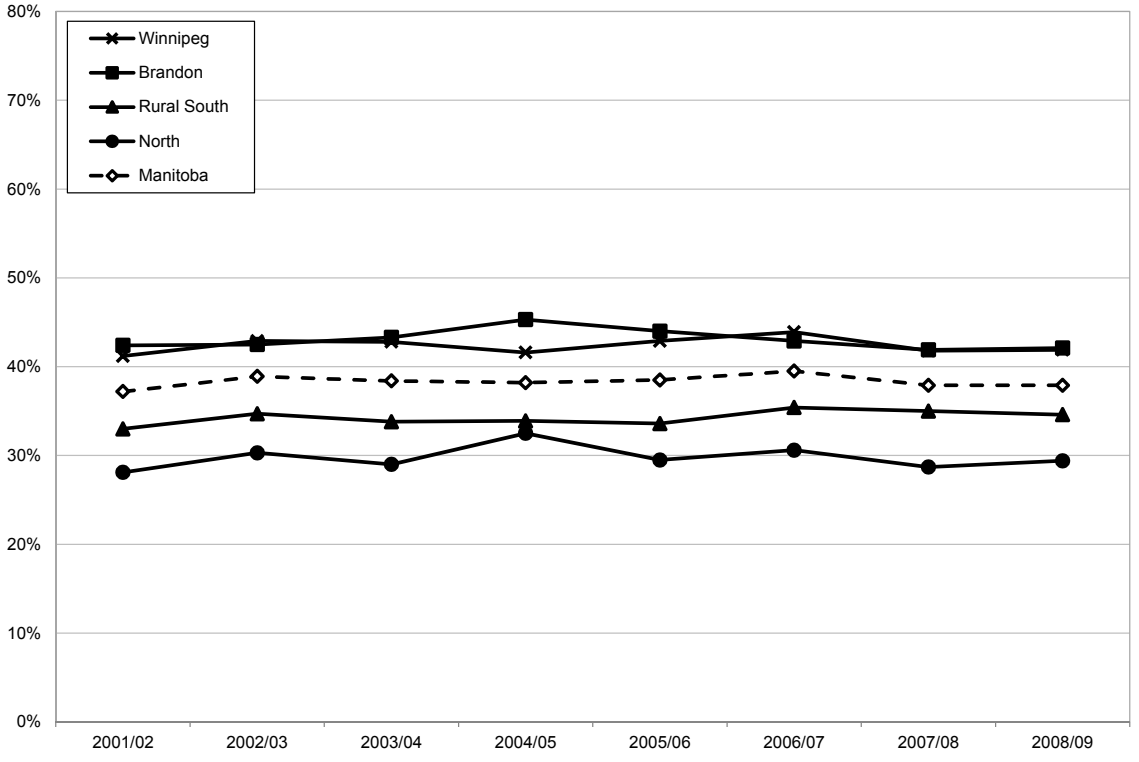
- Time Trend (2001/02–2008/09), Figure 2.11.1
  - The Manitoba rate ranged from 37.2% (2001/02) to 39.5% (2006/07) and was relatively stable.
- RHA (2007/08–2008/09), Figure 2.11.2
  - The Manitoba rate was 37.9%.
  - Central (32.6%), North Eastman (33.8%), Parkland (33.4%), NOR–MAN (31.2%), and Burntwood (28.2%) were significantly lower than the Manitoba rate; while Brandon (42.0%) and Winnipeg (41.8%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 2.11.3
  - The Winnipeg rate was 41.8 %.
  - Point Douglas (35.4%) was significantly lower than the Winnipeg rate, while River Heights (52.7%) was significantly lower.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 2.11.4
  There was a statistically significant difference in the proportion of women giving birth who were primiparous for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, there were fewer primiparous women.
  - Income Quintile – The relationship with area–level income differs in rural and urban areas. In rural areas, there are fewer primiparous women in the lower income quintiles; while in the urban areas, there are more in Urban 2 (45.6%) and Urban 3 (44.0%) than in Urban 5 (39.4%).
  - Income Assistance – 26.0% of the women giving birth who were on income assistance were primiparas compared to 39.9% of the women who were not on income assistance.
  - Maternal Education – 36.5% of the women giving birth who had less than a Grade 12 education were primiparas compared to 42.2% of those with a Grade 12 education.
  - Marital Status – 48.2% of the women giving birth who were lone parents were primiparas compared to only 38.2% of those who were married/partnered.

- Social Isolation – 36.8% of the women giving birth who were socially isolated were primiparas compared to 40.8% who were not socially isolated.
- Ovulation Induction – 61.3% of the women who used any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth were primiparas compared to 37.5% of the women who did not.

Summary

The proportion of births to primiparas in Manitoba was 37.9% in 2007/08–2008/09 and was stable between 2001/02 and 2008/09. Some variation was apparent across RHAs and CAs in Winnipeg. A higher proportion of births to primiparas was evident among women who were younger, lone parents, not on income assistance, or not socially isolated; had completed Grade 12 education; lived in higher income rural areas or lower income urban areas (Urban 2 and 3); or had undergone ovulation induction two years prior to giving birth.

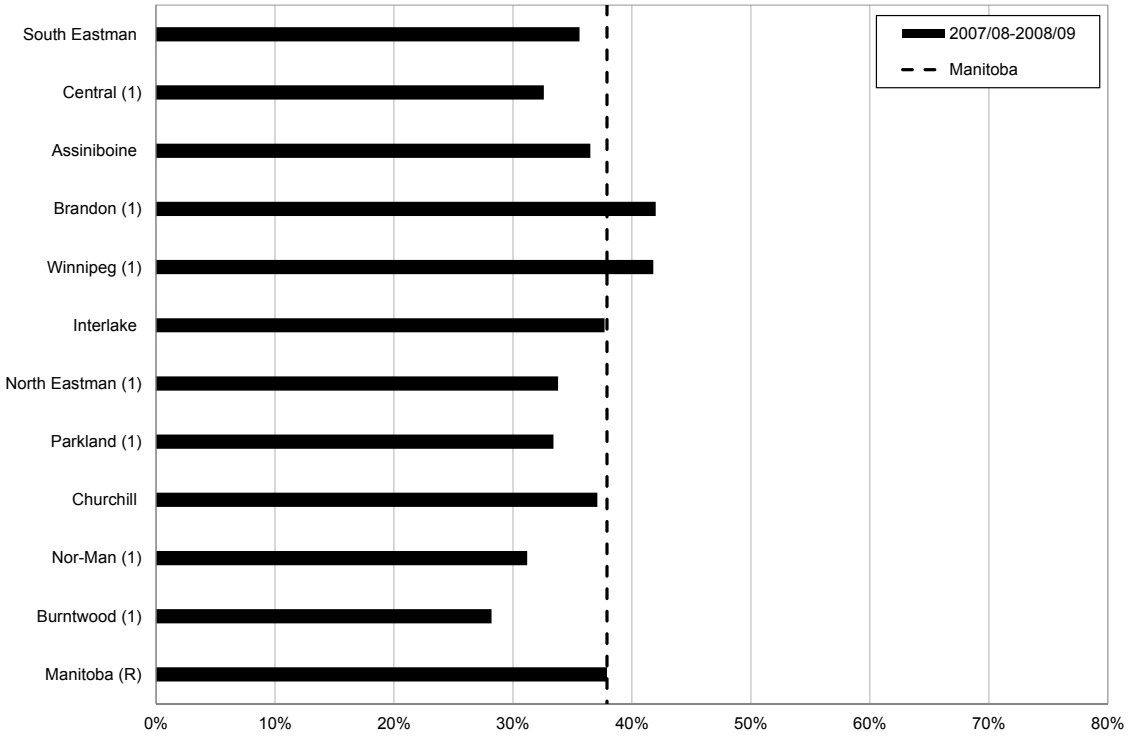
Figure 2.11.1: Proportion of Births to Primiparas by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

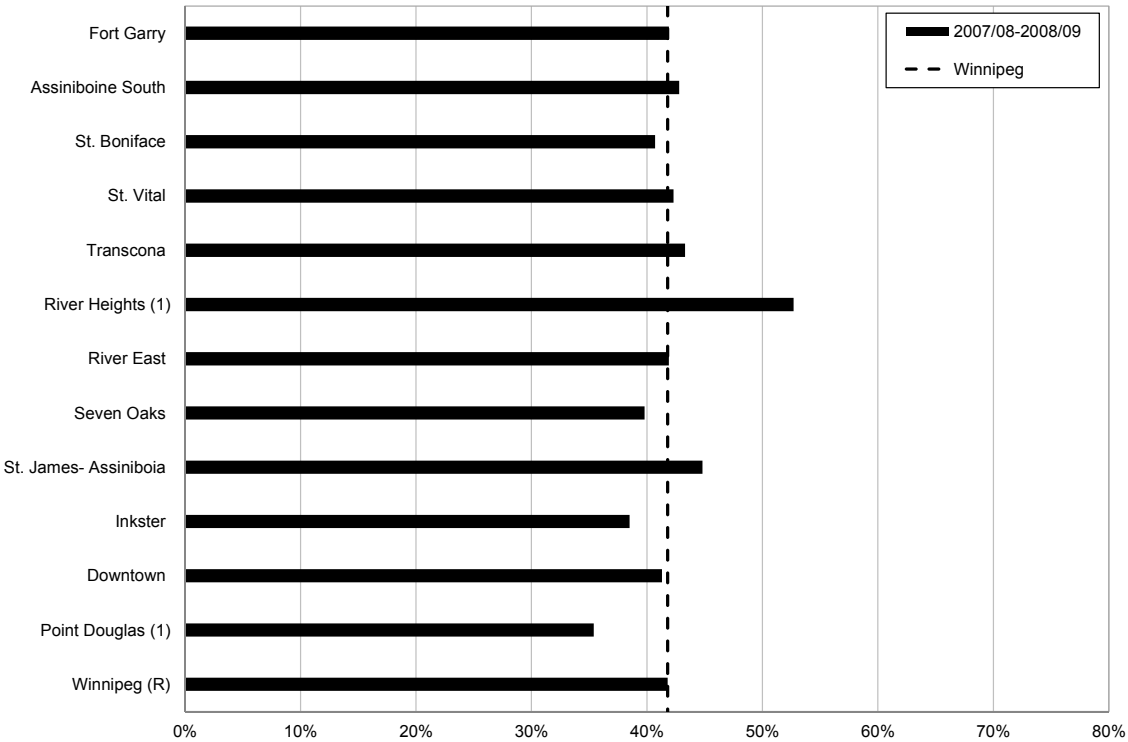
Figure 2.11.2: Proportion of Births to Primiparas by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

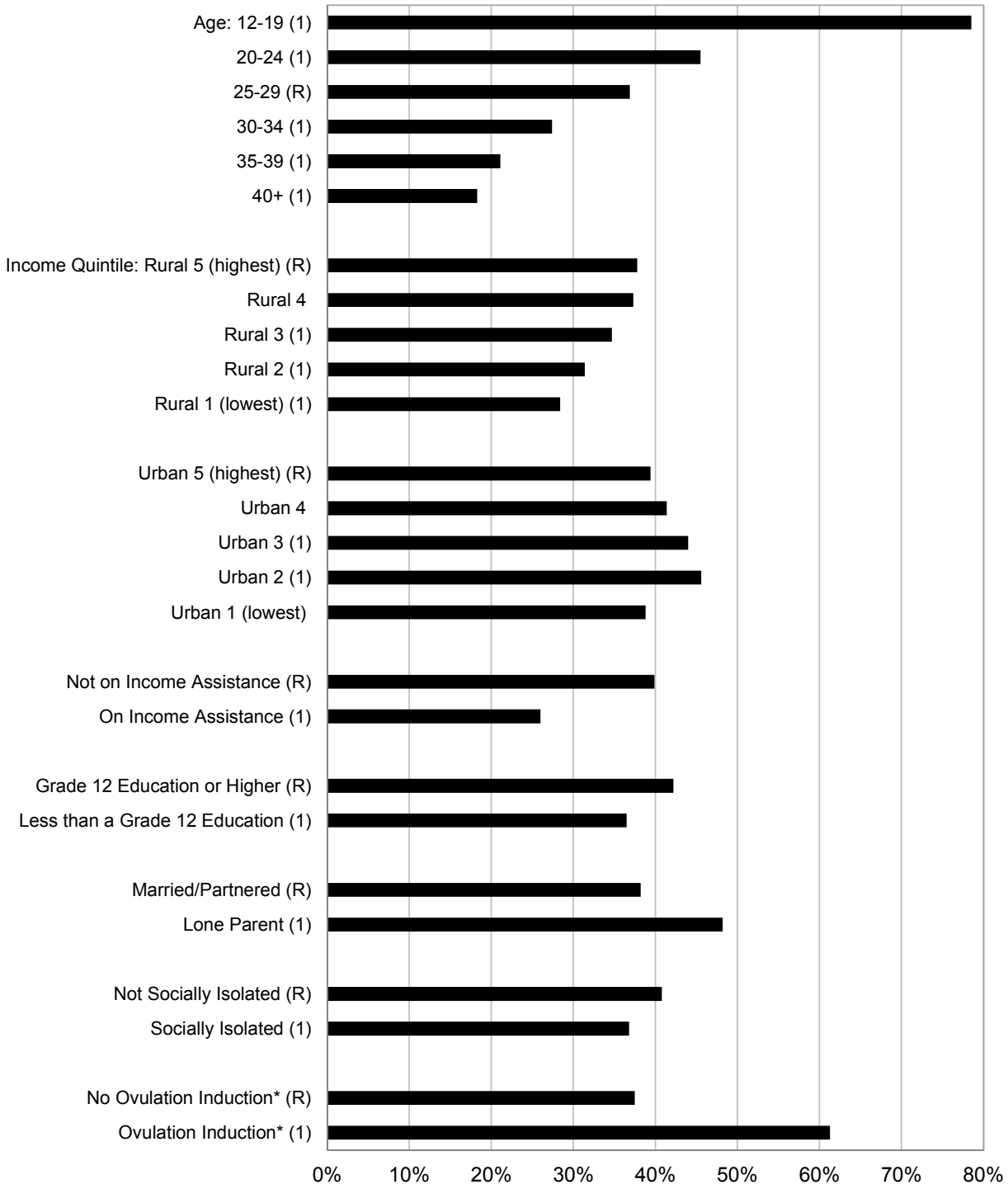
Figure 2.11.3: Proportion of Births to Primiparas by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.11.4: Proportion of Births to Primiparas by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) group ($p<0.01$)
's' indicates data suppressed due to small numbers
'*' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

Source: Manitoba Centre for Health Policy, 2012

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2.12 Short Interpregnancy Interval

Background

The relationship between birth spacing, or **interpregnancy interval (IPI),** and perinatal outcomes has been receiving more attention in recent years (Auger et al., 2008). The interpregnancy interval is defined as the time between the last delivery and conception of the current pregnancy (Auger et al., 2008; Salihu et al., 2012). Preconceptional factors such as pregnancy spacing may influence physiologic parameters in the subsequent pregnancies (Cheslack–Postava, Liu, & Bearman, 2011). Pregnancies with a short IPI (variously defined as less than six or less than 12 months) are at a higher risk for adverse birth outcomes including preterm birth, low birth weight, small–for–gestational–age, early neonatal death, and congenital malformations. On the other hand, longer IPI (i.e., 60 or more months) has been linked to preterm birth, low birth weight, and small–for–gestational–age (Conde–Agudelo, Rosas–Bermudez, & Kafury–Goeta, 2006; Grisaru–Granovsky, Gordon, Haklai, Samueloff, & Schimmel, 2009). Promotion of appropriate birth spacing (i.e., 18 to 23 months) is needed to prevent adverse perinatal outcomes (Hussaini, Ritenour, & Coonrod, 2012; Salihu et al., 2012).

Calculation of the Indicator

The proportion of multiparous women giving birth with a short IPI was calculated by dividing the number of multiparous women with a short IPI by the number of multiparous women giving birth in a given time and place. Primiparous women were not included in the denominator. For this report, a woman was considered to have a short IPI if time between the last delivery and the conception of the most recent pregnancy was less than 12 months. Stillbirths were included in this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 2.12.1
    - The Manitoba rate ranged from 1.8% (2001/02) to 2.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.7% in 2002/03 to a high of 2.5% in 2007/08.
    - The rate for the North ranged from 3.7% (2001/02) to 6.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.1% in 2002/03 to a high of 6.5% in 2007/08.
- RHA (2005/06–2008/09), Figure 2.12.2
    - The Manitoba rate was 2.2%.
    - South Eastman (1.0%) and Winnipeg (1.7%) were significantly lower than the Manitoba rate, while NOR–MAN (4.6%) and Burntwood (5.9%) were significantly higher.
- Winnipeg CA (2005/06–2008/09), Figure 2.12.3
    - Winnipeg rate was 1.7%.
    - Downtown (3.0%) and Point Douglas (3.8%) were higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2005/06–2008/09), Figure 2.12.4
  There was a statistically significant difference in the proportion of women giving birth with a short IPI for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, there were fewer women with a short IPI—10.4% of multiparous women under the age of 19 had a short IPI compared to 2% of women aged 25 to 29 (the reference category) and 0.6% of women aged 35 to 39.
    - Income Quintile – There is a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive decrease in area–level income, there was an increase in the proportion of multiparous women with a short IPI.

- Income Assistance – 4.6% of the multiparous women giving birth who were on income assistance had a short IPI compared to 1.7% of the women who were not on income assistance.
- Maternal Education – 3.7% of the women with less than Grade 12 education giving birth had a short IPI compared to 0.8% of those with a Grade 12 education.
- Marital Status – 3.2% of the **multipara** women giving birth who were lone parents had a short IPI compared to 1.2% of those who were married/partnered.
- Social Isolation – 2.6% of the multipara women giving birth who were socially isolated had a short IPI compared to 1.3% who were not socially isolated.
- Breastfeeding Initiation – 5.4% of multiparous women giving birth who were not breastfeeding at hospital discharge had a short IPI compared to 1.3% of those who were breastfeeding at hospital discharge.

Comparison to Other Findings

There are no national data on interpregnancy interval. The Manitoba rate for short IPI in 2005/06–2008/09 was 2.2%. In a study conducted in Montreal, 9.4% of mothers had a short IPI of less than 12 months (Auger et al., 2008).

Limitations

Births that occurred out of province may be missed, leading to miscalculation of IPI. Additionally, not all miscarriages are captured in the administrative data at MCHP.

Summary

A significantly higher proportion of women in the Burntwood and NOR–MAN RHAs had short IPIs compared to the Manitoba rate. There was also a sudden increase in short IPI in the North starting in 2006/07 that requires further exploration. Women's socioeconomic status was linked to a short IPI. A higher proportion of multiparous women with short IPI was evident among women who were younger than 25, a lone parent, on income assistance, or socially isolated; lived in lower income rural/urban areas; had not completed Grade 12 education, or who did not initiate/were not breastfeeding at discharge. Teen multiparous women (19 and younger) had particularly high rates of short interpregnancy intervals (10.4%), suggesting that this is a target group for education related to optimal pregnancy spacing.

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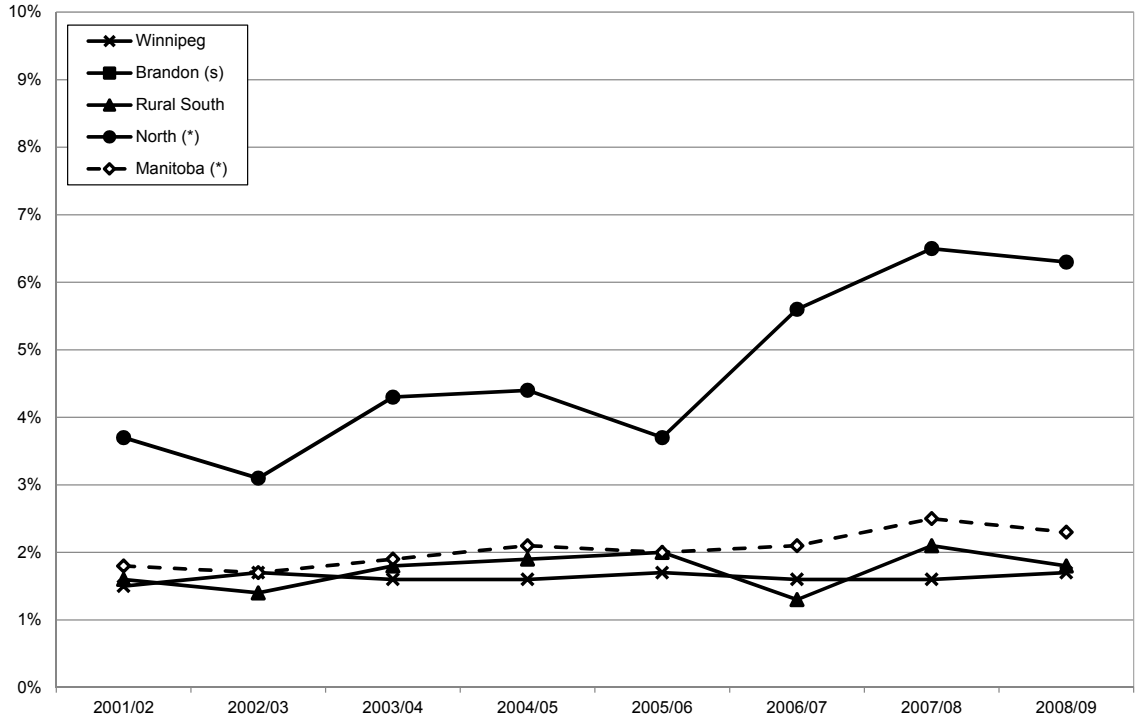
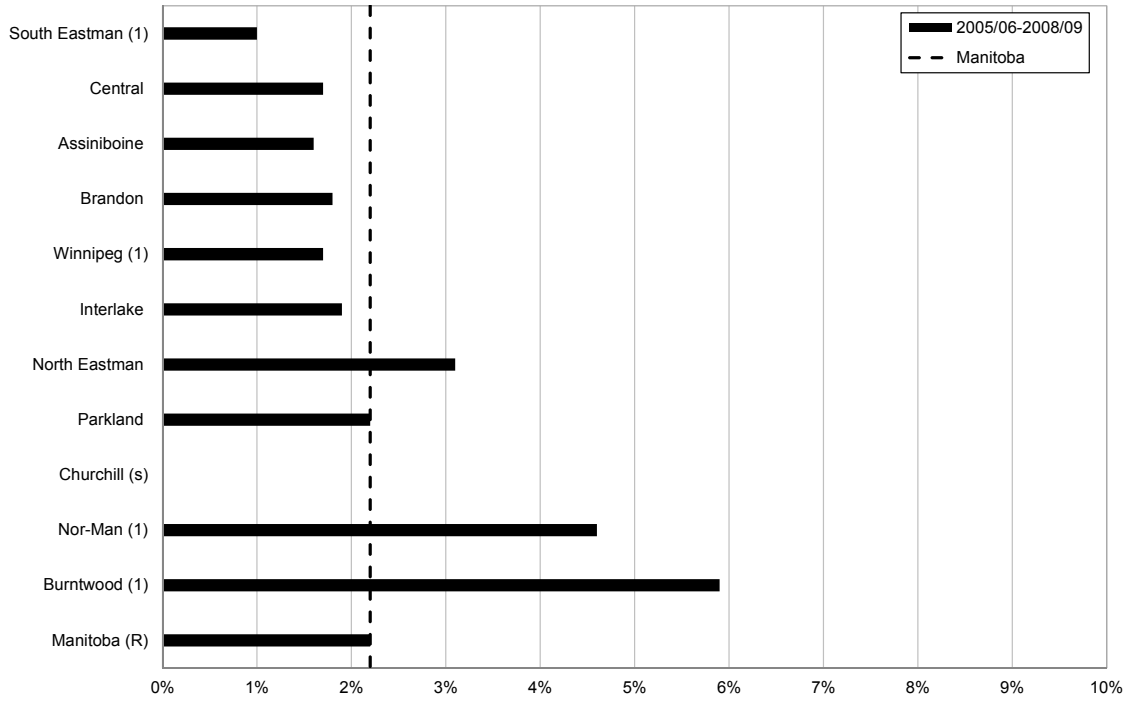
Figure 2.12.1: Proportion of Multiparous Women with Short (within one year) Interpregnancy Interval by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

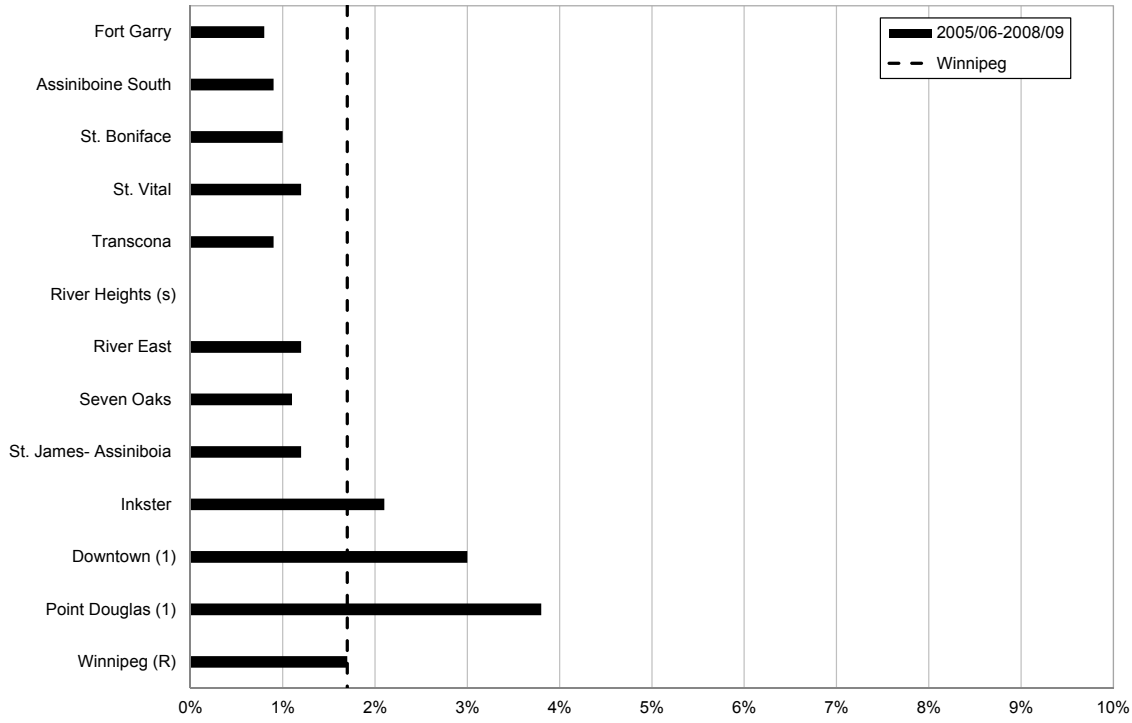
Figure 2.12.2: Proportion of Multiparous Women with Short (within one year) Interpregnancy Interval by RHA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

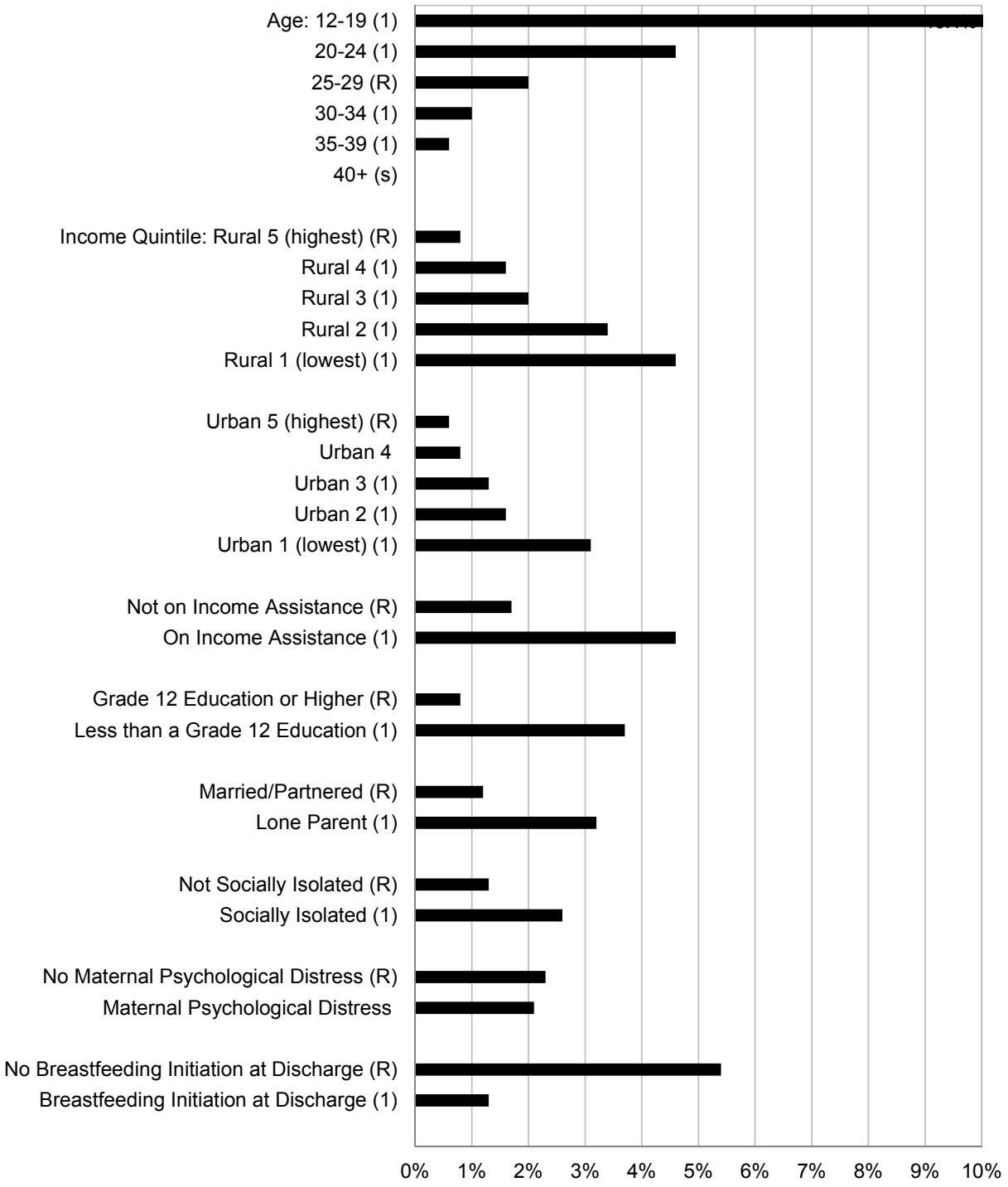
Figure 2.12.3: Proportion of Multiparous Women with Short (within one year) Interpregnancy Interval by Winnipeg CA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 2.12.4: Proportion of Multiparous Women with Short (within one year) Interpregnancy Interval by Sociodemographic and Other Characteristics, 2005/06-2008/09



'1' indicates the group's rate was statistically different from the reference (R) group (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Chapter 3: Maternal Prenatal Health

3.1 Alcohol Consumption During Pregnancy

Background

Alcohol consumption during pregnancy is associated with several adverse outcomes for the mother, fetus and child including **intrauterine growth restriction (IUGR)**, stillbirth, birth defects, neurodevelopmental disorders, and **fetal alcohol spectrum disorders (FASD)** (Meyer–Leu, Lemola, Daeppen, Deriaz, & Gerber, 2011). It is estimated that every year in Canada, more than 3,000 babies are born with FASD and currently about 300,000 people are living with FASD (Health Canada, 2006). While heavy drinking during pregnancy is associated with several adverse health consequences for mother or fetus, there are controversies about safety of moderate drinking and binge drinking during pregnancy (Meyer–Leu et al., 2011; Strandberg–Larsen et al., 2011).

Based on Health Canada and the **Public Health Agency of Canada** guidelines, no amount or type of alcohol is considered safe during pregnancy. Because FASD and its consequences are preventable by avoiding alcohol during pregnancy, these guidelines recommend that pregnant women or women who try to become pregnant avoid alcohol consumption (Health Canada, 2006; Public Health Agency of Canada, 2011). The Society of Obstetricians and Gynaecologists of Canada (SOGC) clinical practice guideline recommends that universal screening for alcohol consumption should be done for all pregnant women; ideally, at–risk drinking should be identified before pregnancy to allow for change in behavior. Although the SOGC guideline notes there is insufficient evidence to define any threshold for low–level drinking in pregnancy, abstinence is recommended as "the prudent choice for a woman who is or might become pregnant" (Carson et al., 2010).

Calculation of the Indicator

The proportion of women who reported consuming alcohol during pregnancy was calculated by dividing the number of women with live births who reported consuming any alcohol during pregnancy (from the Families First Screening Form) by the total number of women with live births in a given time and place. The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality in the early years of the Families First Screen. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2003/04–2008/09), Figure 3.1.1
    - The Manitoba rate ranged from 11.9% (2003/04) to 13.0% (2008/09); the linear trend was significant; the rate increased over time from a low of 11.5% in 2004/05 to a high of 14.3% in 2007/08.
    - The Winnipeg rate ranged from 10.8% (2003/04) to 12.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 10.6% in 2004/05 to a high of 14.0% in 2007/08.
    - The Brandon rate ranged from 9.7% (2003/04) to 20.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 9.7% in 2003/04 to a high of 20.7% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.1.2
    - Manitoba rate was 13.6%.
    - South Eastman (5.9%) was significantly lower than the Manitoba rate; while Assiniboine (25.0%), Brandon (19.3%), and NOR–MAN (24.0%) were significantly higher.

- Winnipeg CA (2007/08–2008/09), Figure 3.1.3
  - Winnipeg rate was 13.1%
  - Fort Garry (6.4%), Assiniboine South (7.6%), St. Vital (10.0%), River Heights (5.0%), River East (10.5%), and St. James–Assiniboia (8.0%) were significantly lower than the Winnipeg rate; while St. Boniface (21.1%), Inkster (19.2%), Downtown (18.2%), and Point Douglas (23.8%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.1.4
  There was a statistically significant difference in the proportion of women giving birth who reported consuming any alcohol during pregnancy for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, fewer women reported consuming alcohol during pregnancy.
  - Income Quintile – There was a significant relationship with income quintile. In both rural and urban income quintiles, there were more women reporting consuming alcohol during pregnancy in lower income quintiles compared to higher income quintiles.
  - Income Assistance – 31.4% of the women giving birth who were on income assistance reported consuming alcohol during pregnancy compared to 11.1% of the women who were not on income assistance.
  - Maternal Education – 24.5% of the women giving birth who had less than a Grade 12 education reported consuming alcohol during pregnancy compared to 11.4% of those with a Grade 12 education.
  - Marital Status –34.1% of the women giving birth who were lone parents reported consuming alcohol during pregnancy compared to 11.0% of those who were married/partnered. This difference was significant.
  - Parity – 18.3% of the primiparous women reported consuming alcohol during pregnancy, compared to 10.5% of multiparous women.
  - Prenatal Care – 26.1% of women with inadequate prenatal care reported consuming alcohol during pregnancy compared to 13.0% of women with adequate prenatal care.

Comparison to Other Findings

In Manitoba, the rate of alcohol consumption during pregnancy increased from 11.9% in 2003/04 to 13.0% in 2008/09. In the Canadian Perinatal Health Report, the proportion of women who reported drinking alcohol during pregnancy in 2005 was 10.5%; this rate was estimated using data from the Canadian Community Health Survey (Public Health Agency of Canada, 2008). Based on the Canadian Maternity Experiences Survey, the rate of alcohol consumption during pregnancy was 10.5% in 2006/07 (Public Health Agency of Canada, 2009). Caution needs to be used in comparing these Canadian rates to our Manitoba rate due to differences in wording of the question and in timing of asking about alcohol consumption during pregnancy.

Limitations

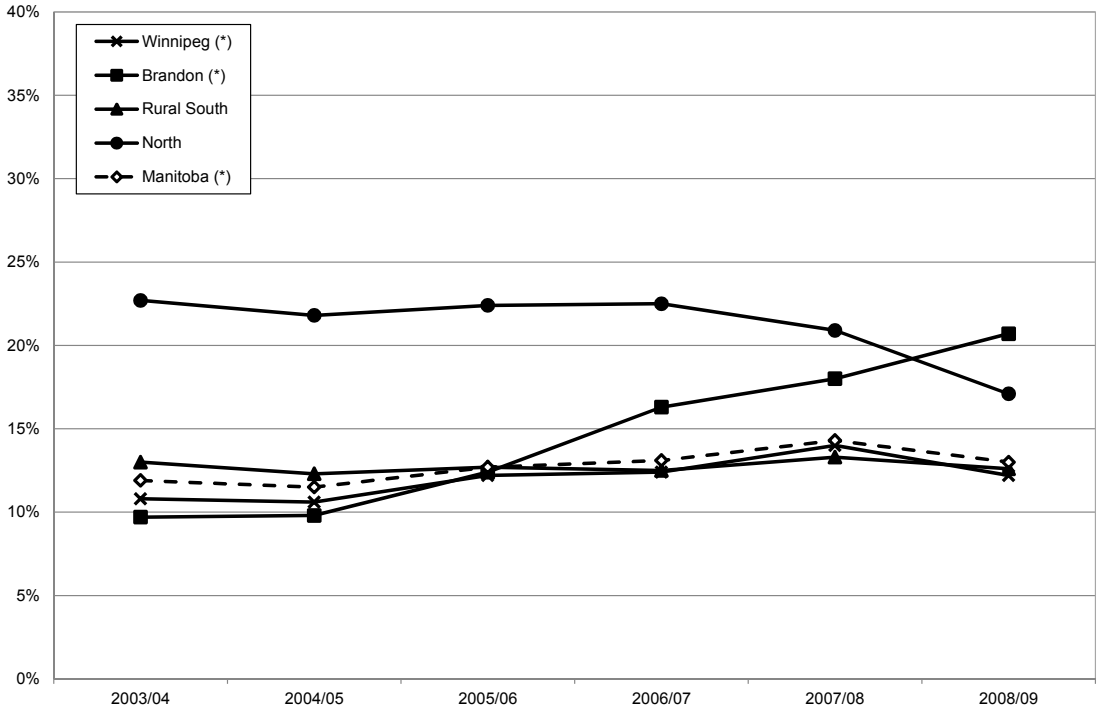
Those women living in First Nations communities were excluded from this analysis as the Families First Screen is not conducted in these communities. Additionally, cases where the variable was missing were excluded. Over the six years of analysis, there were 24,241 cases that were excluded (approximately 29% of women having a live birth). There may be differences in characteristics between women for whom we have Families First Screening data for this variable and those for whom we do not.

Summary

The proportion of women who reported alcohol consumption during pregnancy has increased significantly in Manitoba overall and, in Brandon and Winnipeg, since 2003/04. Whether this reflects a true increase in alcohol consumption, more comfort on the part of the public health nurses asking the question during the Families First Screening process, or whether the nurses are getting better at accessing hard to reach families who may be more likely to consume alcohol is not known. In particular, the reasons for the more noticeable increase in the Brandon rate are unknown and warrant further exploration.

Alcohol consumption varied by RHA and CA. Assiniboine (25.0%), Brandon (19.3%), and NOR–MAN (24.0%) were significantly higher than the Manitoba rate (13.6%) in 2007/08 to 2008/09; while rates in Winnipeg ranged from a low of 5.0% in River Heights to a high of 23.8% and 21.1% in Point Douglas and St. Boniface, respectively. A higher rate of maternal alcohol consumption was evident among women who were younger, primiparous, lone parents, or on income assistance; lived in lower income rural/urban areas; had not completed Grade 12 education; or had inadequate prenatal care.

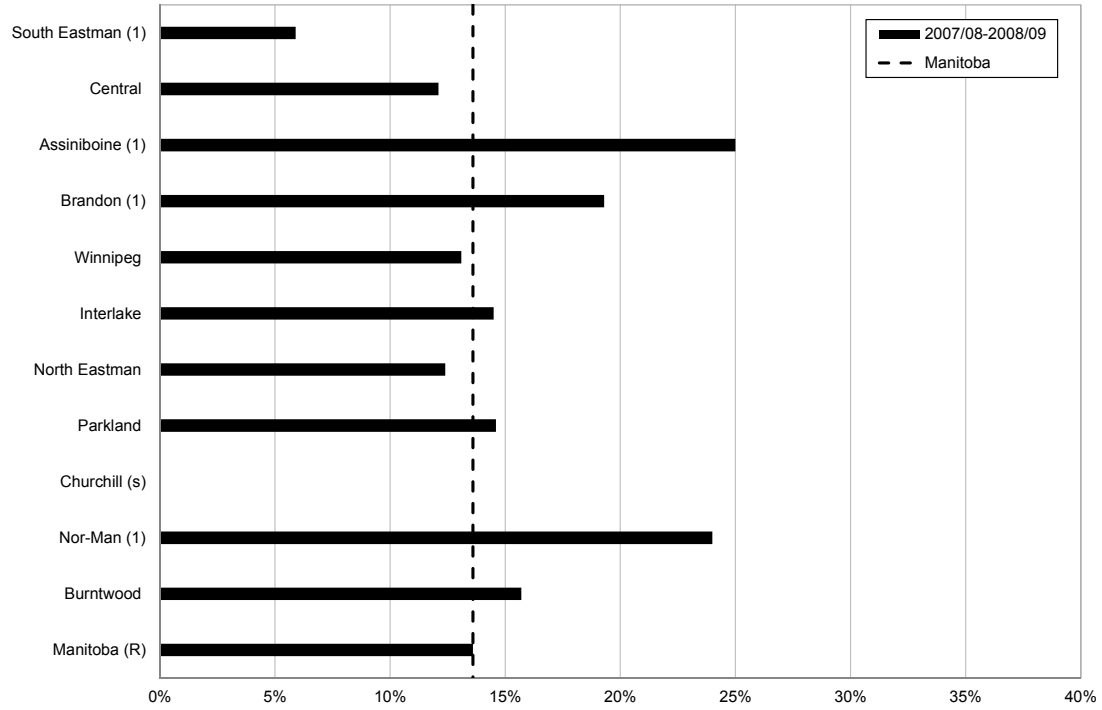
Figure 3.1.1: Proportion of Women Reporting Alcohol Consumption During Pregnancy by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

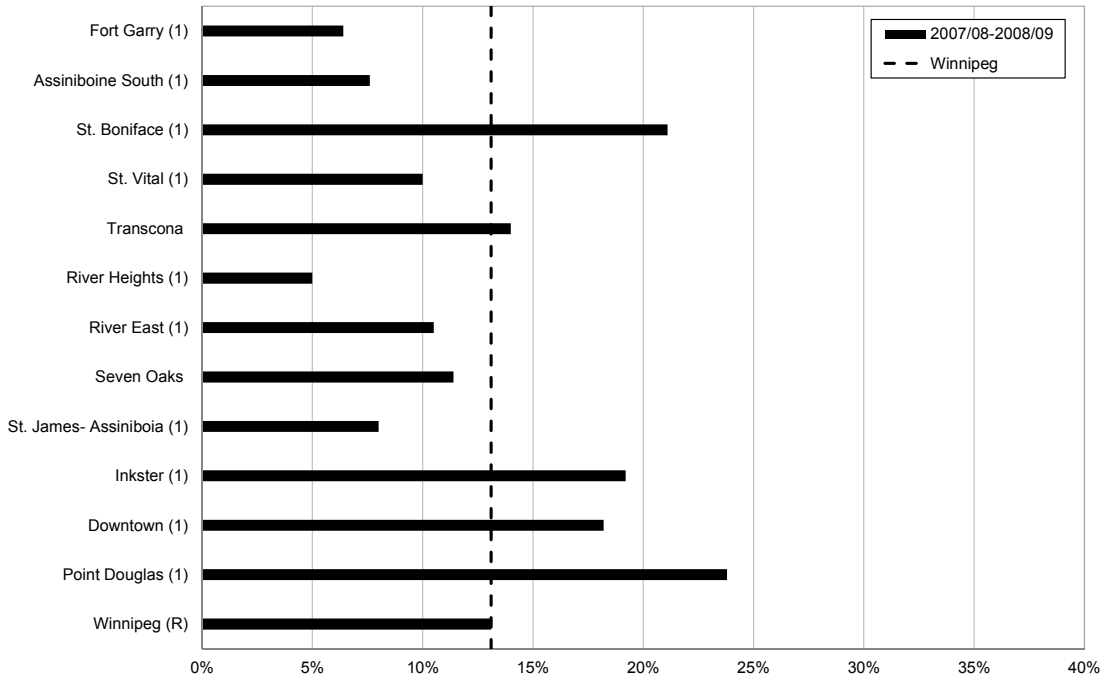
Figure 3.1.2: Proportion of Women Reporting Alcohol Consumption During Pregnancy by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

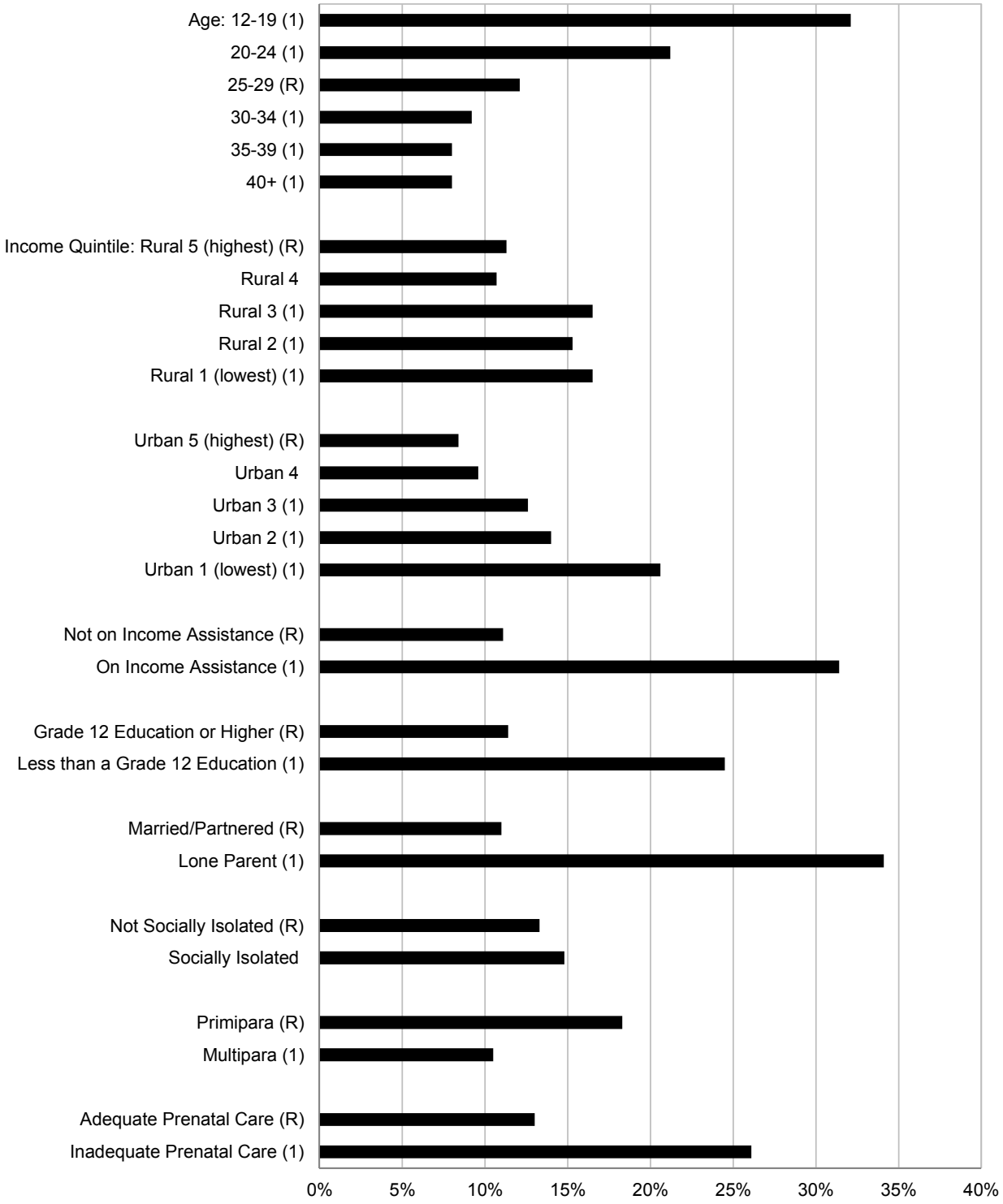
Figure 3.1.3: Proportion of Women Reporting Alcohol Consumption During Pregnancy by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.1.4: Proportion of Women Reporting Alcohol Consumption During Pregnancy by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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3.2 Smoking During Pregnancy

Background

Prenatal smoking is one of the preventable causes of maternal and fetal/neonatal **morbidity**. Maternal smoking has been linked with several adverse outcomes including preterm birth, low birth weight, placenta previa, placental abruption, and sudden infant death syndrome (Gardener, Spiegelman, & Buka, 2011).There is also evidence suggesting that active and passive smoking during pregnancy can affect several aspects of neonatal neurobehavioral development (Odd, Rasmussen, Gunnell, Lewis, & Whitelaw, 2008) and is a risk factor for developing asthma in young children (Lannero, Wickman, Pershagen, & Nordvall, 2006). In a Manitoba study, significant correlates of smoking during pregnancy included young age (19 and younger), low income, single marital status, non–completion of high school, inadequate prenatal care, alcohol use, **illicit drug use**, high perceived stress, physical abuse, and low social support from partner and others (Heaman & Chalmers, 2005).

Calculation of the Indicator

The proportion of women who reported smoking during pregnancy was calculated by dividing the number of women with live births who reported smoking during pregnancy by the total number of women with live births in a given time and place. The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality in the early years of the Families First Screen. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2003/04–2008/09), Figure 3.2.1
  - The Manitoba rate ranged from 18.9% (2003/04) to 17.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 19.3% in 2004/05 to a low of 17.7% in 2008/09.
  - The Winnipeg rate ranged from 19.0% (2003/04) to 17.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 19.7% in 2004/05 to a low of 17.6% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.2.2
  - The Manitoba rate was 18.1%.
  - South Eastman (10.0%) and Central (11.4%) were significantly lower than Manitoba rate, while Brandon (23.7%), Interlake (21.2%), Parkland (27.3%), NOR–MAN (35.2%), and Burntwood (45.4%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.2.3
  - The Winnipeg rate was 18.0%.
  - Fort Garry (6.1%), Assiniboine South (7.9%), St. Boniface (12.3%), St. Vital (11.5%), River Heights (8.2%), and St. James–Assiniboia (12.8%) were significantly lower than the Winnipeg rate; while River East (20.9%), Inkster (25.7%), Downtown (28.2%), and Point Douglas (39.7%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.2.4
  There was a statistically significant difference in the proportion of women giving birth who reported smoking during pregnancy for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, fewer women reported smoking during pregnancy.
  - Income Quintile – There was a significant relationship with urban income quintile. There were more women reporting smoking during pregnancy in lower urban income quintiles (15.1% to 33.7%) compared to higher income quintiles (5.6% to 9.6%).

- Income Assistance – 59.1% of the women giving birth who were on income assistance reported smoking during pregnancy compared to 12.2% of the women who were not on income assistance.
- Maternal Education – 41.4% of the women giving birth who had less than a Grade 12 education reported smoking during pregnancy compared to 11.9% of those with a Grade 12 education.
- Marital Status – 52.5% of the women giving birth who were lone parents reported smoking during pregnancy compared to 13.5% of those who were married/partnered.
- Parity – 17.3% of primiparous women reported smoking during pregnancy compared to 18.6% of multiparous women.
- Prenatal Care – 40.9% of women with inadequate prenatal care reported smoking during pregnancy compared to 16.8% of women with adequate prenatal care.

Comparison to Other Findings

In Canada, the rate of smoking during pregnancy decreased from 17.7% in 2001 to 13.4% in 2005; these rates were estimated using data from the Canadian Community Health Survey (Public Health Agency of Canada, 2008). A declining trend in maternal smoking has also been reported in the U.S. (Ananth, Kirby, & Kinzler, 2005). Based on a recent report by Centers for Disease Control and Prevention, the prevalence of women smoking during pregnancy in the U.S. declined from 15.2% in 2000 to 13.8% in 2005 (Tong, Jones, Dietz, D'Angelo, & Bombard, 2009). Based on the Canadian Maternity Experiences Survey, the rate of smoking daily or occasionally during the last three months of pregnancy was 10.5% (Public Health Agency of Canada, 2009). In Manitoba, the proportion of women who smoked during pregnancy declined from 18.9% in 2003/04 to 17.7% in 2008/09. This declining trend is consistent with national trends; however, rates in Manitoba are considerably higher than the national rates reported here.

Limitations

Those women living in First Nations communities were excluded from this analysis as the Families First Screen is not conducted in these communities. Additionally, cases where the variable was missing were excluded. Over the six years of analysis, there were 23,223 cases that were excluded (approximately 27% of women with live births). There may be differences in characteristics between women for whom we have Families First Screening data on this variable and those for whom we do not. For example, in one Manitoba study, the prevalence of smoking during pregnancy was higher among Aboriginal than non–Aboriginal women (Heaman & Chalmers, 2005). Rates based on the Families First Screen may therefore be an underestimate.

Summary

Data demonstrated a declining trend for maternal smoking during pregnancy in Manitoba from 2003/04 to 2008/09. However, smoking rates in Manitoba remain considerably higher than those for Canada. There were statistically significant variations with higher maternal smoking rates in Brandon, Interlake, Parkland, NOR–MAN, and Burntwood. A higher rate of smoking during pregnancy was evident among women who were younger than 25, multiparous, lone parents, or on income assistance; lived in lower income urban or rural areas; had not completed Grade 12 education; or had inadequate prenatal care.

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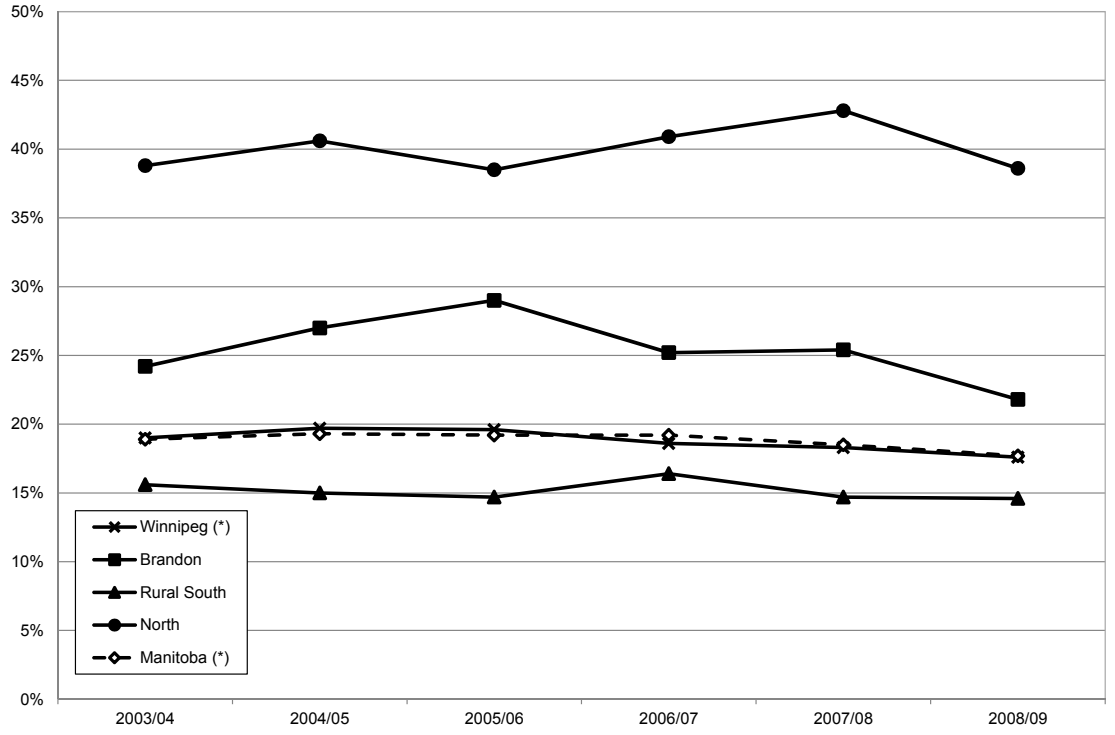
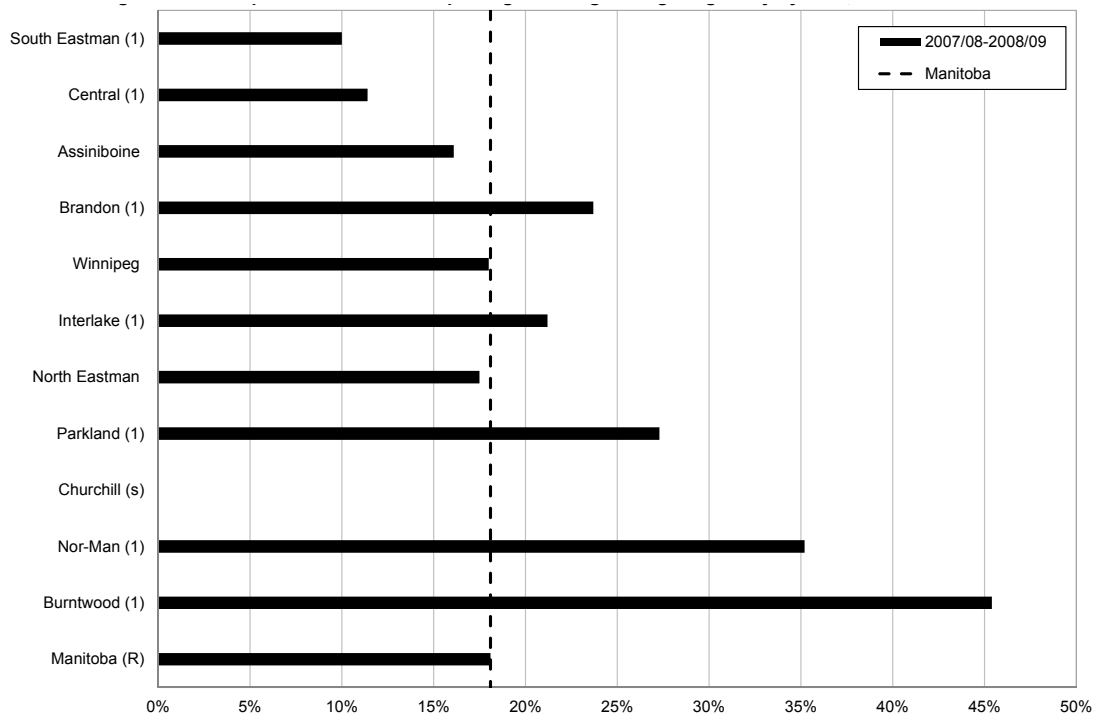
Figure 3.2.1: Proportion of Women Reporting Smoking During Pregnancy by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

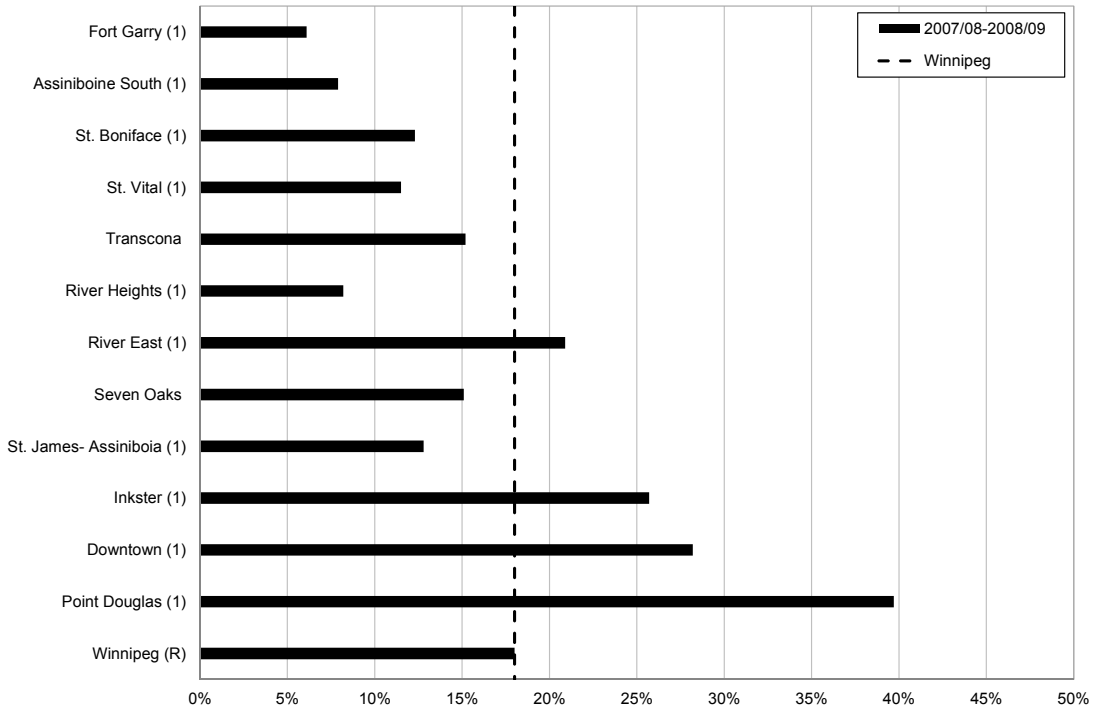
Figure 3.2.2: Proportion of Women Reporting Smoking During Pregnancy by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

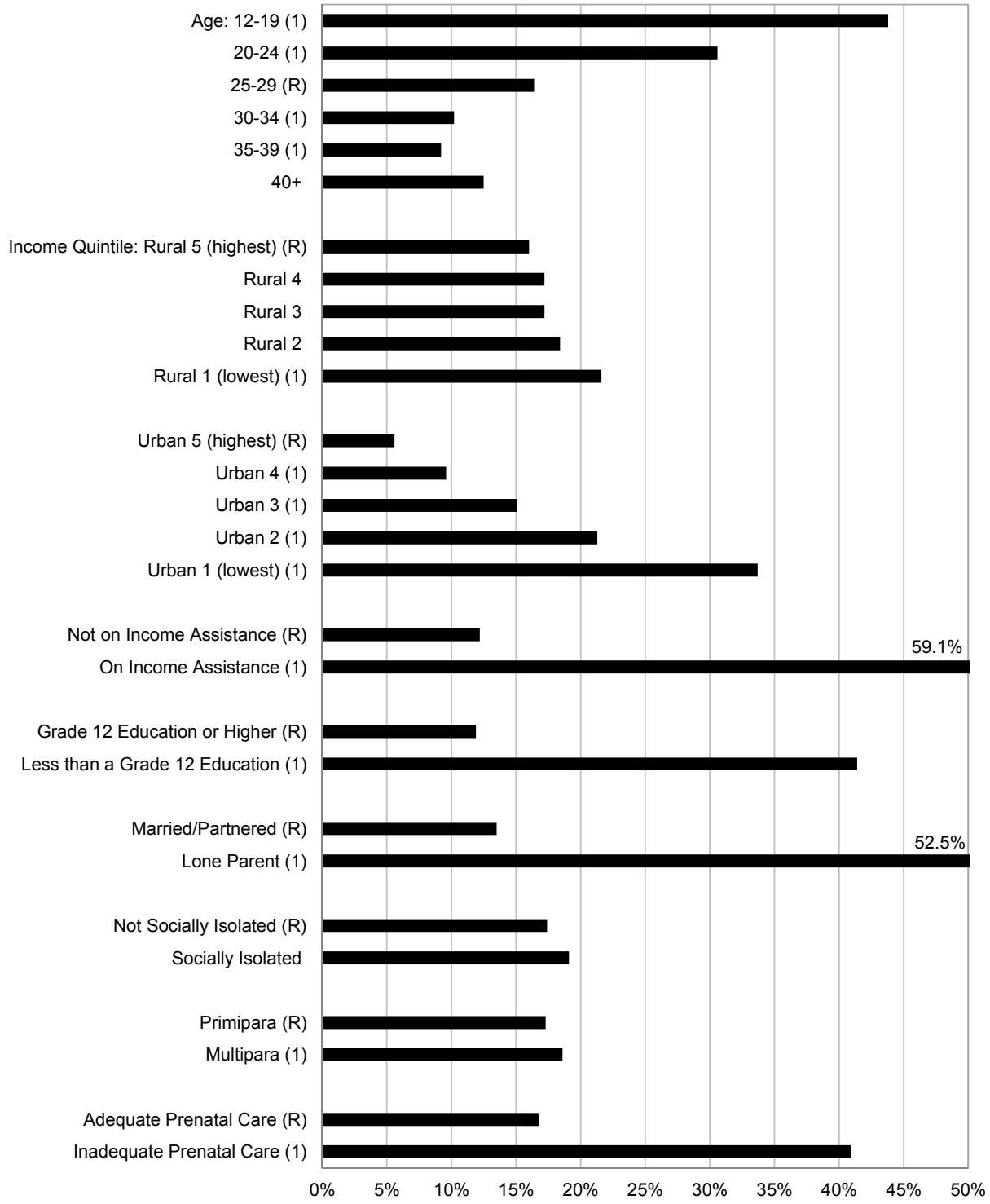
Figure 3.2.3: Proportion of Women Reporting Smoking During Pregnancy by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.2.4: Proportion of Women Reporting Smoking During Pregnancy by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

3.3 Illicit Drug Use During Pregnancy

Background

Women using illicit drugs during pregnancy are at increased risk of adverse obstetric and perinatal outcomes such as preterm birth, low birth weight, and intrauterine growth restriction (Pinto et al., 2010). Illicit drug use is often correlated with smoking and alcohol use and is more prevalent among younger women or women with low socioeconomic status (van Gelder et al., 2010). In the United States between 2000 and 2009, the rate of maternal opiate use during pregnancy showed a substantial increase, accompanied by an increase in the incidence of Neonatal Abstinence Syndrome (NAS) (Patrick et al., 2012). In 2009, newborns with NAS were more likely to have low birth weight and respiratory complications than all other hospital births (Patrick et al., 2012).

Calculation of the Indicator

The proportion of women who reported using illicit drugs during pregnancy was calculated by dividing the number of women with live births who reported using illicit (illegal) drugs during pregnancy (from the Families First Screen) by the total number of women with live births in a given time and place. The time trend analysis for this indicator is limited to 2003/04 to 2008/09 due to data quality in the early years of the Families First Screen. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2003/04–2008/09), Figure 3.3.1
    - The Manitoba rate ranged from 3.2% (2003/04) to 3.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.2% in 2003/04 to a high of 4.1% in 2006/07.
    - The Winnipeg rate ranged from 3.8% (2003/04) to 4.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 3.6% in 2004/05 to a high of 5.0% in 2006/07.
- RHA (2007/08–2008/09), Figure 3.3.2
    - The Manitoba rate was 3.6%.
    - South Eastman (0.9%) and Central (1.0%) were significantly lower than the Manitoba rate; while Winnipeg (4.5%), NOR–MAN (6.5%), and Burntwood (10.4%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.3.3
    - The Winnipeg rate was 4.5%.
    - Fort Garry (1.2%), Assiniboine South (1.8%), St. Vital (1.8%), River Heights (2.1%), Seven Oaks (2.1%), and St. James–Assiniboia (1.8%) were significantly lower than the Winnipeg rate; while Inkster (7.8%), Downtown (8.9%), and Point Douglas (13.5%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.3.4
  There was a statistically significant difference in the proportion of women giving birth who reported using illicit drugs during pregnancy for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. More younger women (12 to 19, 17.5%; 20 to 24, 7.0%) and fewer older women (30 to 34, 1.2%; 35 to 39, 0.5%) reported using illicit drugs compared to the reference group (25 to 29, 2.5%).
    - Income Quintile – There was a significant relationship with urban income quintile. There were more women who reported using illicit drugs during pregnancy in lower urban income quintiles (2.8 to 9.4%) compared to higher income quintile (1.2% to 1.5%).
    - Income Assistance – 17.5% of the women giving birth who were on income assistance reported using illicit drugs during pregnancy compared to 1.7% of the women who were not on income assistance.

- Maternal Education – 12.4% of the women giving birth who had less than a Grade 12 education reported using illicit drugs during pregnancy compared to 1.4% of those with a Grade 12 education.
- Marital Status –17.9% of the women giving birth who were lone parents reported using illicit drugs during pregnancy compared to 1.7% of those who were married/partnered.
- Social Isolation – 5.9% of the women giving birth who were socially isolated reported using illicit drugs during pregnancy compared to 3.1% of those who were not socially isolated.
- Parity – 4.4% of primiparous women reported using illicit drugs during pregnancy compared to 3.0% of multiparous women.
- Prenatal Care – 13.4% of women with inadequate prenatal care reported using illicit drugs during pregnancy compared to 3.0% of women with adequate prenatal care.

Comparison to Other Findings

In Manitoba, the proportion of women reporting illicit drug use during pregnancy has increased from 3.2% in 2003/04 to 3.4% in 2008/09, with a high of 4.1% in 2006/07. In 2007/08–2008/09, the Manitoba rate for illicit drug use in pregnancy was 3.6%, which is higher than the national average. Based on self–report of women participating in the Canadian Maternity Experiences Survey, the rate of illicit drug use during pregnancy in Canada was 1.0% (Public Health Agency of Canada, 2009).

Limitations

Those women living in First Nations communities were excluded from this analysis as the Families First Screen is not conducted in these communities. Additionally, cases where the variable was missing were excluded. Over the six years of analysis, there were 24,653 cases that were excluded (approximately 29% of women having a live birth).

There may be differences in characteristics between women for whom we have Families First Screening data for this variable and those for whom we do not. In addition, illicit drug use may be under–reported due to social desirability response bias. The specific types of illicit drugs used by pregnant women are not known.

Summary

There was an increasing trend for use of illicit drugs during pregnancy in Manitoba from 2003/04 to 2008/09, particularly in Winnipeg. In Winnipeg, statistically significant variations were apparent across CAs. From 2007/08 to 2008/09, rates ranged from a low of 1.2% in Fort Garry to a high of 13.5% in Point Douglas. In the rural areas, NOR–MAN (6.5%) and Burntwood (10.4%) had the highest rates of illicit drug use. Overall, a higher rate of illicit drug use was evident among women who were younger than 25, primiparous, lone parents, on income assistance, or socially isolated; lived in lower income urban areas; had not completed Grade 12 education; or had inadequate prenatal care.

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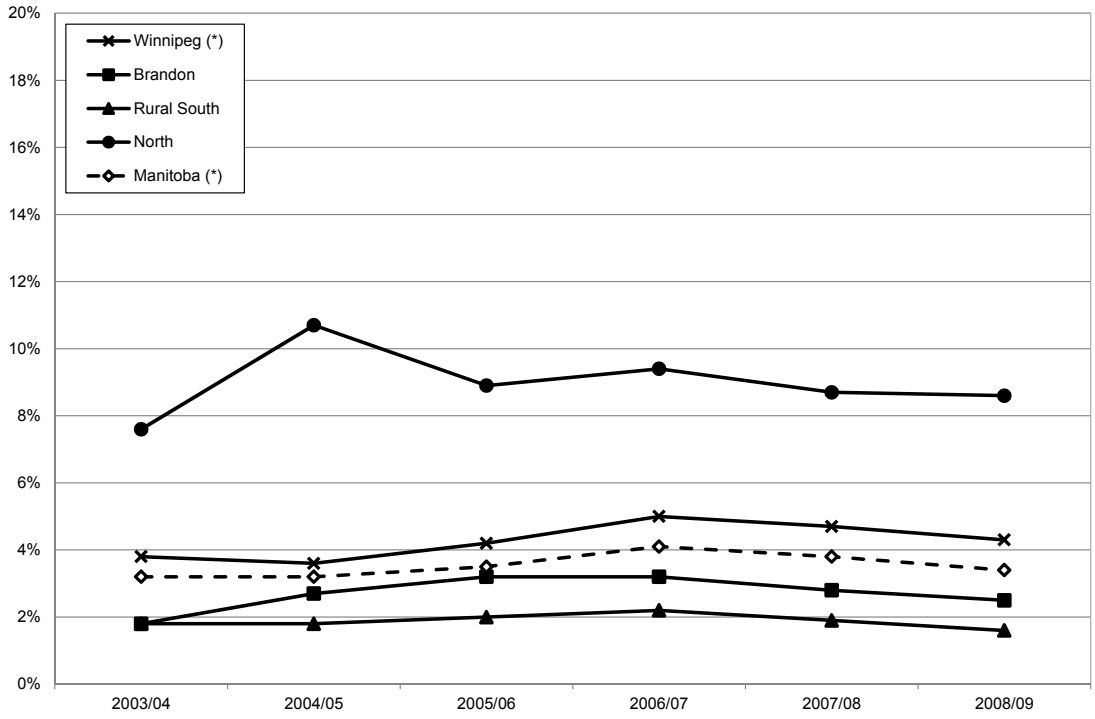
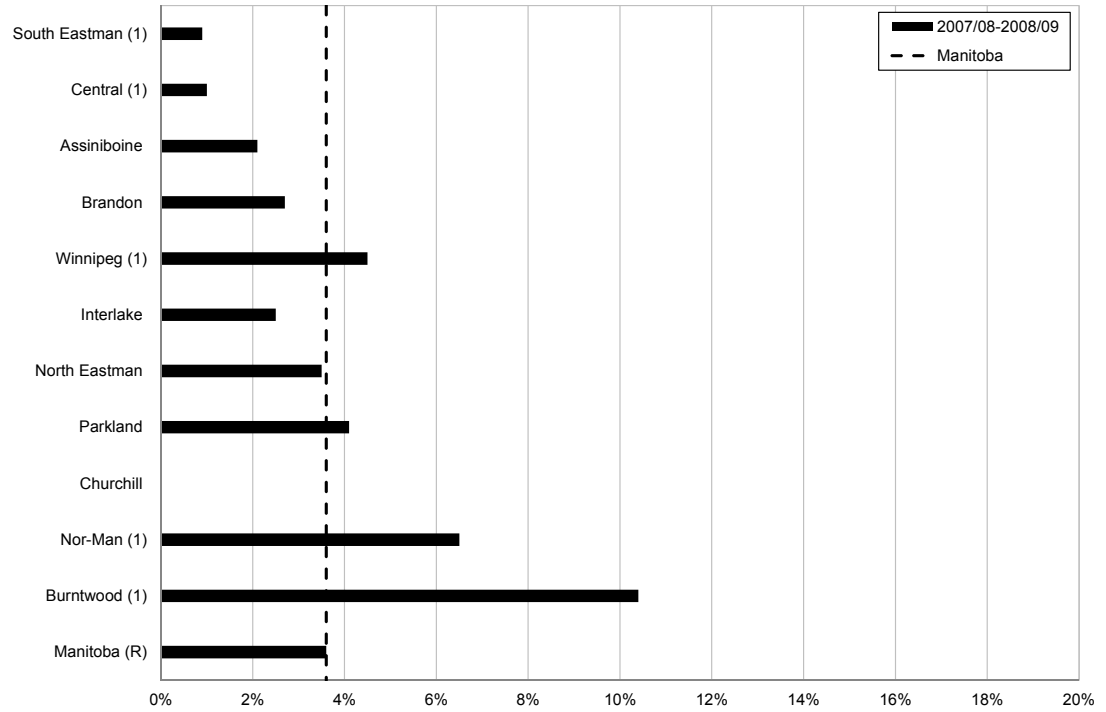
Figure 3.3.1: Proportion of Women Reporting Illicit Drug Use During Pregnancy by Region and Year, 2003/04-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

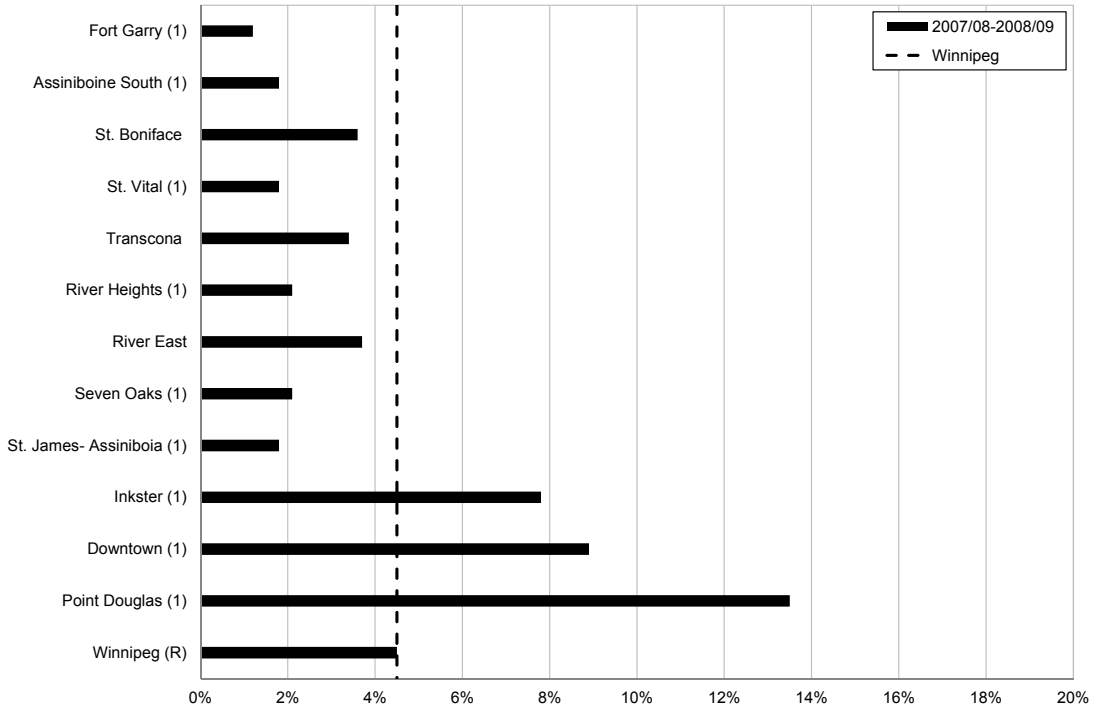
Figure 3.3.2: Proportion of Women Reporting Illicit Drug Use During Pregnancy by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

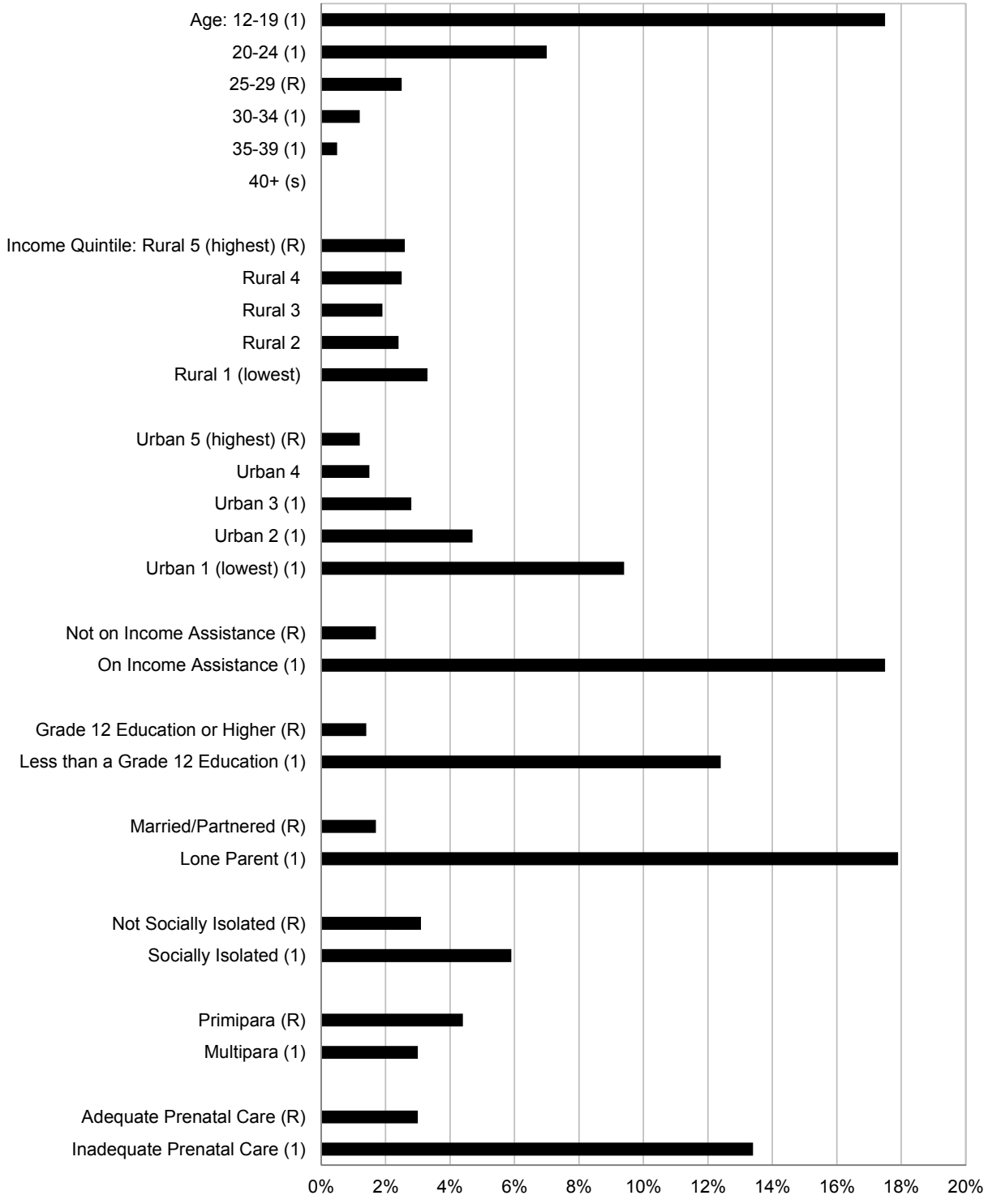
Figure 3.3.3: Proportion of Women Reporting Illicit Drug Use During Pregnancy by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.3.4: Proportion of Women Reporting Illicit Drug Use During Pregnancy by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

3.4 Ectopic Pregnancies

Background

Ectopic pregnancy is defined as the implantation of a fertilized egg outside of the uterine cavity and is considered a serious acute obstetric condition (Trabert, Holt, Yu, Van Den Eeden, & Scholes, 2011). Ectopic pregnancy accounts for approximately 2% of all recognized pregnancies (Marion & Meeks, 2012) and is associated with increased risk of pregnancy–related morbidity and mortality. Ectopic pregnancy is the leading cause of pregnancy–related death in the first trimester of pregnancy; the most frequent causes of death for women with ectopic pregnancy are hemorrhage, infection, and anesthetic complications (Marion & Meeks, 2012). Women with a history of ectopic pregnancy are also at greater risk for subsequent ectopic pregnancy and sub–infertility issues (Barnhart, 2009; Creanga et al., 2011). The etiology of ectopic pregnancy is multifactorial; risk factors include pelvic infection (e.g., sexually transmitted infections, pelvic inflammatory disease), endometriosis, and surgery that lead to disruption or obstruction of the fallopian tubes (Marion & Meeks, 2012).

Calculation of the Indicator

The number of the women diagnosed with an ectopic pregnancy was divided by the total number of pregnancies (the total of ectopic pregnancies, induced abortions, and live and stillborn deliveries). These rates are reported as a rate per 1,000 pregnancies. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.4.1
    - The Manitoba rate ranged from 13.1% (2001/02) to 10.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 13.8% in 2005/06 to a low of 10.6% in 2008/09.
    - The rate for the North rate ranged from 16.0% (2001/02) to 12.3% (2008/09); the linear trend was significant; the rate decreased over time from a high of 25.8% in 2003/04 to a low of 12.3% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.4.2
    - Manitoba rate was 10.7 per 1,000 pregnancies.
- Winnipeg CA (2007/08–2008/09), Figure 3.4.3
    - Winnipeg rate was 11.0 per 1,000 pregnancies.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.4.4
  There was a statistically significant difference in the proportion of women who had an ectopic pregnancy for the following characteristics:
    - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age, there were more ectopic pregnancies.
    - Income Quintile – There were more ectopic pregnancies to women living in the lowest urban quintile (Urban 1, 13.8 per 1,000 pregnancies) compared to women living in the highest urban income quintile (Urban 5, 9.2 per 1,000 pregnancies).

Comparison to Other Findings

In Manitoba, the rate of ectopic pregnancy decreased from 13.1 per 1,000 pregnancies in 2001/02 to 10.6 in 2008/09. These decreasing trends are consistent with national trends; the rate of ectopic pregnancy in Canada decreased from 17.2 per 1,000 reported pregnancies in 1995/96 to 11.9 per 1,000 in 2004/05 (Public Health Agency of Canada, 2008). In 2004/05, the rate of ectopic pregnancy in Manitoba was 14.9 per 1,000 pregnancies, which was higher than national average of 11.9 at the

time (Public Health Agency of Canada, 2008); however Manitoba's rate in 2008/09 was lower than the national average in 2004/05 (10.6 versus 11.9 per 1,000 pregnancies).

Limitations

"As **outpatient** management of ectopic pregnancy though expectant management or methotrexate therapy becomes more common, the enumeration of ectopic pregnancy may be less complete" (Public Health Agency of Canada, 2008, page 116).

Summary

In Manitoba, there has been a declining trend in rate of ectopic pregnancy from 2001/02 to 2008/09. A higher rate of ectopic pregnancy was evident among women aged 30 and older, which may be partly due to an increased prevalence of damage to fallopian tubes among older women (Public Health Agency of Canada, 2008), and among women who lived in lowest income urban areas.

Reference List

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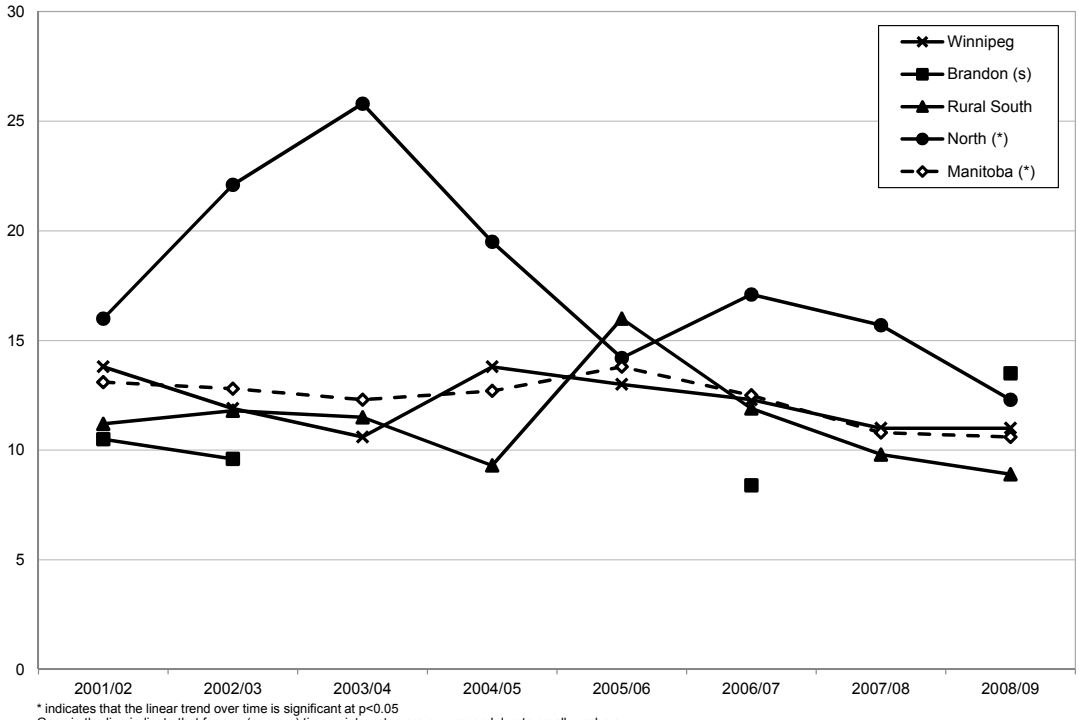
Marion LL, Meeks GR. Ectopic pregnancy: History, incidence, epidemiology, and risk factors. *Clin Obstet Gynecol.* 2012;55(2):376–386.

Public Health Agency of Canada. Canadian Perinatal Health Report, 2008 Edition. PHAC. 2008. http://www.phac–aspc.gc.ca/publicat/2008/cphr–rspc/pdf/cphr–rspc08–eng.pdf. Accessed August 8, 2011.

Trabert B, Holt VL, Yu O, Van Den Eeden SK, Scholes D. Population–based ectopic pregnancy trends, 1993–2007. *Am J Prev Med.* 2011;40(5):556–560

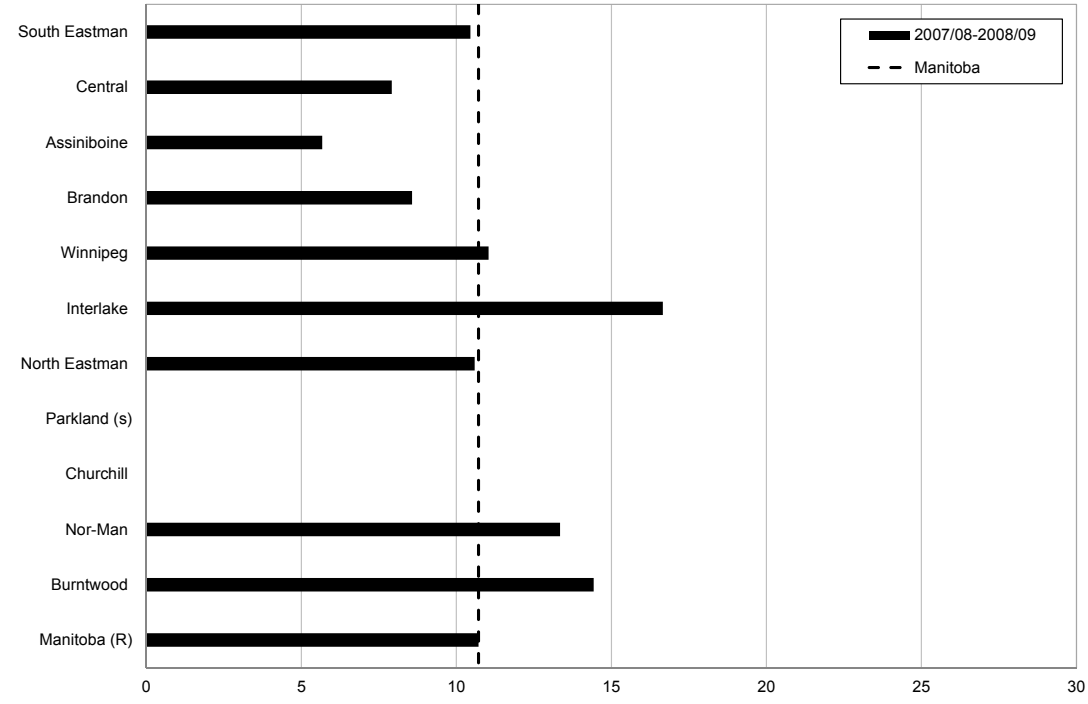
Figure 3.4.1: Ectopic Pregnancy Rate by Region and Year, 2001/02-2008/09
per 1,000 pregnancies



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

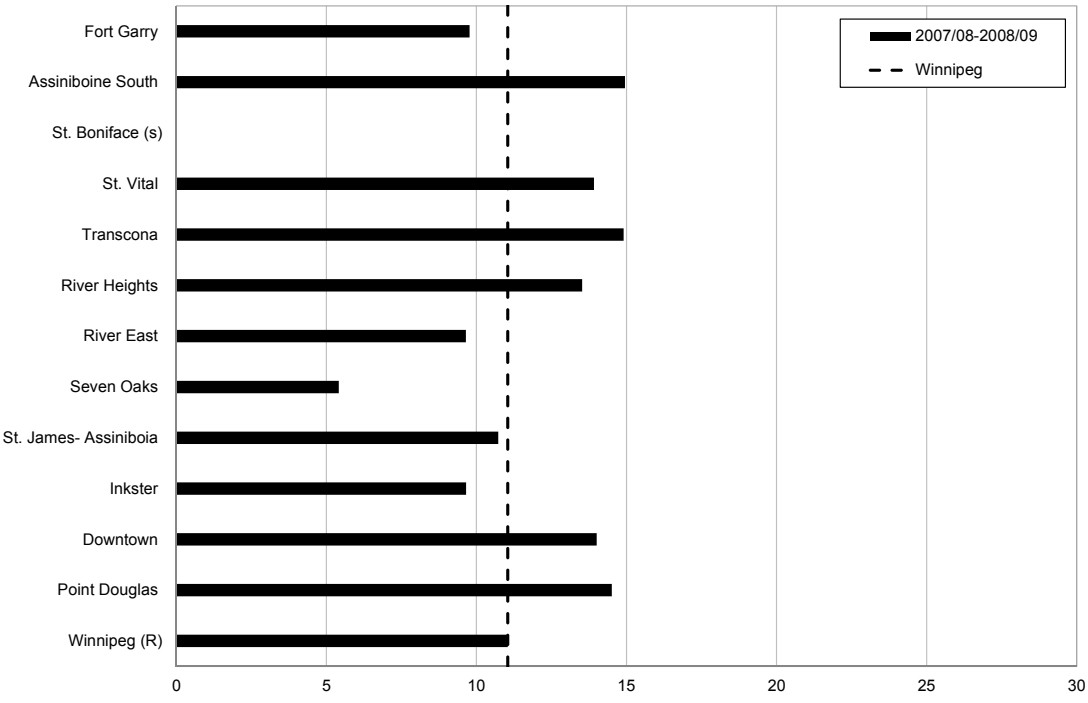
Figure 3.4.2: Ectopic Pregnancy Rates by RHA, 2007/08-2008/09
per 1,000 pregnancies



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

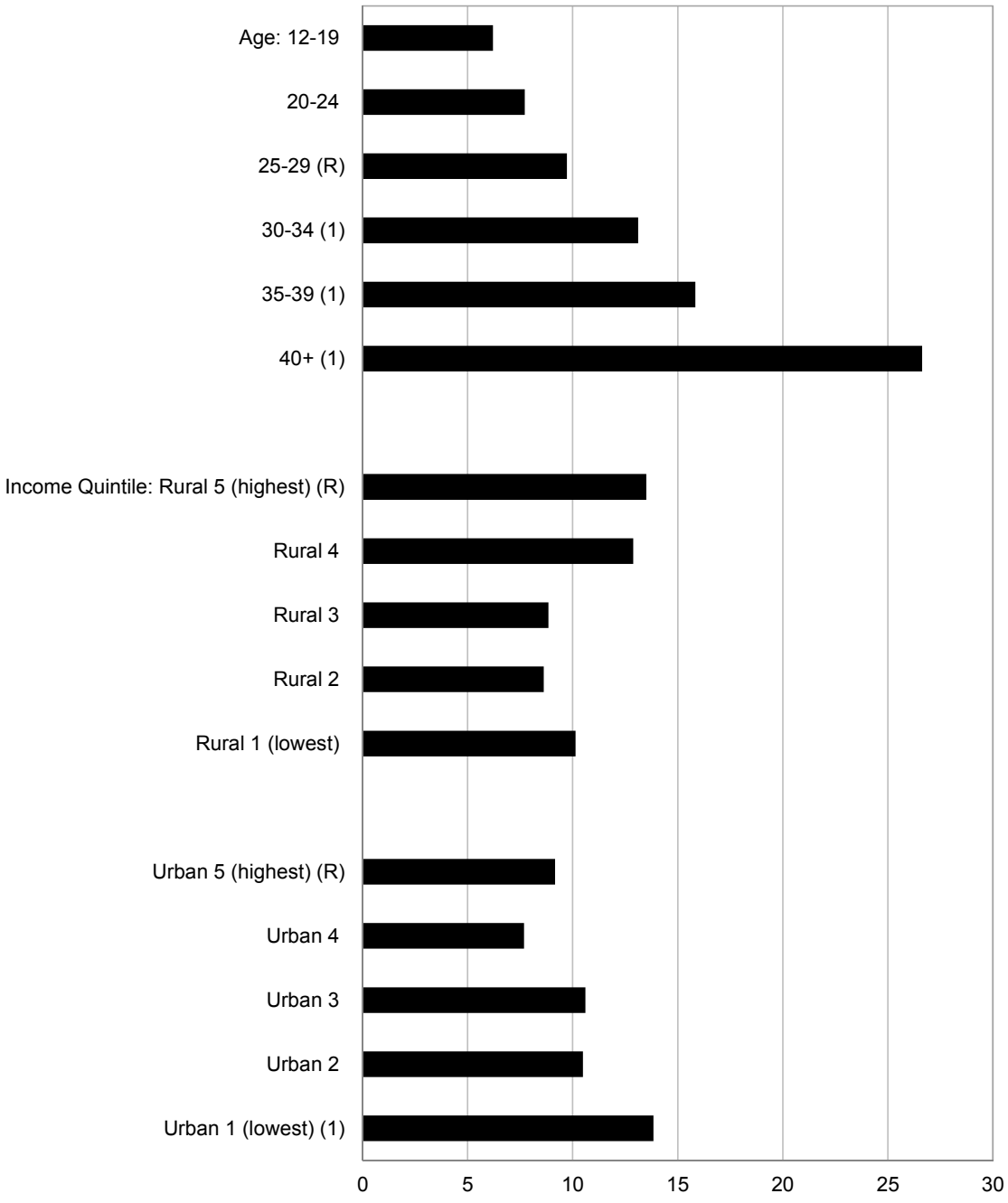
Figure 3.4.3: Ectopic Pregnancy Rates by Winnipeg CA, 2007/08-2008/09
per 1,000 pregnancies



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.4.4: Ectopic Pregnancy Rates by Sociodemographic and Other Characteristics, 2007/08-2008/09
per 1,000 pregnancies



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

3.5 Use of Infertility Drugs Prior to Live Birth

Background

The Royal Commission on New Reproductive Technologies provided the first estimate of the prevalence of infertility in Canada: "8.5 percent of couples —some 300,000 couples —who were married or had been cohabiting for at least one year at the time of our survey, and who had not used contraception during that period, failed to have a pregnancy, while 7 percent of couples—some 250,000 couples—who had been married or cohabiting for at least two years, and who had not used contraception during that period, failed to have a pregnancy." (Royal Commission on New Reproductive Technologies, 1993, p. 180).

Treatments for infertility vary in their intensity, invasiveness, and associated risks. Infertility medications are used for ovulation induction or controlled ovarian hyperstimulation, while assisted reproductive technologies (ART) such as ***in vitro* fertilization (IVF)** are more complex and invasive in that they involve techniques to manipulate and fertilize the egg outside the body (Hrometz & Gates, 2009). Women experience a decline in natural fertility that begins in the mid–30s (Liu et al., 2011). The trend toward delayed childbearing has led to a rising demand for infertility treatments (Lisonkova & Joseph, 2012). In Canada, the number of ART cycles has been steadily increasing, based on data reported from all 28 Canadian ART clinics to the Canadian ART Register. In 2009, a total of 16,315 cycles of ART were conducted, resulting in 5621 clinical pregnancies, 4448 deliveries, 3208 singleton live births, and 1217 multiple births (Gunby, Bissonnette, Librach, & Cowan, 2011). In Manitoba, ART procedures are paid for privately and not billed to Manitoba Health; therefore data on ART are not available in the administrative data housed at MCHP. We therefore are limited to reporting on the use of infertility drugs (e.g., clomiphene citrate or gonadotropins) as a proxy measure of the rate of infertility among Manitoba women who subsequently have a live birth.

The Society of Obstetricians and Gynaecologists of Canada (SOGC) clinical practice guideline, *Advanced Reproductive Age and Fertility*, states: "Fertility treatment for age–related infertility is aimed at increasing monthly fecundity and decreasing the time to conception. Women may be offered controlled ovarian hyperstimulation with clomiphene citrate or gonadotropins, or IVF to improve their chances of pregnancy and decrease time to pregnancy" (Liu et al., 2011). Ovulatory disorders represent a major cause of infertility; polycystic ovary syndrome (PCOS) is the most common cause of oligoovulation and anovulation (Urman & Yakin, 2006). Another SOGC clinical practice guideline recommends that Clomiphene citrate should be considered the first line therapy for women with PCOS (Vause et al., 2010).

Calculation of the Indicator

The proportion of women, aged 18 to 44, having a live birth following the use of selected drugs for ovulation induction or controlled ovarian hyperstimulation in the two years prior to having a live birth was calculated by dividing this number of women by the number of women having a live birth in a given time and place. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from the analysis. Refer to Table 3.5.1 Drugs Used in the Definition of Ovulation Induction or Controlled Ovarian and Appendix Table A.4 for more details.

Table 3.5.1: Drugs Used in the Definition of Ovulation Induction or Controlled Ovarian Hyperstimulation

Drug Identification Number (DIN)	Drug Name or Health Canada Product Name	Active Ingredient(s)	Frequency	Percent
02262088	Ovidrel (HCG)	Choriogonadotropin Alpha	114	0.78
01925679	Profasi Hp 10000	Chorionic Gonadotropin	232	1.58
02182904	Pregnyl	Chorionic Gonadotropin	235	1.60
02247459	Hcg-Ppc (Hcg)/Chorionic Gonadotropin For Injection, USP	Chorionic Gonadotropin	213	1.45
00893722	Serophene (Clomiphene Citrate)	Clomiphene Citrate	10,927	74.44
02091879	Clomid (Clomiphene Citrate)	Clomiphene Citrate	378	2.58
00640158	Serophene Tab 50Mg	Clomiphene Citrate	s	0.02
00254916	Pergonal	Follicle Stimulating Hormone (Fsh)	173	1.18
01958992	Humegon Inj 75 I.U	Follicle Stimulating Hormone (Fsh)	26	0.18
02231464	Gonal-F	Follitropin Alpha	272	1.85
02231465	Gonal-F	Follitropin Alpha	500	3.41
02244787	Gonal-F	Follitropin Alpha	100	0.68
02248154	Gonal-F	Follitropin Alpha	187	1.27
02248156	Gonal-F	Follitropin Alpha	135	0.92
02248157	Gonal-F	Follitropin Alpha	133	0.91
02270382	Gonal F Pen	Follitropin Alpha	s	0.01
02231655	Puregon	Follitropin Beta	200	1.36
02242441	Puregon	Follitropin Beta	36	0.25
02243948	Puregon	Follitropin Beta	269	1.83
02231384	Femara	Letrozole*	291	1.98
02269066	Luveris	Lutropin Alfa	49	0.33
02247790	Repronex	Menotropins	204	1.39

* Less than 15 pills per month

The following DINs were also included in the analysis but no counts were found in the data (02243004, 02270390, 02270404, 02242439, 02041820, 00368385, 02042096, 02309114, 02322315, 02338459, 02344815, 02347997, 02348969, 02283093, 02125412, 00755613, and 02268140)

Source: Manitoba Centre for Health Policy, 2012

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.5.1
  - The Manitoba rate ranged from 2.5% (2001/02) to 2.0% (2008/09); the linear trend was significant; the rate decreased over time from a high of 2.6% in 2002/03 to a low of 2.0% in 2008/09.
  - The Winnipeg rate ranged from 3.0% (2001/02) to 2.4% (2008/09); the linear trend was significant; the rate decreased over time from a high of 3.0% in 2001/02 to a low of 2.3% in 2007/08.
  - The rate for the Rural South ranged from 2.3% (2001/02) to 1.9% (2008/09); the linear trend was significant; the rate decreased over time from a high of 2.6% in 2002/03 to a low of 1.9% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.5.2
  - The Manitoba rate was 2.0%.
  - Winnipeg (2.4%) was significantly higher than the Manitoba rate, while Burntwood (0.3%) was significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 3.5.3
  - The Winnipeg rate was 2.4%.
  - Fort Garry (4.1%) and St. Boniface (4.2%) were significantly higher than the Winnipeg rate; while Downtown (0.9%) and Point Douglas (0.5%) were significantly lower.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.5.4
  There was a statistically significant difference in the proportion of women giving birth who had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. More women giving birth over age 30 had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth than mothers aged 29 and younger.
  - Income Quintile – There was a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive decrease in area–level income, there was a decrease in the proportion of women who had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth.
  - Income Assistance – 0.3% of women on income assistance had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 2.3% of women not on income assistance.
  - Education – 0.7% of women with less than a Grade 12 education had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 2.8% of women with a Grade 12 education.
  - Marital Status – 2.6% of women who were married/partnered used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth. The percentage of lone parent women using these drugs was suppressed due to low numbers.
  - Social Isolation – 1.0% of women who were socially isolated used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 2.5% of women who were not socially isolated.
  - Parity – 3.5% of primiparous women used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 1.2% of multiparous women.
  - Delivery Method – 1.7% of women who had a vaginal birth used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 3.2% of women who had a cesarean birth.
  - Multiple Births – 1.9% of women who had a singleton birth had used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compare to 11.7% of women who had a multiple birth.
  - Gestation – 5.0% of early preterm deliveries were to women who used a drug for ovulation induction or controlled hyperstimulation in the two years prior to giving birth compared to 3.1% of late preterm 2.4% of early term and 1.8% of term deliveries.

Comparisons to Other Findings

A population–based study in British Columbia examined trends in clomiphene citrate use; the prevalence of clomiphene citrate use was calculated as the number of women aged 20 to 49 to whom at least one prescription was dispensed from 1996 to 2008 (Lisonkova & Joseph, 2012). The one–year period prevalence rates declined from 4.1 to 3.7 users per 1,000 women from 1996 to 2008, while the incidence rates remained stable (2.2 new users per 1,000 women per year). Prevalence rates declined among women aged 20 to 29, but increased among women aged 30 and older. The results of this study are not directly comparable to Manitoba because the investigators used a different definition of drug use, only studied one particular infertility drug, and examined women of childbearing age rather than women having a live birth. However, our Manitoba results showed similar trends in that the proportion of women having a live birth following the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth declined from 2.5% in 2001/02 to 2.0% in 2008/09. Use of infertility drugs was also more common in older age groups.

Limitations

This analysis is limited to use of infertility drugs in women in the two years prior to having a live birth. Our analysis does not provide any information about the number of women who used infertility drugs and did not conceive a pregnancy or have a live birth. As some of the drugs used for ovulation induction or ovarian hyperstimulation are also used for other purposes (e.g., treatment of endometriosis), we primarily limited our analysis to those medications specifically used for ovulation induction or ovarian hyperstimulation. We also included use of Letrozole but limited it to those women receiving less than 15 tablets a month, because this drug is also used to treat breast cancer in larger dosages. Our rates therefore provide an underestimate of the use of infertility drugs by women in Manitoba.

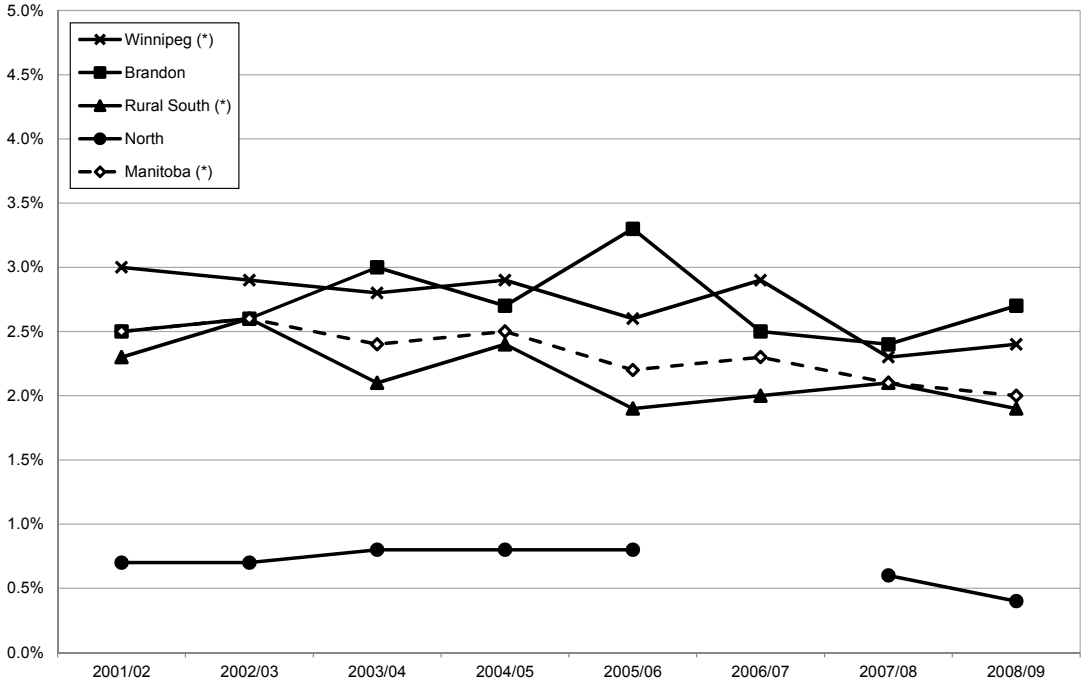
Summary

There was a declining trend for having a live birth following the use of a drug for ovulation induction or controlled ovarian hyperstimulation in Manitoba from 2001/02 to 2008/09, particularly in Winnipeg and Rural South. In Winnipeg, statistically significant variations were evident across CAs. A higher rate of having a live birth following the use of select drugs for ovulation induction or controlled ovarian hyperstimulation was apparent among women who were aged 30 and older, primiparous, married, not on income assistance, or not socially isolated; lived in higher income rural/urban areas; or had completed Grade 12 education. A higher proportion of women who had a multiple birth or cesarean birth or delivered before 39 weeks of gestation had received infertility drugs.

Acknowledgement

We gratefully acknowledge Dr. Jeremy Kredentser of Heartland Clinic for his advice on which infertility drugs to study in this analysis.

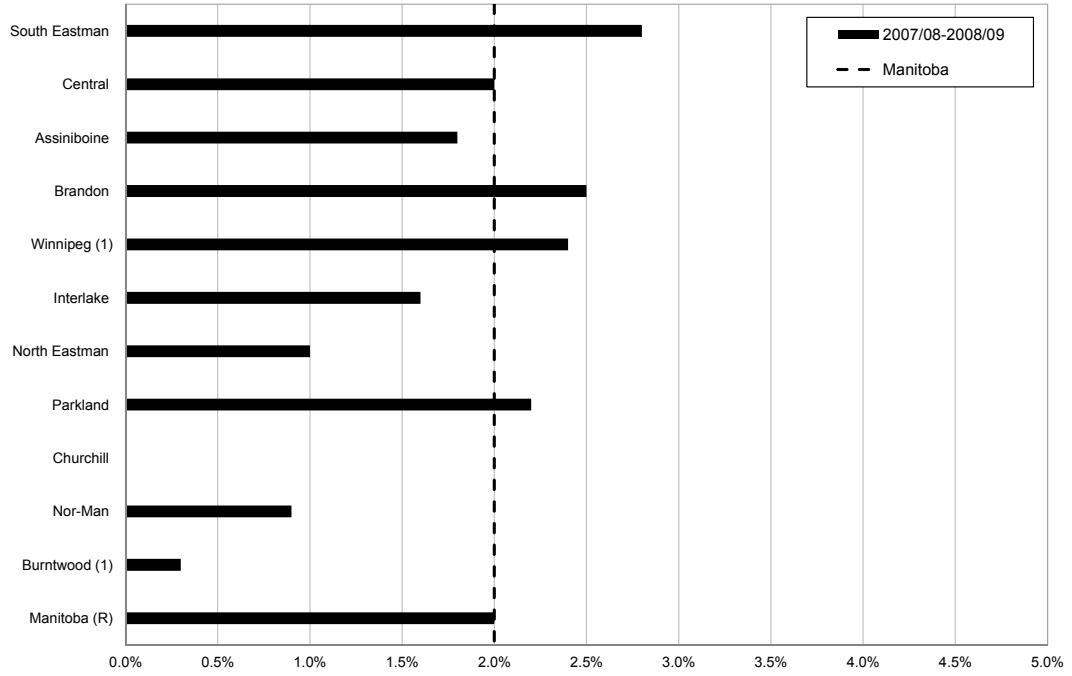
Figure 3.5.1: Proportion of Women, Aged 18-44, Having a Live Birth Following the Use of Select Drugs for Ovulation Induction or Controlled Ovarian Hyperstimulation in the Two Years Prior to Giving Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

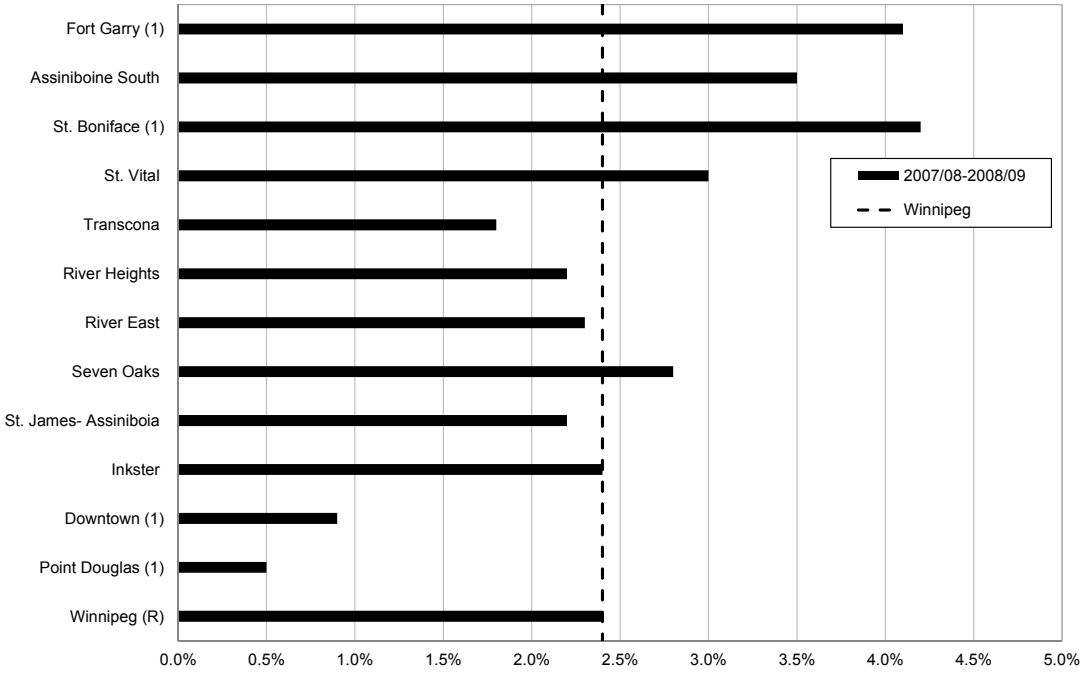
Figure 3.5.2: Proportion of Women, Aged 18-44, Having a Live Birth Following the Use of Select Drugs for Ovulation Induction or Controlled Ovarian Hyperstimulation in the Two Years Prior to Giving Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

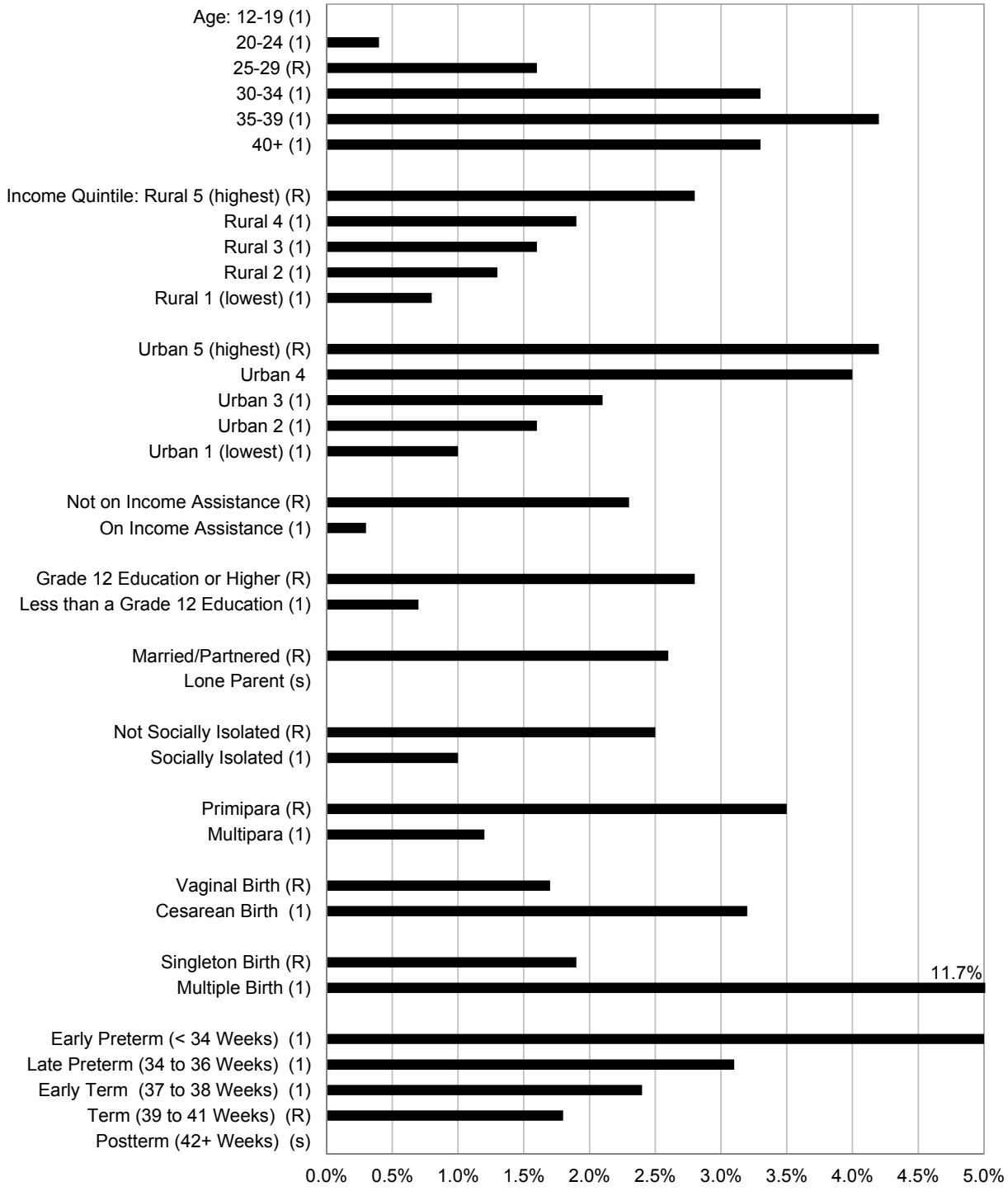
Figure 3.5.3: Proportion of Women, Aged 18-44, Having a Live Birth Following the Use of Select Drugs for Ovulation Induction or Controlled Ovarian Hyperstimulation in the Two Years Prior to Giving Birth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.5.4: Proportion of Women, Aged 18-44, Having a Live Birth Following the Use of Select Drugs for Ovulation Induction or Controlled Ovarian Hyperstimulation in the Two Years Prior to Giving Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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3.6 Prenatal Care

Background

Prenatal care (PNC) is one of the most widely used preventive healthcare services in developed countries (Alexander & Kotelchuck, 2001). The Chief Public Health Officer's Report on the State of Public Health in Canada emphasizes that "Ongoing prenatal care is important to achieving a healthy pregnancy and birth, and positively influencing the health of the child in the early years. It provides a pregnant woman with the opportunity to access health information and identify risks and underlying factors that can influence her health and the health of her fetus/child" (Butler–Jones, 2009, p. 52). Several studies have demonstrated an association between inadequate PNC and preterm birth or low birth weight (Barros, Tavares, & Rodrigues, 1996; Cox, Zhang, Zotti, & Graham, 2011; Debiec, Paul, Mitchell, & Hitti, 2010; El–Mohandes et al., 2003; Heaman, Blanchard, Gupton, Moffatt, & Currie, 2005; Heaman, Newburn–Cook, Green, Elliott, & Helewa, 2008; Herbst, Mercer, Beazley, Meyer, & Carr, 2003; Krueger & Scholl, 2000; Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002d), while others have found an association between lack of PNC and fetal, neonatal, and postneonatal deaths (Kothari, Wendt, Liggins, Overton, & Sweezy, 2011; Krueger & Scholl, 2000; Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002a; Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002b; Vintzileos, Ananth, Smulian, Scorza, & Knuppel, 2002c).

Prenatal care (PNC) is more likely to be effective if women begin receiving care in the first trimester of pregnancy and continue to receive care throughout pregnancy, according to accepted standards for a schedule of visits (U.S. Department of Health and Human Services, 2000). The Society of Obstetricians and Gynaecologists of Canada (SOGC) recommends that women receive PNC visits every four to six weeks in early pregnancy, every two to three weeks after 30 weeks' gestation, and every one to two weeks after 36 weeks' gestation (Society of Obstetricians and Gynaecologists of Canada, 1998), whereas the American College of Obstetricians and Gynecologists (ACOG) recommends that a woman with an uncomplicated pregnancy be examined every four weeks for the first 28 weeks of pregnancy, every two to three weeks until 36 weeks gestation, and weekly thereafter (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 1992; Healthy People, 2010). Despite the emphasis placed on the value of PNC, a segment of the childbearing population continues to receive inadequate PNC. Several indicators have been used to define inadequate PNC, including late initiation of PNC (e.g., after the first trimester), receiving less than a recommended number of PNC visits, or being rated as having inadequate PNC on an index that takes into account timing of initiation of PNC and total number of PNC visits that is adjusted for gestational age at birth. At least four indices have been developed to measure utilization of PNC (Alexander & Cornely, 1987; Alexander & Kotelchuck, 1996; Kessner, Singer, Kalk, & Schlesinger, 1973; Kotelchuck, 1994). We have chosen to use the **Revised Graduated Index of PNC Utilization (R–GINDEX)** proposed by Alexander and Kotelchuck, for which an algorithm has been published (1996). We have used the R–GINDEX in a previous Manitoba study (Heaman et al., 2008).

According to results of the national survey, *What Mothers Say: The Canadian Maternity Experiences Survey* (Public Health Agency of Canada, 2009), Manitoba has the highest proportion of women who reported not getting prenatal care as early as they wanted and a high proportion of women who initiated prenatal care after the first trimester, compared to the other provinces. Previous population–based research conducted in Manitoba found that teens, women of high parity, and First Nations women in Manitoba were much more likely to receive inadequate PNC. There was also wide regional variation in the proportion of women receiving inadequate PNC, ranging from 0.7% to 21.8%, with highest rates in the Northern region of the province and in the inner–city of Winnipeg (Heaman, Green, Newburn–Cook, Elliott, & Helewa, 2007). These neighbourhood inequities in rates of inadequate PNC emphasize the need for effective targeted services and programs.

Limitations

The number and timing of PNC visits was estimated from hospital discharge abstracts and physician claims files, and the accuracy of our estimates may be affected by several factors, such as missing PNC records in the hospital chart or receipt of PNC from healthcare providers who do not submit physician claims for PNC. As well, inaccurate ascertainment of gestational age may affect assignment to a PNC utilization category. In addition, these indicators only reflect the quantity of PNC; they indicate nothing about the content, clinical adequacy, or quality of PNC. The R–GINDEX is based on the ACOG recommendations for number of visits for low risk pregnant women; the effectiveness of this standard has not been assessed through rigorous scientific testing, nor has adequacy of care for women with high risk pregnancies been operationalized (Alexander & Kotelchuck, 2001). For the purpose of calculating these indicators of PNC, a prenatal visit was defined as a visit to a health professional (i.e., physician, **midwife** or nurse practitioner) where some kind of medical or healthcare was performed to take care of the pregnancy. Other forms of prenatal health services were not included in this definition, such as attendance at prenatal classes or Healthy Baby Community Support Programs.

Late Initiation of Prenatal Care

Calculation of the Indicator

The proportion of women who had a late initiation of prenatal care was calculated by dividing the number of women with a late initiation of prenatal care by the number of women giving birth in a given time and place. A woman was considered to have late initiation of prenatal care if the prenatal care began after the first trimester of pregnancy (more than13 weeks gestation). The time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. The analysis was limited to hospital births, as the prenatal care was not well recorded in the Midwifery Discharge Summary Reports data. Cases with missing data on prenatal care visits or trimester of first prenatal visit values were also excluded. Maternal delivery records that could not be linked to a newborn birth record, those with a recorded gestation out of range, those with a recorded birth weight out of range, those where the maternal PHIN was not found on the Manitoba Health Registry or not covered by Manitoba Health Registry during pregnancy were excluded. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.6.1
    - The Manitoba rate ranged from 22.9% (2001/02) to 26.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 22.5% in 2003/04 to a high of 26.5% in 2007/08.
    - The Winnipeg rate ranged from 19.6% (2001/02) to 22.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 19.6% in 2001/02 to a high of 23.5% in 2007/08.
    - The Brandon rate ranged from 14.4% (2001/02) to 19.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 14.4% in 2001/02 to a high of 19.6% in 2008/09.
    - The rate for the Rural South ranged from 26.0% (2001/02) to 26.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 23.7% in 2003/04 to a high of 28.1% in 2005/06.
    - The rate for the North ranged from 32.7% (2001/02) to 41.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 32.7% in 2001/02 to a high of 41.9% in 2008/09.

- RHA (2007/08–2008/09), Figure 3.6.2
  - The Manitoba rate was 26.3%.
  - South Eastman (21.3%), Brandon (18.3%), and Winnipeg (23.1%), were significantly lower than Manitoba rate; while Central (28.7%), North Eastman (30.4%), Parkland (30.2%), NOR–MAN (41.4%), and Burntwood (42.1%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.6.3
  - The Winnipeg rate was 23.1%.
  - Fort Garry (14.9%), St. Boniface (18.3%), St. Vital (16.6%), Transcona (15.6%), and River Heights (18.6%) were significantly lower than the Winnipeg rate; while Inkster (30.4%), Downtown (33.2%), and Point Douglas (35.1%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.6.4
  There was a statistically significant difference in the proportion of women giving birth who initiated care after the first trimester for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. As maternal age increased, there was a decrease in the proportion of women who initiated care after the first trimester.
  - Income Quintile – There was a significant relationship with area–level income. With each successive increase in area–level income, there was a decrease in the number of women with a late initiation of prenatal care. The gradient in rural areas was steeper.
  - Income Assistance – 41.5% of the women giving birth who were on income assistance initiated prenatal care after the first trimester compared to 23.8% of the women who were not on income assistance.
  - Maternal Education – 37.2% of the women giving birth who had less than a Grade 12 education initiated prenatal care after the first trimester compared to 18.0% of those with a Grade 12 education.
  - Marital Status – 36.7% of the women giving birth who were lone parents initiated prenatal care after the first trimester compared to 20.5% of those who were married/partnered.
  - Social Isolation – 28.8% of the women giving birth who were socially isolated had a late initiation of prenatal care compared to 21.3% who were not socially isolated.
  - Parity – 29.4% of the multiparous women initiated prenatal care after the first trimester compared to 21.2% of primiparous women.

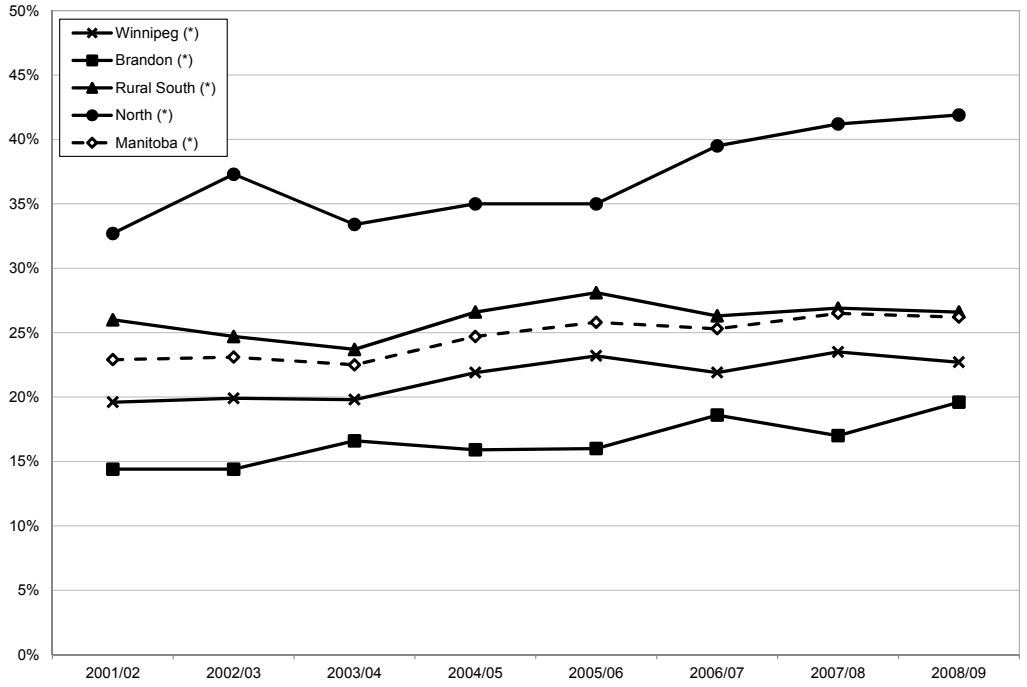
Comparison to Other Findings

The Canadian Perinatal Health Report does not contain any information on prenatal care (Public Health Agency of Canada, 2008).

Summary

The rate of late initiation of prenatal care has increased over time in Manitoba, from 22.9% to 26.2% (2001/02–2008/09). Over a quarter of women (26.3%) initiated care after the first trimester in 2007/08–2008/09. There were regional variations in rates of late initiation of prenatal care. Central, North Eastman, Parkland, NOR–MAN, and Burntwood had rates that were significantly higher than the Manitoba rate. The Winnipeg rate was 23.1% with Inkster, Downtown, and Point Douglas having significantly higher rates. Late initiation of prenatal care was more likely in women who had less than a Grade 12 education or were younger (less than 25), a lone parent, socially isolated, multiparous, living in lower income areas, or on income assistance. The North has dramatically higher rates of late initiation of PNC. This requires further exploration of issues related to availability and type of providers, data quality (e.g., proportion of prenatal records transferred to the delivery hospital and thereby available for abstraction of data, extent of shadow billing by non–physician providers), and barriers to access to care.

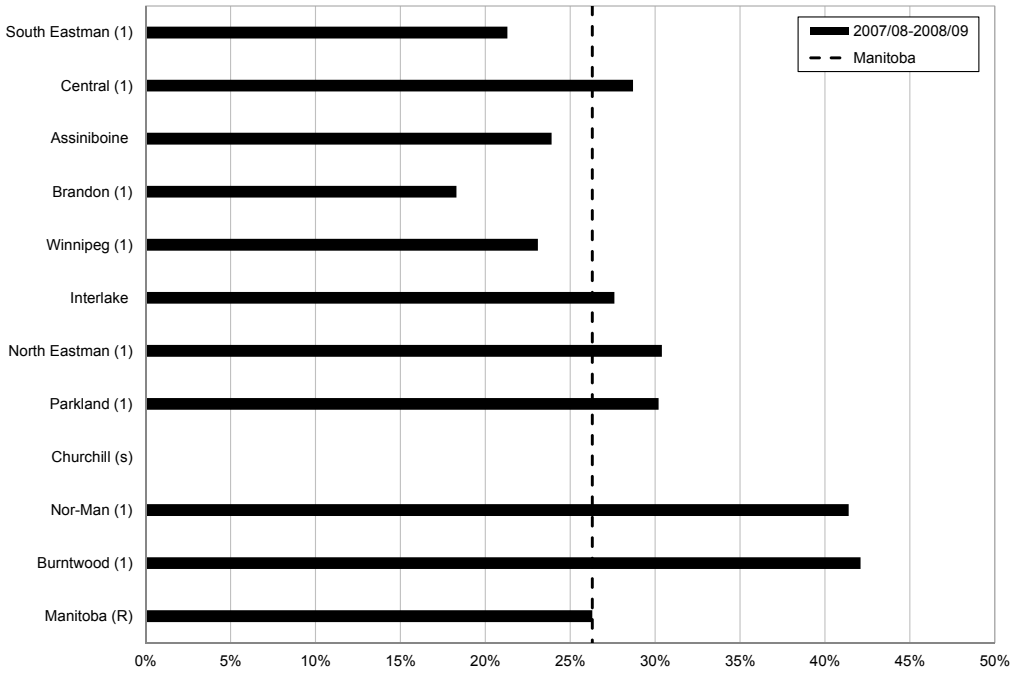
Figure 3.6.1: Late Initiation of Prenatal Care by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

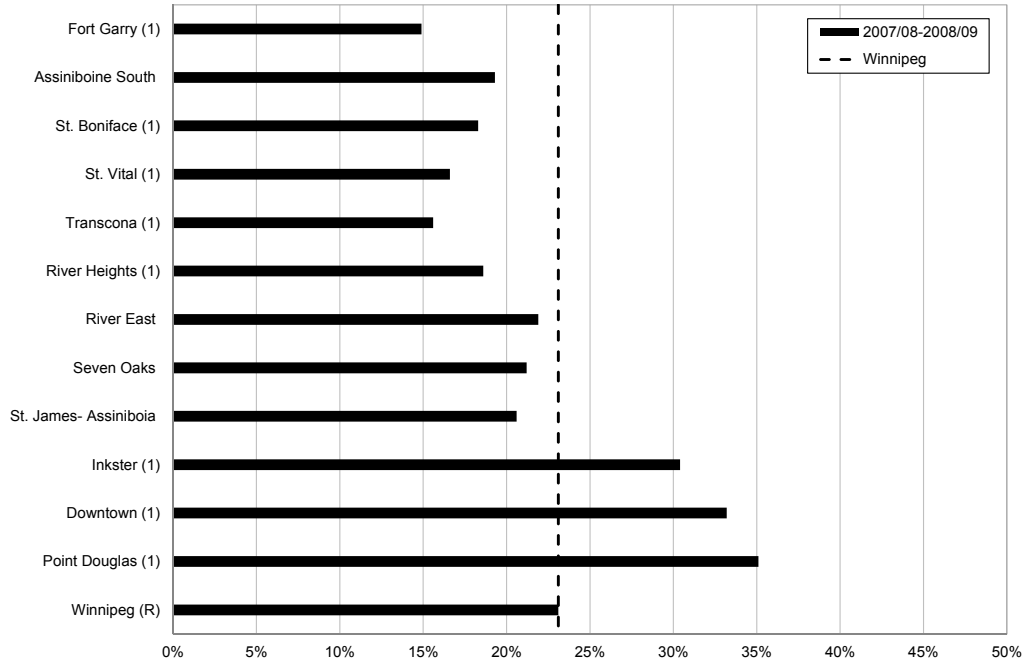
Figure 3.6.2: Late Initiation of Prenatal Care by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

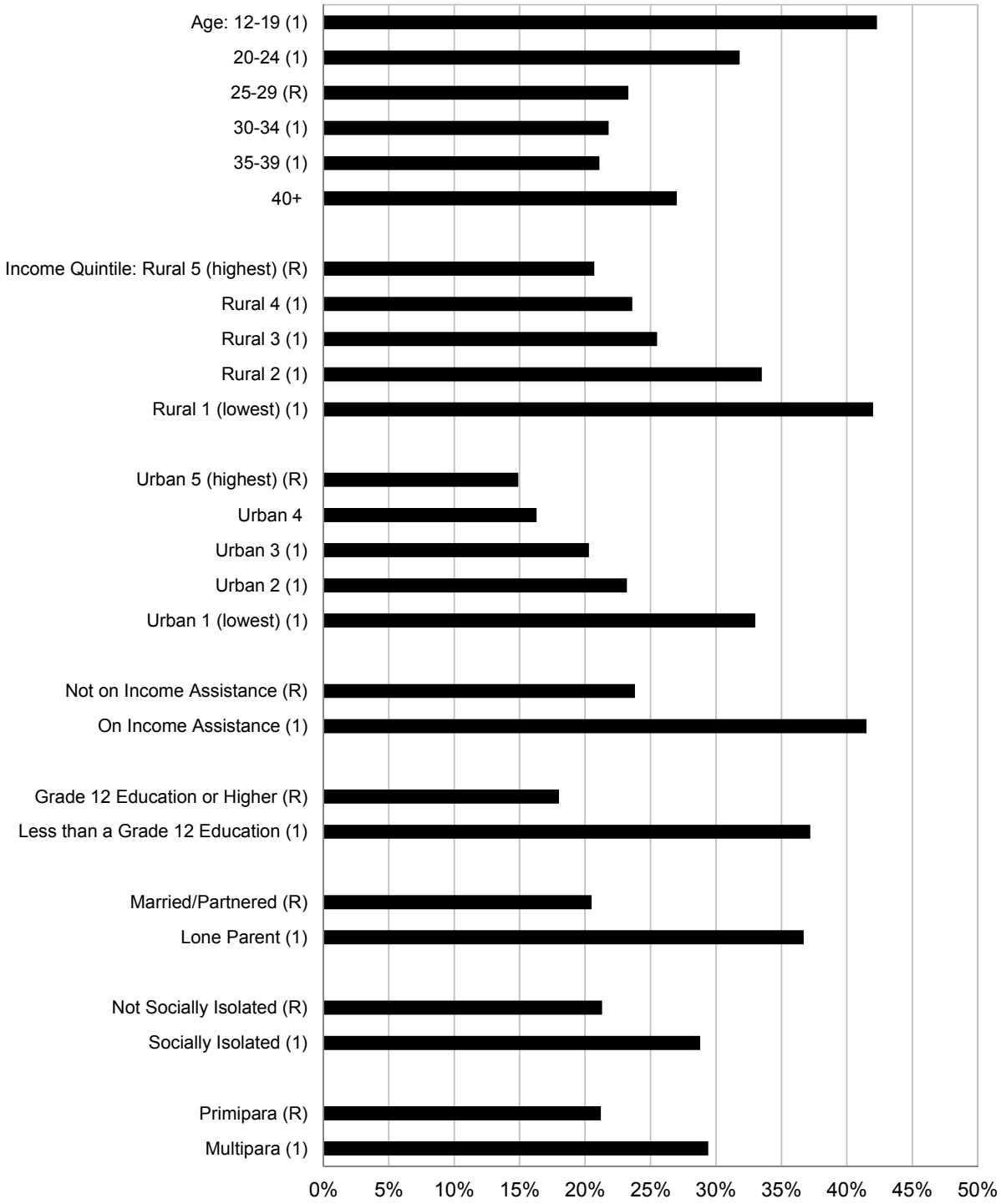
Figure 3.6.3: Late Initiation of Prenatal Care by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.6.4: Late Initiation of Prenatal Care by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Low Number of Prenatal Visits

Calculation of the Indicator

The proportion of women who had a low number of prenatal visits was calculated by dividing the number of women with a low number of prenatal visits by the number of women giving birth in a given time and place. A woman was considered to have a low number of prenatal visits if she had less than five prenatal care visits prior to delivery. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. The analysis was limited to in province and hospital births, as prenatal care was not well recorded on the midwifery data forms. Cases with missing prenatal care values were also excluded. Maternal delivery records that could not be linked to a newborn birth record, those with a recorded gestation out of range and those with a recorded birth weight out of range, those where the maternal PHIN was not found on the Manitoba Health Registry or covered by Manitoba Health Registry during pregnancy were excluded. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2007/08), Figure 3.6.5
    - The Manitoba rate ranged from 4.7% (2001/02) to 5.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 4.6% in 2002/03 to a high of 5.4% in 2008/09.
    - The rate for the North ranged from 11.4% (2001/02) to 17.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 10.1% in 2002/03 to a high of 17.4% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.6.6
    - The Manitoba rate was 5.4%.
    - South Eastman (1.3%), Central (4.2%), Assiniboine (3.2%), Brandon (1.9%), and Winnipeg (3.6%) were significantly lower than Manitoba rate; while North Eastman (7.5%), Parkland (8.9%), NOR–MAN (20.0%), and Burntwood (15.8%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.6.7
    - The Winnipeg rate was 3.6%.
    - Fort Garry (1.6%), St. Boniface (1.9%), St. Vital (1.8%), River Heights (2.0%), River East (2.4%), Seven Oaks (1.8%), and St. James–Assiniboia (2.1%) were significantly lower than the Winnipeg rate, while Downtown (7.3%) and Point Douglas (10.3%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.6.8
  There was a statistically significant difference in the proportion of women giving birth who had less than five prenatal care visits for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, fewer women had less than five prenatal care visits.
    - Income Quintile – There was a significant relationship with area–level income. With each successive increase in area–level income, there was a decrease in the number of women who had less than five prenatal care visits, with the gradient in rural areas being steeper.
    - Income Assistance – 12.9% of the women giving birth who were on income assistance had less than five prenatal care visits compared to 4.1% of the women who were not on income assistance.
    - Maternal Education – 6.5% of the women giving birth who had less than a Grade 12 education, had less than five prenatal care visits compared to 1.0% of those with a Grade 12 education.
    - Marital Status – 7.2% of the women giving birth who were lone parents had less than five prenatal care visits compared to 1.9% of those who were married/partnered.
    - Social Isolation – 3.7% of the women giving birth who were socially isolated had less than five prenatal care visits compared to 1.8% who were not socially isolated.
    - Parity – 3.2% of the primiparous women had less than five prenatal care visits compared to 6.7% of multiparous women.

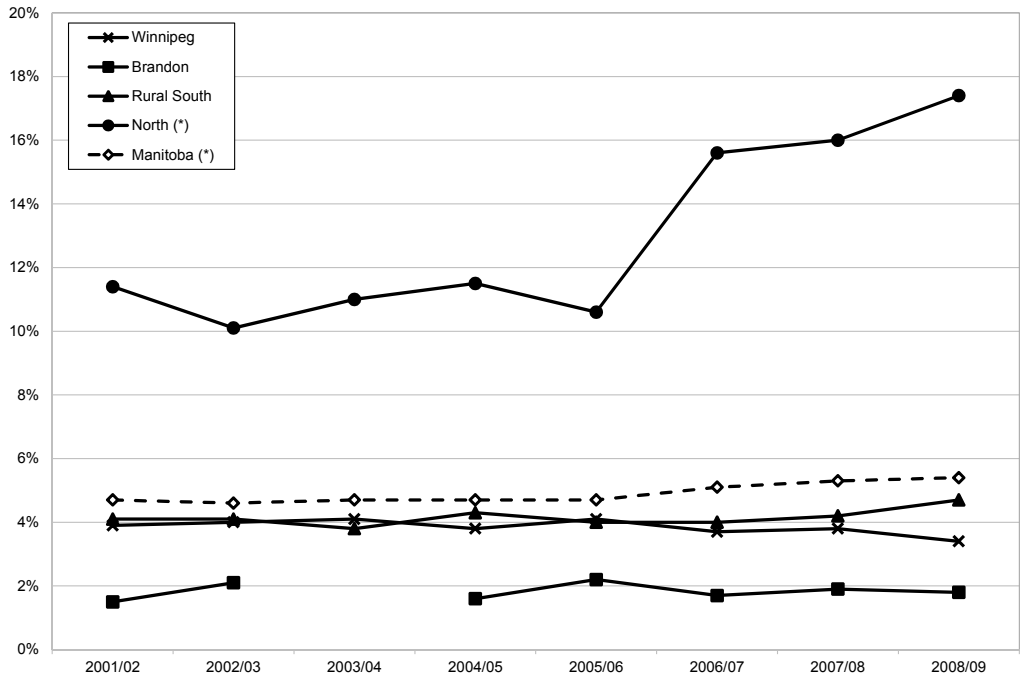
Comparison to Other Findings

The Canadian Perinatal Health Report does not contain any information on prenatal care (Public Health Agency of Canada, 2008).

Summary

The rate of low number of prenatal visits has increased over time in Manitoba from 4.7% to 5.4% (2001/02–2008/09) and the North from 11.4% to 17.4%. There were regional variations in rates of low number of prenatal visits—North Eastman, Parkland, NOR–MAN, and Burntwood had rates that were significantly higher than the Manitoba rate. The Winnipeg rate was 3.6%; Downtown and Point Douglas had rates that were significantly higher than the Winnipeg rate. A low number of prenatal visits was more likely among women who had less than a Grade 12 education or were younger (less than 25), living in lower income areas, on income assistance, a lone parent, socially isolated, or multiparous. The overall higher rates of a low number of prenatal visits for women in the North requires further exploration; the sudden increase in rates in the North from 2006/07–2008/09 suggests some health system or provider issue (i.e., problems with access to care) or a data quality issue as opposed to patient choice.

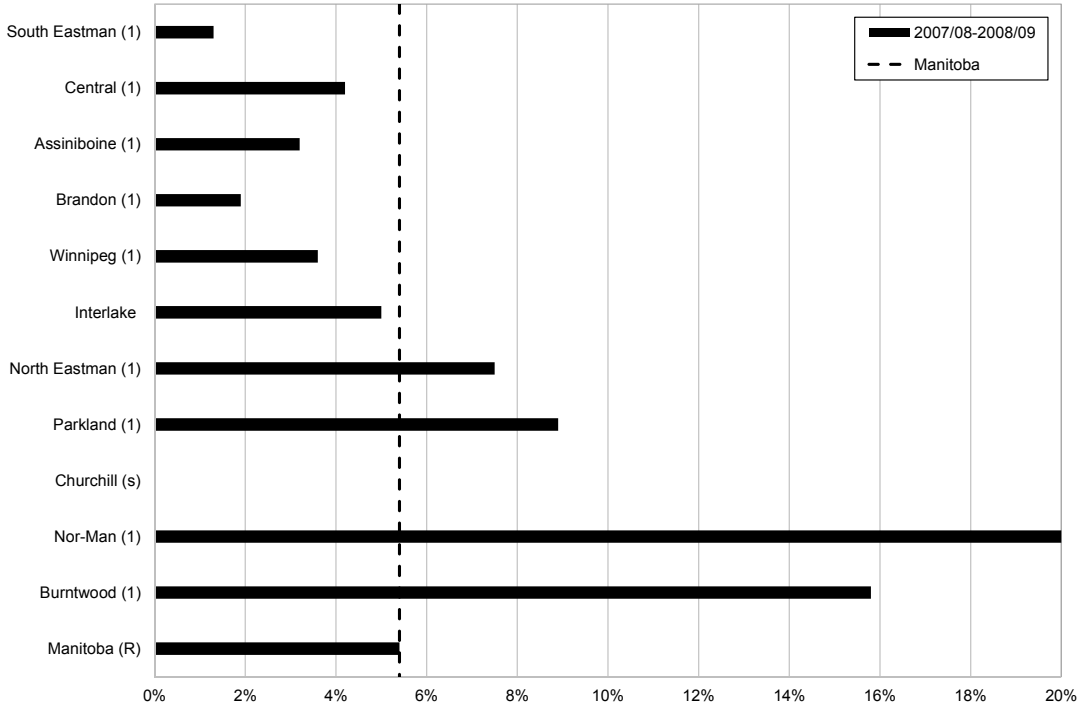
Figure 3.6.5: Proportion of Women with Less than Five Prenatal Care Visits by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers.

Source: Manitoba Centre for Health Policy, 2012

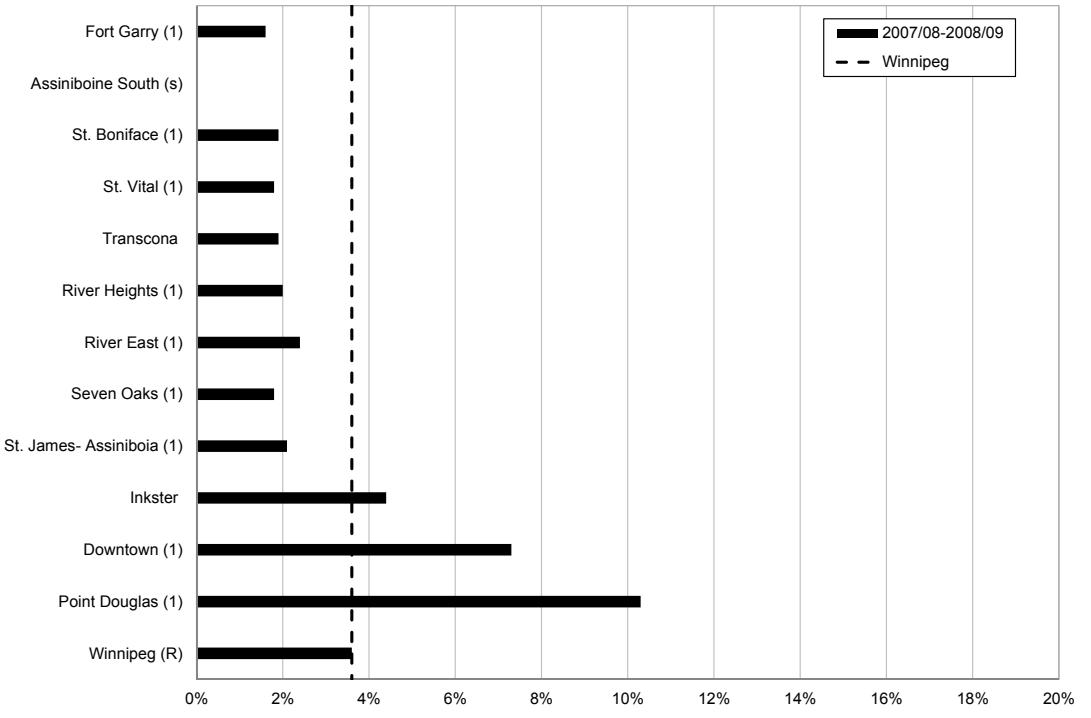
Figure 3.6.6: Proportion of Women with Less than Five Prenatal Care Visits by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

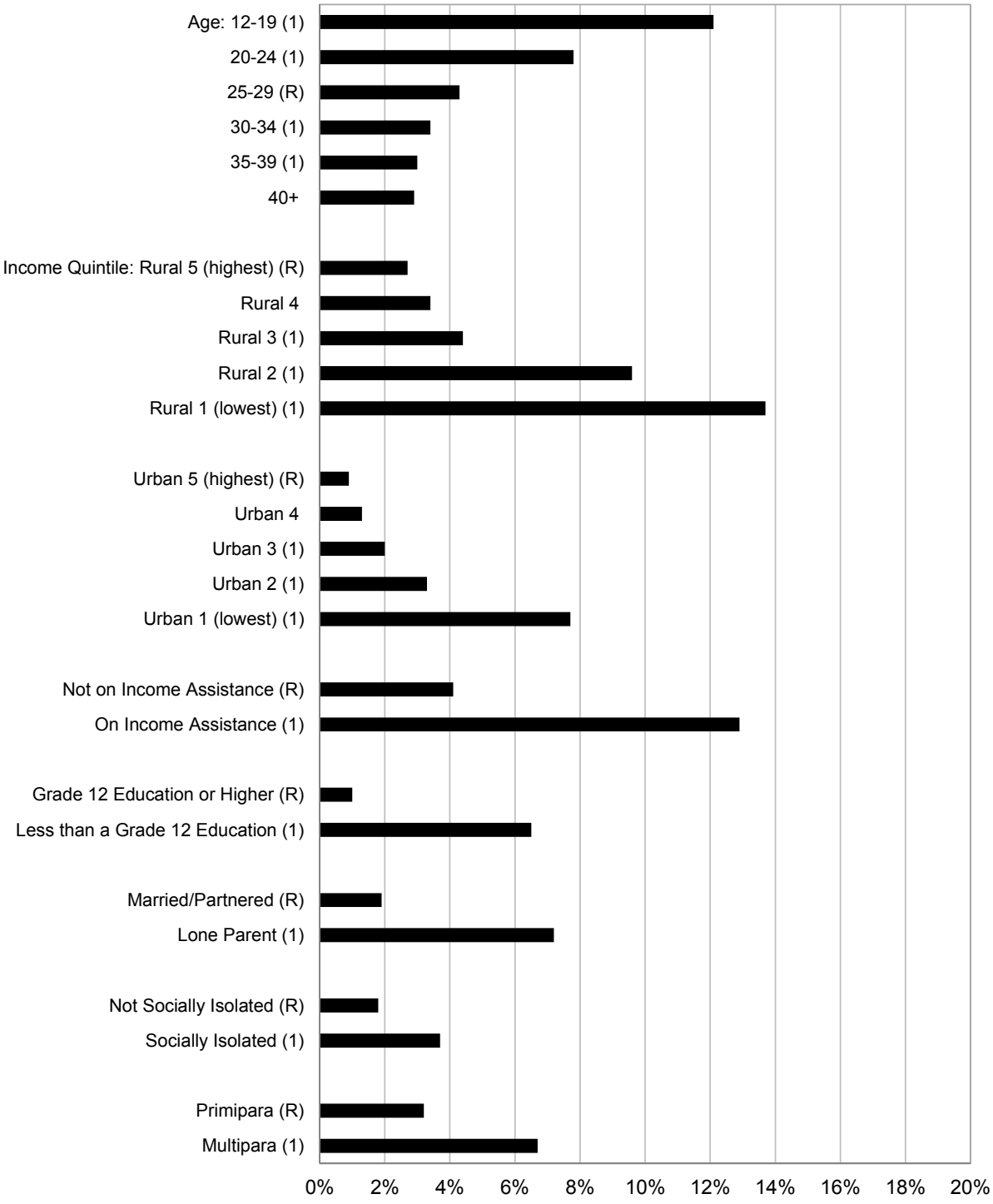
Figure 3.6.7: Proportion of Women with Less than Five Prenatal Care Visits by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.6.8: Proportion of Women with Less than Five Prenatal Care Visits by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Inadequate Prenatal Care

Calculation of the Indicator

The proportion of women with no or inadequate prenatal care was determined using the Revised Graduated Index of PNC Utilization (R–GINDEX) (Alexander & Kotelchuck, 1996). Women who were classified as having no or inadequate prenatal care were divided by the number of women giving birth in a given time and place. Knowledge of three birth–related variables is required to calculate R–GINDEX:

a. the gestational age of the infant (date of birth)
b. the trimester during which prenatal care began (date of first prenatal visit)
c. the total number of prenatal visits during pregnancy

The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. The analysis was limited to hospital births as the prenatal care was not well recorded on the midwifery data forms. Cases with missing prenatal care or R–GINDEX values were also excluded. Maternal delivery records that could not be linked to a newborn birth record, those with a recorded gestation out of range, those with a recorded birth weight out of range, and those where the maternal PHIN was not found on the Manitoba Health Registry or covered by Manitoba Health Registry during pregnancy were excluded. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2007/08), Figure 3.6.9
  - The Manitoba rate ranged from 11.1% (2001/02) to 12.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 10.3% in 2002/03 to a high of 12.5% in 2008/09.
  - The rate for the Rural South ranged from 11.0% (2001/02) to 12.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 9.2% in 2002/03 to a high of 12.4% in 2008/09.
  - The rate for the North ranged from 26.4% (2001/02) to 37.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 24.6% in 2004/05 to a high of 37.4% in 2008/09.
- RHA (2007/08–2008/09), Figure 3.6.10
  - The Manitoba rate was 12.3%.
  - South Eastman (5.2%), Central (10.4%), Assiniboine (8.9%), Brandon (5.2%), and Winnipeg (7.7%), were significantly lower than Manitoba rate, while North Eastman (17.9%), Parkland (21.3%), NOR–MAN (41.0%), and Burntwood (34.9%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.6.11
  - The Winnipeg rate was 7.7%.
  - Fort Garry (4.4%), Assiniboine South (3.9%), St. Boniface (3.8%), St. Vital (4.1%), Transcona (4.2%), River Heights (4.6%), River East (6.1%), Seven Oaks (4.0%), and St. James–Assiniboia (4.1%) were significantly lower than the Winnipeg rate; while Inkster (10.8%), Downtown (14.8%), and Point Douglas (19.1%) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.6.12
  There was a statistically significant difference in the proportion of women giving birth who had no or inadequate prenatal care for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, fewer women had no or inadequate prenatal care.
  - Income Quintile – There was a significant relationship with area–level income. With each successive increase in area–level income, there was a decrease in the number of women with no or inadequate prenatal care, with the gradient in rural areas being steeper.

- Income Assistance – 26.6% of the women giving birth who were on income assistance had no or inadequate prenatal care compared to 9.9% of the women who were not on income assistance.
- Education – 16.9% of the women giving birth who had less than a Grade 12 education had no or inadequate prenatal care compared to 3.8% of those with a Grade 12 education.
- Marital Status –17.5% of the women giving birth who were lone parents had no or inadequate prenatal care compared to 5.6% of those who were married/partnered.
- Social Isolation – 10.4% of the women giving birth who were socially isolated had no or inadequate prenatal care compared to 5.9% who were not socially isolated.
- Parity – 8.1% of the primiparous women had no or inadequate prenatal care compared to 14.8% of multiparous women.

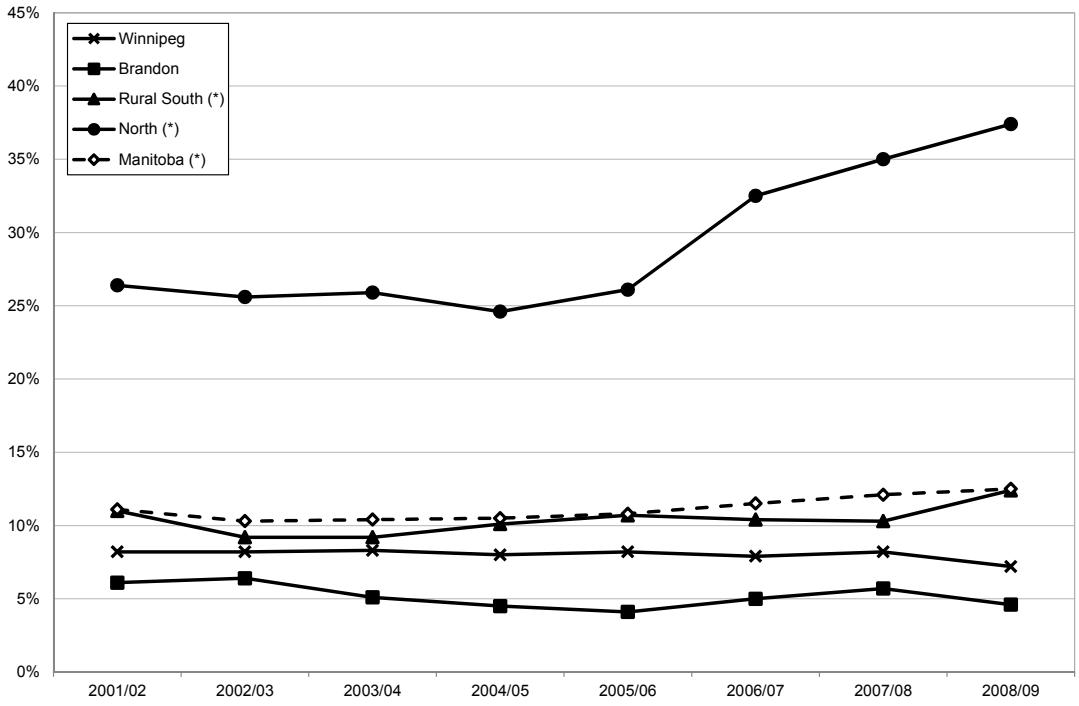
Comparison to Other Findings

The Canadian Perinatal Health Report does not contain any information on prenatal care (Public Health Agency of Canada, 2008).

Summary

The rate of inadequate prenatal care has increased significantly over time in Manitoba from 11.1% to 12.5% (2001/02–2008/09). The Manitoba rate of inadequate prenatal care was 12.3%, while the Winnipeg rate was lower at 7.7%. Regional variations were evident. NOR–MAN (41.0%) and Burntwood (34.9%) had particularly high rates. Inkster (10.8%), Downtown (14.8%), and Point Douglas (19.1%) had rates that were significantly higher than the Winnipeg rate. Inadequate prenatal care was more likely in women who had less than a Grade 12 education or were younger (less than 25), living in lower income areas, on income assistance, lone parent, socially isolated, or multiparous. The overall higher rates of inadequate prenatal care for women in the North requires further exploration; the sudden increase in rates in the North from 2006/07–2008/09 suggests some health system or provider issue (i.e., problems with access to care) or a data quality issue as opposed to patient choice.

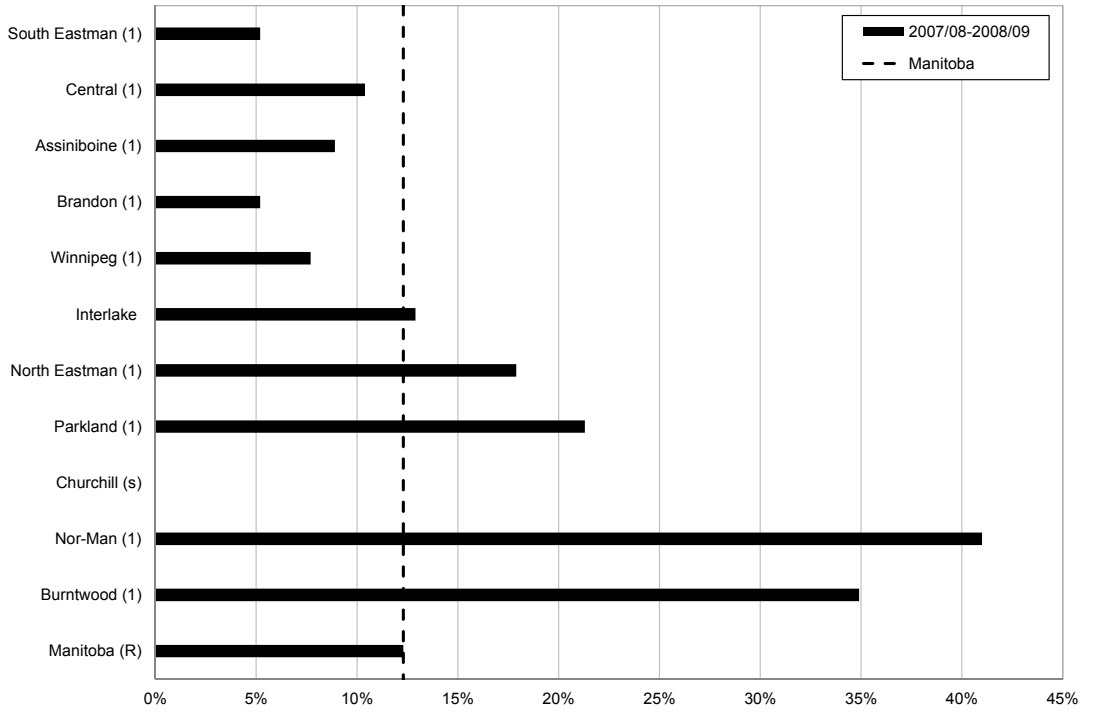
Figure 3.6.9: Proportion of Women with Inadequate Prenatal Care Using R-GINDEX by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

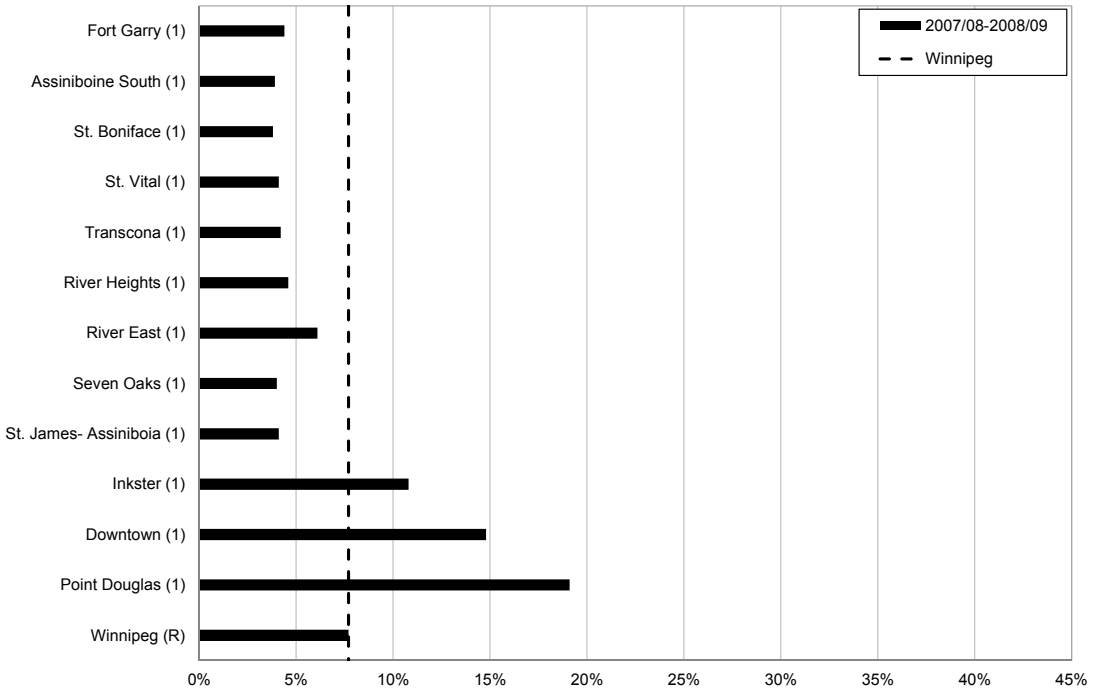
Figure 3.6.10: Proportion of Women with Inadequate Prenatal Care Using R-GINDEX by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

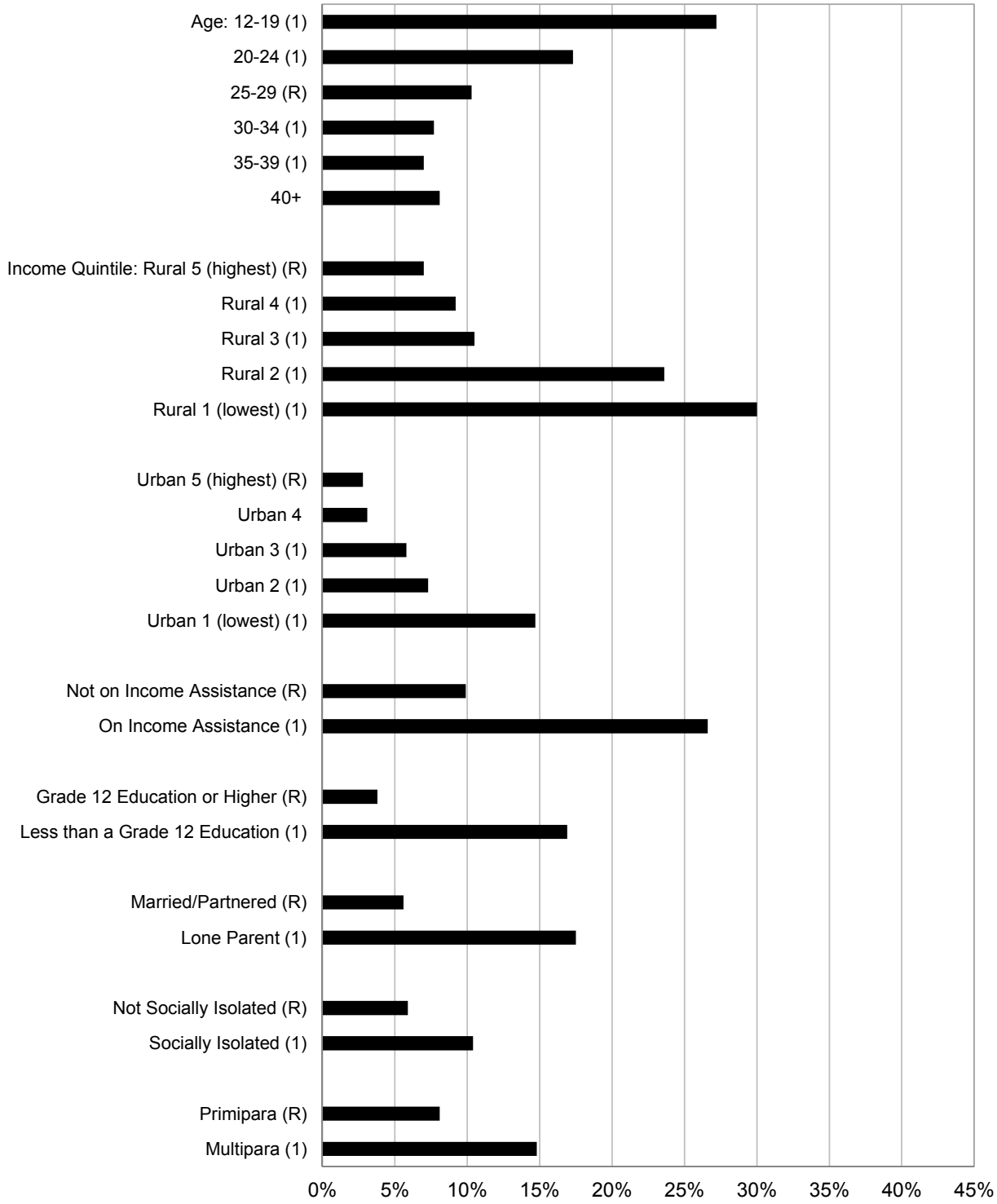
Figure 3.6.11: Proportion of Women with Inadequate Prenatal Care Using R-GINDEX by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.6.12: Proportion of Women with Inadequate Prenatal Care Using R-GINDEX by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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3.7 Healthcare Provider for Prenatal Care

Background

"Prenatal care in Canada is provided by a variety of healthcare professionals, including **obstetricians/ gynecologists,** family physicians, midwives, nurses and nurse practitioners" (Public Health Agency of Canada, 2009, p.37). There is a growing shortage of maternity care providers in Canada (Society of Obstetricians and Gynaecologists of Canada, 2008), particularly in remote and rural areas. Many family practice physicians are no longer providing the full range of maternity care (Canadian Institute for Health Information (CIHI), 2004). In the National Physician Survey 2004, 57% of family physicians reported involvement in maternal or newborn care, and 47% were providing prenatal care (Society of Obstetricians and Gynaecologists of Canada, 2008). Many family physicians provide "shared care," in which they provide prenatal care up to a certain number of weeks of pregnancy, and then transfer care to another provider, such as an obstetrician (CIHI, 2004). Obstetricians are largely filling the gap in prenatal care; however, the number of obstetricians/gynecologists varies by region and not all of them provide obstetrical care; some only provide gynecological services (Canadian Institute for Health Information (CIHI), 2004). Midwifery is a growing profession in Canada. Currently midwifery has been legislated in British Columbia, Alberta, Manitoba, Saskatchewan, Ontario, Quebec, Nova Scotia, New Brunswick, Nunavut, and the Northwest Territories (CMRC, 2012). The Midwifery Act in Manitoba was passed in 1997 and was proclaimed in June of 2000. The *Human Resource Strategy for Midwifery Implementation* (1998) projected that within two and a half years of legislation there would be 50 midwives each attending/caring for 40 births, resulting in approximately 2,000 births per year. The midwifery birthrate was projected to be 14%, which meant that by 2005 there would need to be approximately 140 practicing midwives in the province. However, midwifery has not grown as quickly as projected for a variety of reasons. Refer to Table 3.7.1 below for information on the number of practicing and non–practicing midwives per RHA per year from 2001 to 2010. Women continue to seek midwifery care; however demand exceeds capacity with about 60% of women being turned away due to full caseloads (Personal communication, K. Robinson, WRHA Midwifery Specialist).

In collaboration with other health professional organizations, the Society of Obstetricians and Gynaecologists of Canada (SOGC) has developed *A National Birthing Initiative for Canada*, which presents an inclusive, integrated and comprehensive pan–Canadian framework for sustainable family–centered maternity and newborn care (Society of Obstetricians and Gynaecologists of Canada, 2008). This initiative builds upon the *Multidisciplinary Collaborative Primary Maternity Care Project (MCP2)*, completed in June 2006, which produced national guidelines for collaborative models of care in Canada.

Table 3.7.1: College of Midwives of Manitoba Membership Information, 2001-2010

Year	Status		RHAs							
	Practicing	Non-Practicing	Winnipeg RHA	Brandon RHA	Nor-Man RHA	Burntwood RHA	South Eastman RHA	Central RHA	Churchill RHA	Independent
2001	22	1	15	3	0	2	2	0		
2002	28	2	20	2	2	2	1	1		
2003	31	2	19	3	2	2	2	3		1
2004	30	5	19	2	1	2	3	3		1
2005	30	5	18	4	1	1	3	3	1	1
2006	29	6	17	4	1	1	4	2		
2007	30	7	16	4	2	1	3	4		
2008	33	11	15	4	4	3	3	4		
2009	40	12	22	5	2	3	3	5		
2010	40	11	21	6	3	1	4	5		

The membership numbers and RHA of employment represent the situation as close to April 1 of that year as possible, therefore do not represent any changes that happened during the course of the year
The non-practising membership numbers include only those members that were once registered as practicing, they do not include those that never practiced
The chart does not reflect full-time or part-time Equivalent Full Time
This table is also presented as Table 3.7.1

Source: College of Midwives of Manitoba, 2012

Calculation of the Indicator

The provider of a women's prenatal care was assigned to one of four groups: **General Practitioner or Family Physician**, Obstetrician/Gynecologist, Midwife, or a Mix of Providers. It's based on the Maternal Delivery Record or the Midwifery Discharge Summary Report. The proportion of women receiving care from each of these four groups was calculated by dividing the number of women in each group by the number of women giving birth in a given time and place. As a woman may see a few different providers during her pregnancy, we assigned provider type based on which provider type was responsible for two–thirds or more of the prenatal care. If no provider type provided two–thirds or more of the care, then the **Mix of Providers** was assigned to that woman. Women who could not be linked to a newborn birth record (n=2,097), those records where the birth weight or gestation was out of range (n=62), those where PHIN could not be found (n=94) and those where the Maternal PHIN was not covered by the Manitoba Health Registry during the pregnancy (n=3,607) were excluded from this analysis. Time trends were calculated across 2001/02–2008/09. The rates by RHA and Winnipeg CA were calculated by provider type for two 2–year time periods 2001/02–2002/03 and 2007/08–2008/09. As the midwifery program was just beginning in the first time period, data for these years are suppressed due to small numbers at the RHA and Winnipeg CA levels. Refer to Appendix Table A.4 for more information.

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.7.1
  - The rate for General Practitioners/Family Physicians ranged from 42.2% (2001/02) to 34.6% (2008/09); the linear trend was significant and the rate decreased over time from a high of 42.2% in 2001/02 to a low of 34.6% in 2008/09.
  - The rate for Obstetricians/Gynecologists ranged from 37.4% (2001/02) to 41.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 37.4% in 2001/02 to a high of 41.1% in 2008/09.
  - The rate for Midwives ranged from 2.4% (2001/02) to 4.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.4% in 2001/02 to a high of 4.9% in 2006/07.
  - The rate for a Mix of Providers ranged from 17.6% (2001/02) to 19.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 16.3% to in 2003/04 to a high of 19.1% in 2008/09.
- General Practitioner or Family Physician (2001/02–2002/03 and 2007/08–2008/09)
  - RHA, Figure 3.7.2
    - The Manitoba rate was 41.8% in 2001/02–2002/03 and decreased to 35.5% in 2007/08–2008/09.
    - In both time periods South Eastman (64.8% and 56.1%), Central (81.7% and 74.6%), Assiniboine (72.8% and 78.1%), Brandon (61.8% and 76.0%), Parkland (93.5% and 90.3%), and NOR–MAN (79.6% and 63.0%) were significantly higher than the Manitoba rate; while Winnipeg (22.5% and 13.1%) and Burntwood (38.3% and 38.3%) were significantly lower.
    - Interlake (45.2%) was significantly higher than the Manitoba rate in the first time period, but was significantly lower in the second time period (24.3%)
    - Churchill (68.6%) was significantly higher than the Manitoba rate in the first time period.
    - North Eastman (26.7%) was significantly lower than the Manitoba rate in the second time period.
  - Winnipeg CA, Figure 3.7.3
    - The Winnipeg rate was 22.5% in 2001/02–2002/03 and decreased to 13.1% in 2007/08–2008/09
    - Fort Garry (31.4% and 17.1%) and St. Vital (28.5% and 21.3%) were significantly higher than the Winnipeg rate in both time periods, while Seven Oaks (16.6% and 8.8%) and Inkster (18.1% and 9.4%) were significantly lower.

        - St. James–Assiniboia (19.1%) was significantly lower than the Winnipeg rate in the first time period.
        - St. Boniface (16.1%) was significantly higher than the Winnipeg rate in the second time period, while Assiniboine South (8.9%) and Downtown (10.6%) were significantly lower.
- Obstetrician/Gynecologist, (2001/02–2002/03 and 2007/08–2008/09)
    - RHA, Figure 3.7.4
        - The Manitoba rate was 37.4% in 2001/02–2002/03 and increased to 40.7% in 2007/08–2008/09 and is largely driven by Winnipeg.
        - South Eastman (18.7% and 20.0%), Central (10.5% and 11.5%), Assiniboine (13.7% and 5.6%), Brandon (28.2% and 7.9%), North Eastman (29.0% and 32.9%), Parkland (2.4% and 1.6%), NOR–MAN (4.0% and 4.4%), and Burntwood (9.3% and 12.5%) were significantly lower than the Manitoba rate in both time periods; while Winnipeg (56.1% and 65.3%) was significantly higher.
        - Interlake (49.4%) was significantly higher than the Manitoba rate in the second time period, while Churchill (0.0%) was significantly lower.
    - Winnipeg CA, Figure 3.7.5
        - The Winnipeg rate was 56.1% in 2001/02–2002/03 and increased to 65.3% in 2007/08–2008/09.
        - St. Vital (52.4% and 58.0%) was significantly lower than the Winnipeg rate in both time periods; while Seven Oaks (65.8% and 76.0%), St. James–Assiniboia (62.2% and 69.8%), and Inkster (63.9% and 72.8%) were significantly lower.
        - Point Douglas (49.1%) and Fort Garry (47.4%) were significantly lower than the Winnipeg rate in the first time period.
        - St. Boniface (59.7%), Transcona (58.7%), and River East (61.3%) were significantly lower than the Winnipeg rate in the second time period; while Assiniboine South (74.2%) was significantly higher.
- Midwife (2007/08–2008/09)
    - RHA, Figure 3.7.6
        - The Manitoba rate was 4.5%.
        - South Eastman (10.2%), Central (5.5%), Brandon (8.3%), and NOR–MAN (9.8%) were significantly higher than the Manitoba rate; while Interlake (0.6%), North Eastman (1.3%), and Burntwood (2.5%) were significantly lower than the Manitoba rate.
    - Winnipeg CA (2007/08–2008/09), Figure 3.7.7
        - The Winnipeg rate was 4.2%.
        - River Heights (7.5%) and Downtown (5.8%) were significantly higher than the Winnipeg rate, while Seven Oaks (1.8%) and Inkster (1.8%) were significantly lower.
- Mix of Providers (2001/02–2002/03 and 2007/08–2008/09)
    - RHA, Figure 3.7.8
        - The Manitoba rate was 17.4% in 2001/02–2002/03 and increased to 18.7% in 2007/08–2008/09.
        - South Eastman (10.9% and 13.6%), Central (6.5% and 7.8%), Assiniboine (12.2% and 11.1%), Brandon (7.0% and 7.3%), and Parkland (3.3% and 7.4%) were significantly lower than the Manitoba rate in both time periods; while North Eastman (29.5% and 38.1%) and Burntwood (50.2% and 45.9%) were significantly higher.
        - NOR–MAN (12.8%) was significantly lower than the Manitoba rate in the first time period.
        - Winnipeg (17.0%) was significantly lower than the Manitoba rate in the second time period, while Interlake (25.1%) and Churchill (39.4%) were significantly higher.
    - Winnipeg CA, Figure 3.7.9
        - The Winnipeg rate was 16.9% in 2001/02–2002/03 and 17.0% in 2007/08–2008/09.
        - Transcona (21.1% and 22.8%), River East (19.9% and 20.2%), and Point Douglas (22.7% and 19.8%) were significantly higher than the Winnipeg rate in both time periods
        - St. Boniface (13.7%) was significantly lower than the Winnipeg rate in the first time period.
        - Seven Oaks (13.1%) was significantly lower than the Winnipeg rate in the second time period.

Comparison to Other Findings

In the Canadian Maternity Experiences Survey (Public Health Agency of Canada, 2009), women were asked from which type of healthcare provider they received most of their prenatal care. Over half (58.1%) received care from an obstetrician/gynecologist, 34.2% from a family physician, 6.1% from a midwife, 0.6% from a nurse/nurse practitioner, and 1.0% other or unspecified. In Manitoba in 2007/08–2008/09, 40.7% of women received two–thirds or more of their prenatal care from an obstetrician/gynecologist, 35.5% from a family physician, 4.5% from a midwife, and 18.7% from a mix of providers. Differences in these proportions between Canada and Manitoba are partially due to differences in how the data were collected.

Limitations

MCHP administrative data on type of prenatal care provider may not fully capture data for nurse practitioners and nurses working in nursing stations in First Nations communities.

Summary

The type of prenatal care provider varies significantly by region in Manitoba; the rates are likely influenced by the number and types of providers available in various RHAs. Although in 2007/08–2008/09, 40.7% of women in Manitoba overall received care from an obstetrician, this increased to 65.3% for women in Winnipeg. Conversely, although 35.5% of women in Manitoba overall received prenatal care from a family physician, this decreased to 13.1% for women living in Winnipeg. The proportion of women receiving care from a midwife was similar for Manitoba (4.5%) and Winnipeg (4.2%). The RHAs of Interlake, North Eastman, and Burntwood had significantly lower proportions of women receiving prenatal care from a midwife.

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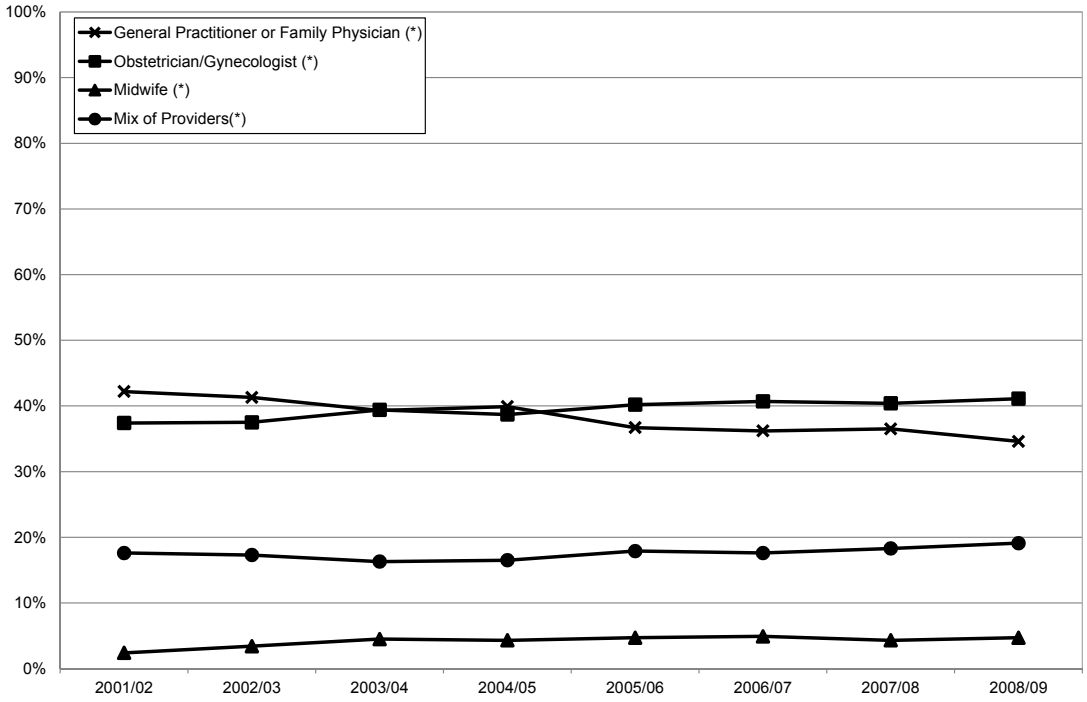
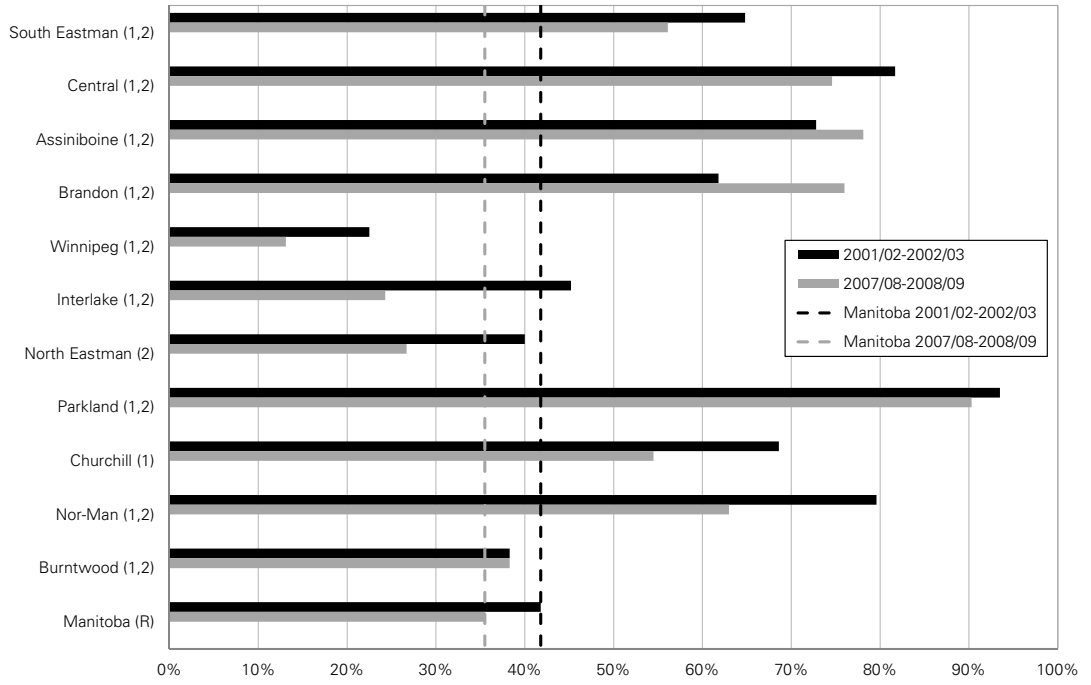
Figure 3.7.1: Prenatal Care by Type of Provider and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

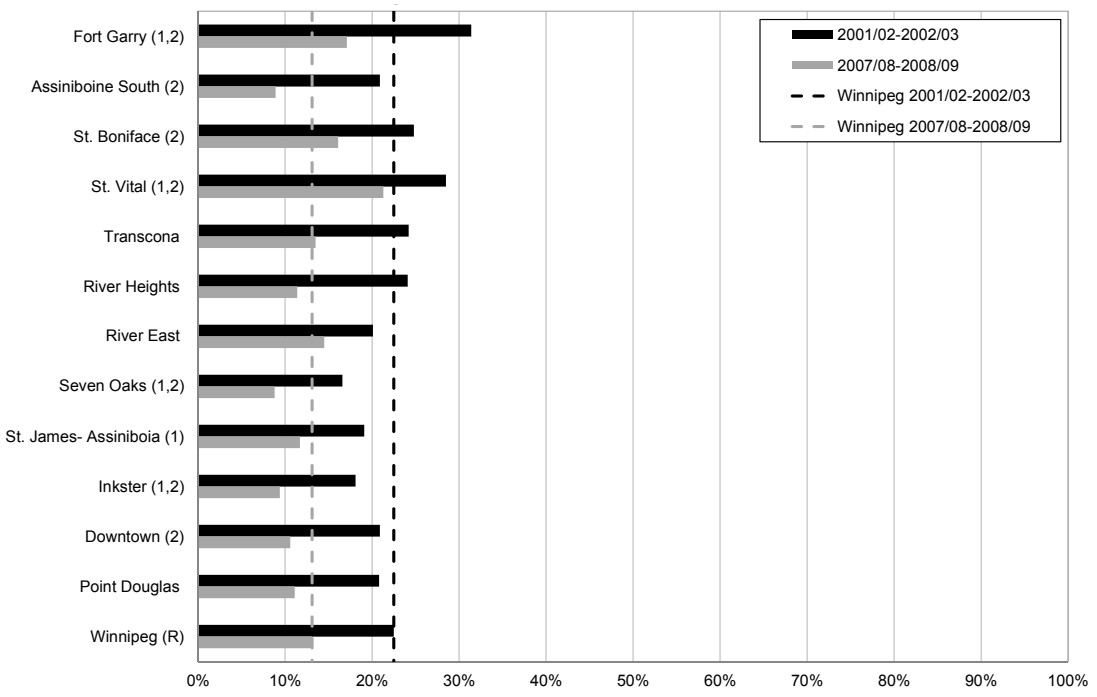
Figure 3.7.2: Proportion of Women Receiving Prenatal Care by a General Practitioner or Family Physician by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

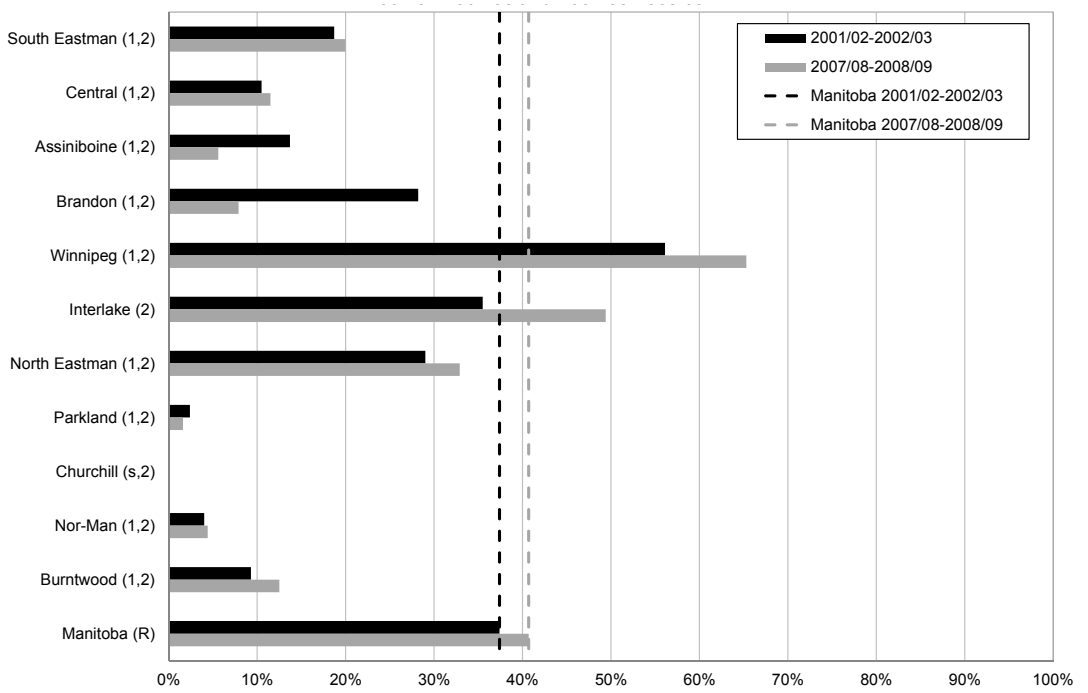
Figure 3.7.3: Proportion of Women Receiving Prenatal Care by a General Practitioner or Family Physician by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

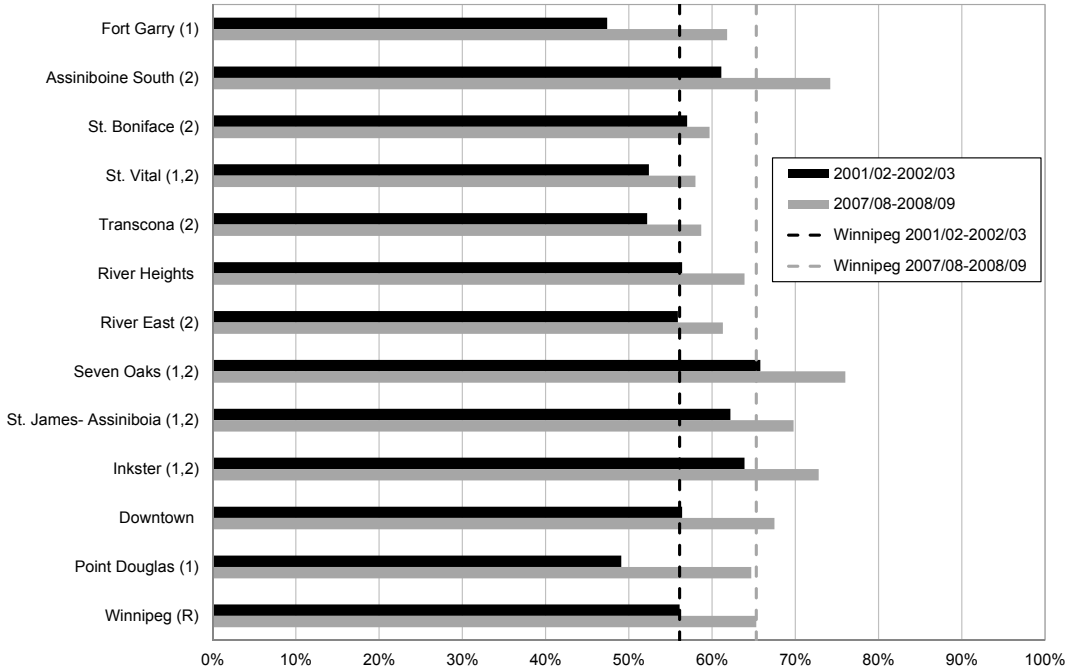
Figure 3.7.4: Proportion of Women Receiving Prenatal Care by an Obstetrician/Gynecologist by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

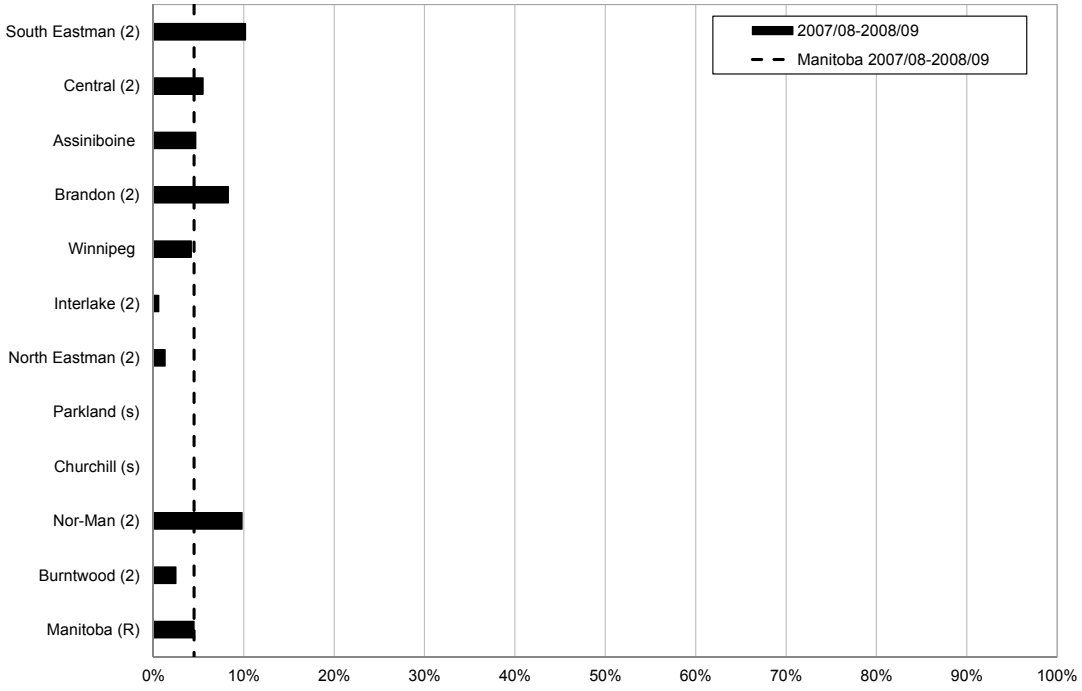
Figure 3.7.5: Proportion of Women Receiving Prenatal Care by an Obstetrician/Gynecologist by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

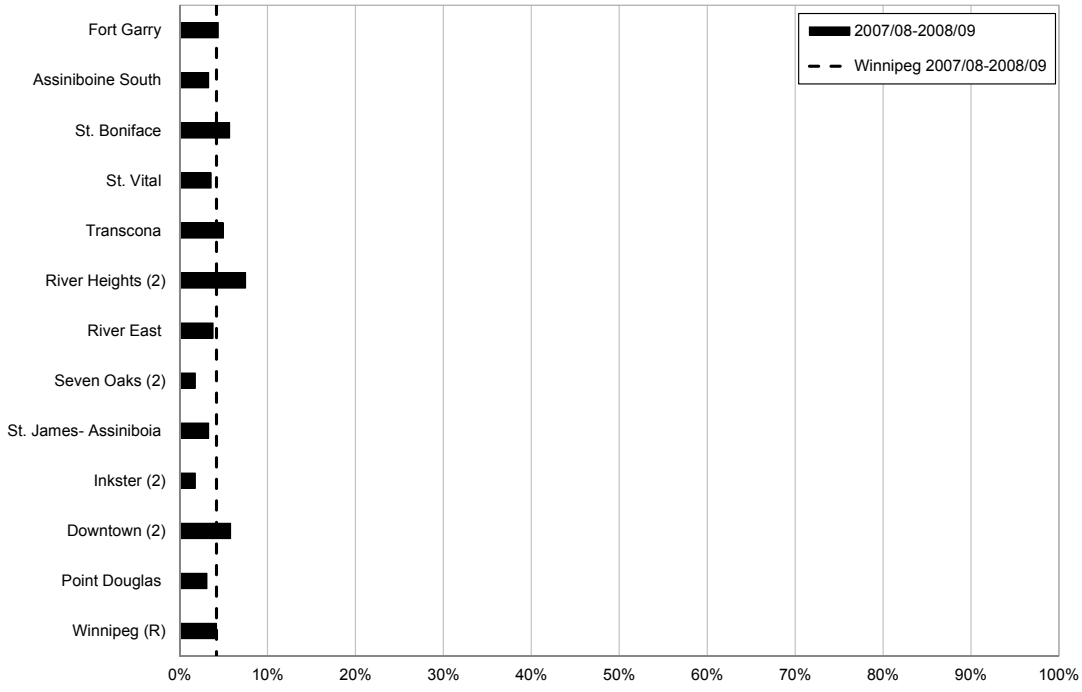
Figure 3.7.6: Proportion of Women Receiving Prenatal Care by a Midwife by RHA, 2007/08-2008/09



'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

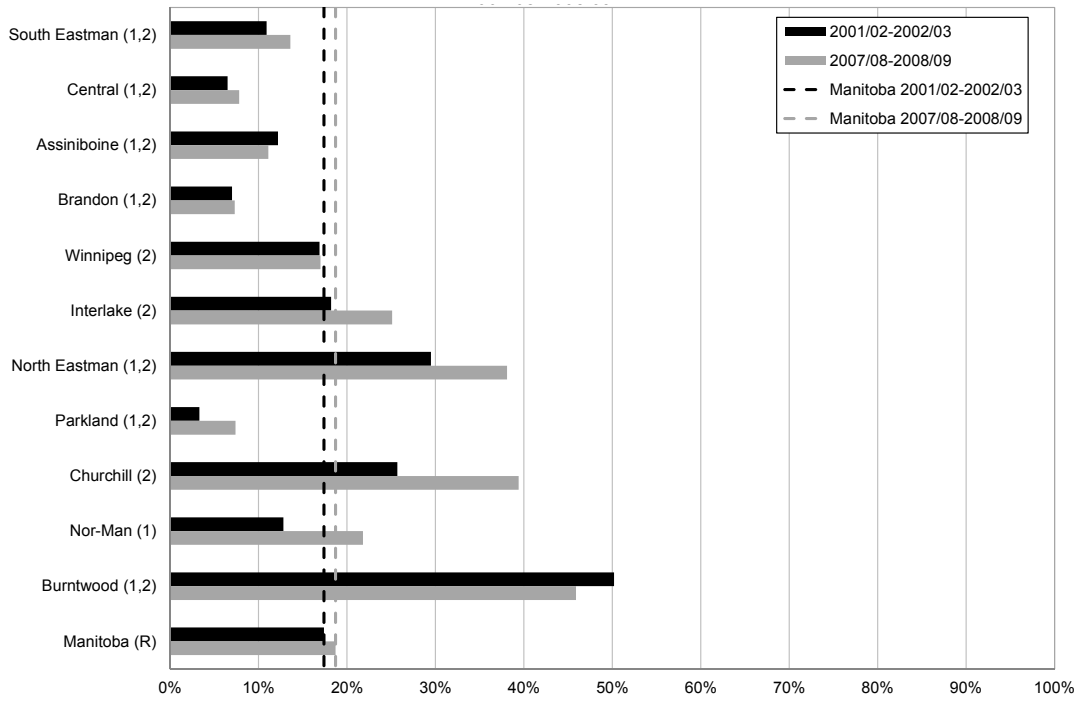
Figure 3.7.7: Proportion of Women Receiving Prenatal Care by a Midwife by Winnipeg CA, 2007/08-2008/09



'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

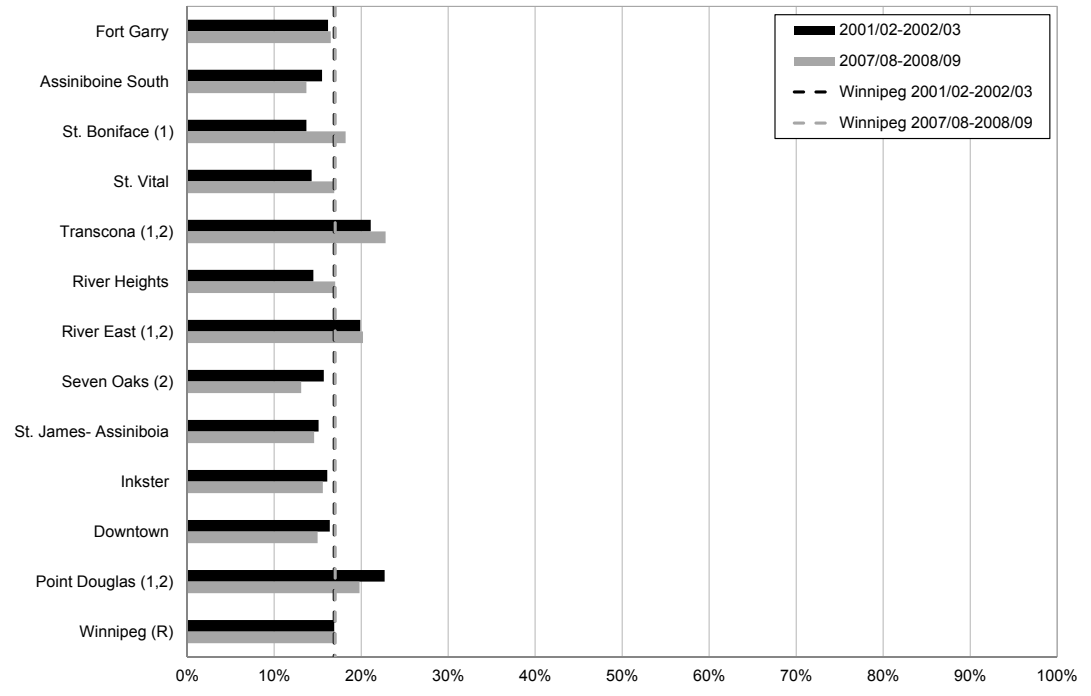
Figure 3.7.8: Proportion of Women Receiving Prenatal Care by a Mix of Providers by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.7.9: Proportion of Women Receiving Prenatal Care by a Mix of Providers by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

3.8 Prenatal Psychological Distress

Background

Prenatal psychological distress (anxiety and/or depression) is one of the most common pregnancy–related morbidities (Priest, Austin, Barnett, & Buist, 2008). Two decades of well–conducted, longitudinal studies have demonstrated that prenatal psychological distress can have serious adverse effects on mothers, children, and families including preterm birth and low birthweight (Hobel, Goldstein, & Barrett, 2008), child developmental delay (Beck, 1999; Kingston, Tough, & Whitfield, 2012), impaired mother–child bonding (Moehler, Brunner, Wiebel, Reck, & Resch, 2006), poor child emotional health (Glasheen, Richardson, & Fabio, 2010; Martini, Knappe, Beesdo–Baum, Lieb, & Wittchen, 2010), attention deficit/hyperactivity disorder (Martini et al., 2010), and parenting stress (Cornish et al., 2006). In addition, maternal psychiatric illness has been identified as one of the leading causes of maternal deaths in Australia (Austin, Kildea, & Sullivan, 2007). Emerging evidence suggests that early, prenatal intervention aimed at improving maternal mental health can reduce the risks of these outcomes (Cho, Kwon, & Lee, 2008; El–Mohandes, Kiely, Gantz, & El–Khorazaty, 2011; Milgrom, Schembri, Ericksen, Ross, & Gemmill, 2011).

Calculation of the Indicator

The number of the women diagnosed with prenatal psychological distress was divided by the total number of women giving birth. A woman was considered to have prenatal psychological distress if in the eight months prior to giving birth (or hospital discharge in case of a stillbirth) she had:

- one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression, or adjustment reaction OR
- one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction OR
- one or more hospitalizations with a diagnosis for anxiety disorders OR
- one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more physician visits with a diagnosis for anxiety disorders and one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders OR
- two or more physician visits with a diagnosis for anxiety disorders

Refer to Appendix Table A.4 for more details. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09.

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.8.1
    - The Manitoba rate ranged from 6.5% (2001/02) to 7.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 6.5% in 2001/02 to a high of 8.0% in 2005/06.
    - The Brandon rate ranged from 9.9% (2001/02) to 13.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 9.9% in 2001/02 to a high of 15.0% in 2006/07.
    - The Rural South rate ranged from 4.6% (2001/02) to 6.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 4.6% in 2001/02 to a high of 6.6% in 2006/07.

- RHA (2007/08–2008/09), Figure 3.8.2
  - The Manitoba rate was 7.5%.
  - Central (5.3%), Assiniboine (5.7%), and Burntwood (3.4%) were significantly lower than the Manitoba rate; while Brandon (13.4%), Winnipeg (8.4%) and Parkland (11.4%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.8.3
  - The Winnipeg rate was 8.4%.
  - St. James–Assiniboia (11.3%) was significantly higher than the Winnipeg rate (8.4%).
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.8.4
  There was a statistically significant difference in the proportion of women giving birth who had prenatal psychological distress for the following characteristics:
  - Maternal Age – Fewer women aged 12 to19 (5.4%) and more women aged 30 to 34 (8.3%) and 35 to 39 (8.6%) had prenatal psychological distress compared to women aged 25 to 29 (7.1%).
  - Income Quintile – Fewer women living in the lowest rural income quintiles (Rural 1, 5.2%; Rural 2, 4.5%) had prenatal psychological distress compared to women living in the highest rural income quintile (6.7%). More women living in lower urban income quintiles (Urban 4, 8.7%; Urban 3, 9.8%; Urban 1, 9.6%) had prenatal psychological distress compared to women living in the highest urban income quintile (Urban 5, 7.3%).
  - Income Assistance – 12.9% of the women giving birth who were on income assistance had prenatal psychological distress compared to 6.6% of the women who were not on income assistance.
  - Maternal Education – 8.9% of the women giving birth who had less than a Grade 12 education had prenatal psychological distress compared to 7.2% of those with a Grade 12 education.
  - Marital Status –11.3% of the women giving birth who were lone parents had prenatal psychological distress compared to 7.1% of those who were married/partnered.
  - Social Isolation – 11.0% of the women giving birth who were socially isolated had prenatal psychological distress compared to 7.3% who were not socially isolated.
  - Parity – 7.0% of the primiparous women had prenatal psychological distress compared to 7.7% of multiparous women.
  - **Maternal Hypertension** – 9.8% of women with a hypertension diagnosis had prenatal psychological distress compared to 7.2% of women without a hypertension diagnosis.
  - **Maternal Diabetes** – 9.7% of women with a diabetes diagnosis also had prenatal psychological distress compared to 7.3% of women without a diabetes diagnosis.
  - Antepartum Hemorrhage – 10.4% of women who had an antepartum hemorrhage also had prenatal psychological distress compared 7.3% of women who did not have an antepartum hemorrhage.

Comparison to Other Findings

To our knowledge, the rates of prenatal psychological distress have not been reported in other population–based maternity studies in Canada. However, the rates of prenatal psychological distress in this report are similar to those reported by others for antidepressants used/prescribed in pregnancy (Andrade et al., 2008; Ramos, Oraichi, Rey, Blais, & Berard, 2007) in Quebec (7.7%, (Ramos et al., 2007)) and the U.S. (8.0%, (Andrade et al., 2008)).

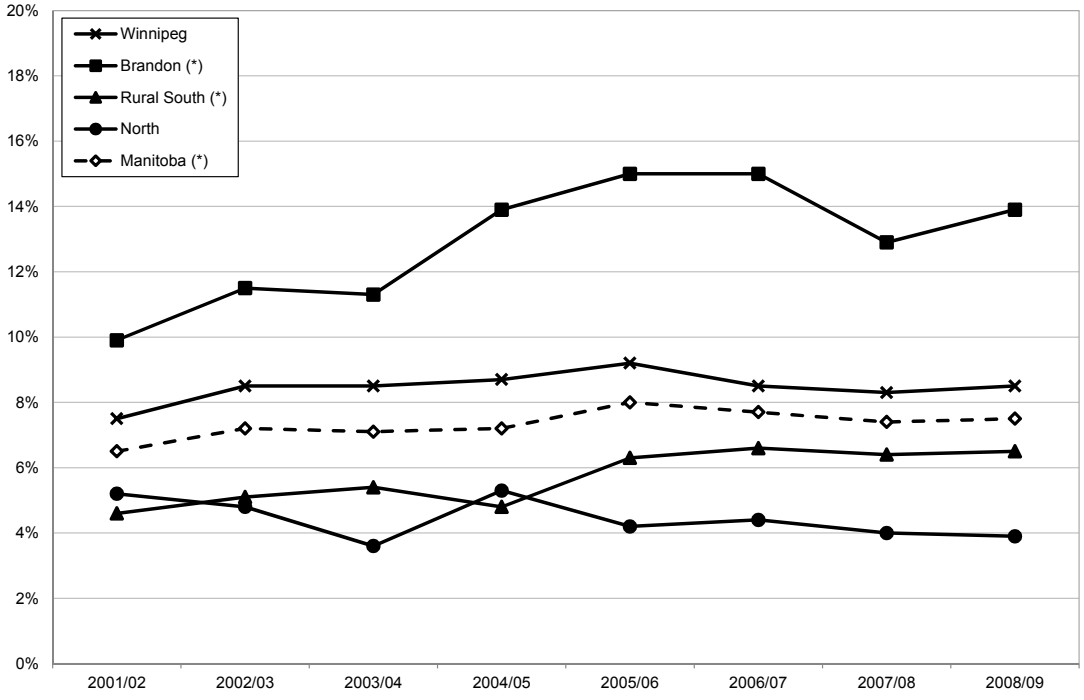
Limitations

Most studies assess prenatal psychological distress by maternal self–report or clinical interviews. Although a strength of the data in this report is that they are based on medical diagnosis and treatment, a limitation is that women who do not access care (e.g., either by choice or lack of available services) but who experience distress are not captured. Many pregnant women do not seek help for psychological distress because they want to avoid pharmacological therapy or stop taking medication that they took pre–pregnancy. Others may seek non–pharmacological care (e.g., psychologist, support groups) and these data are not available from administrative data. As such, the proportion of women with prenatal psychological distress may be under–reported.

Summary

The rates of women who sought physician care, were hospitalized, or received pharmacological treatment for prenatal psychological distress increased significantly in Manitoba during 2001/02–2008/09 from 6.5 % to 7.5%. Increases during this period were also observed in Brandon and the Rural South. It is unclear whether these rates reflect true increases in prenatal psychological distress or increases in access to treatment services. In particular, the reason for the much higher rates of prenatal psychological distress among women in Brandon is unknown and requires further exploration. Pregnant women with psychological distress were more likely to be older (aged 30 to 39), lone parents, on income assistance, socially isolated, or multiparous; reside in higher income rural or lower income urban areas; have less than Grade 12 education; or have medical complications (e.g., hypertension, diabetes, antepartum hemorrhage).

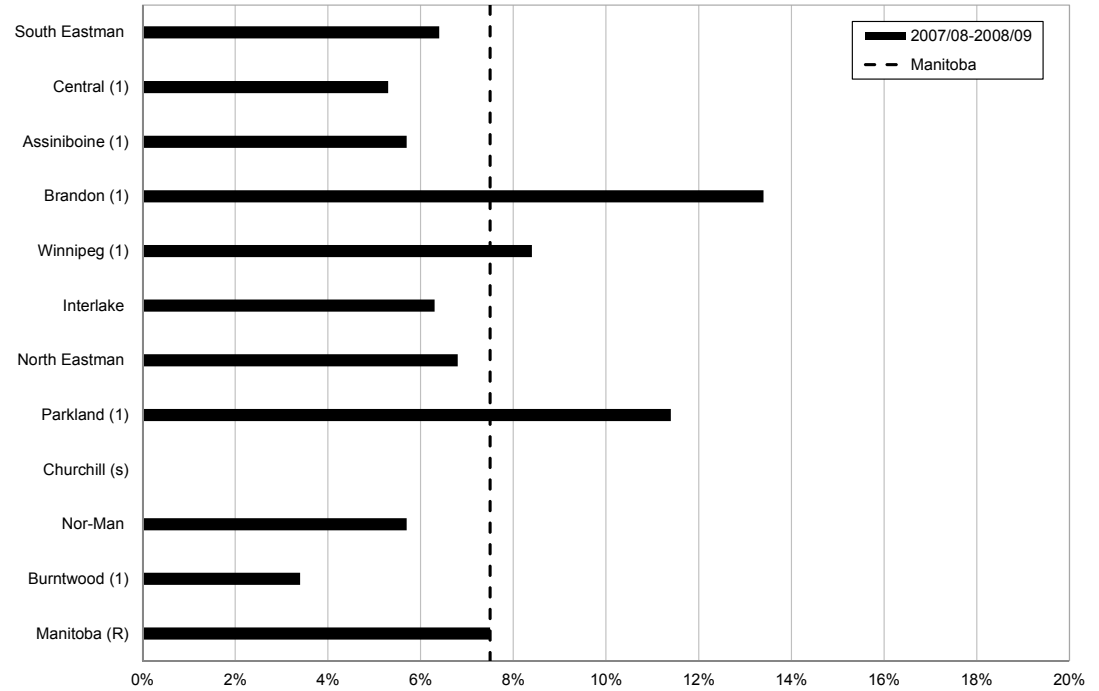
Figure 3.8.1: Proportion of Women who were Diagnosed with Psychological Distress in the Eight Months Prior to Giving Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

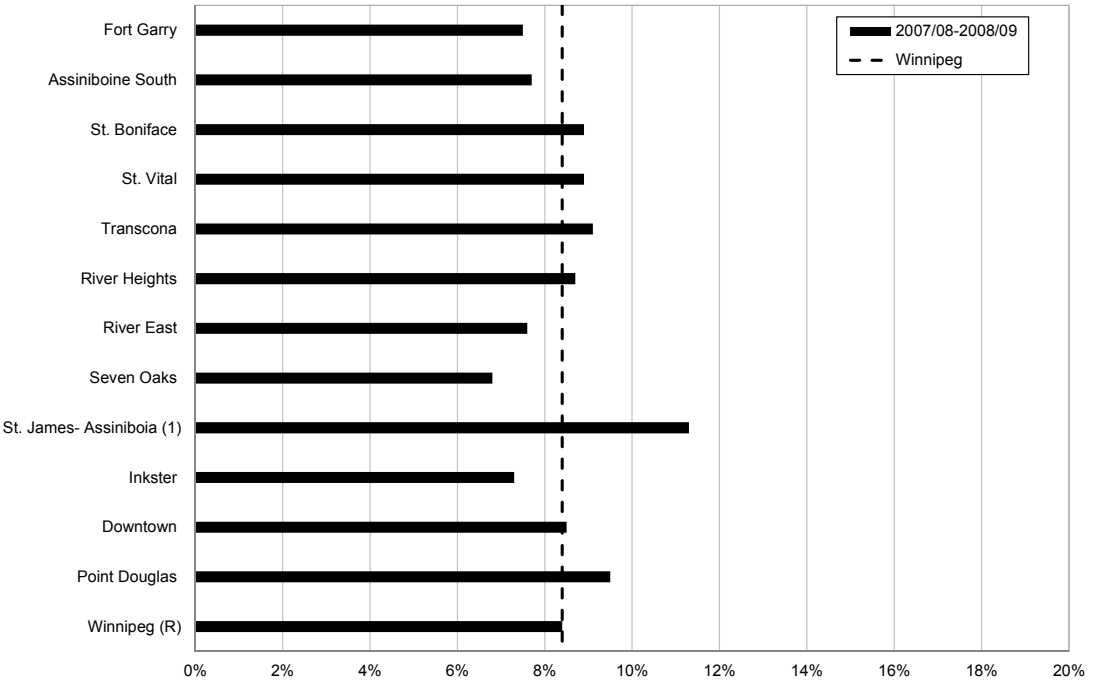
Figure 3.8.2: Proportion of Women who were Diagnosed with Psychological Distress in the Eight Months Prior to Giving Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

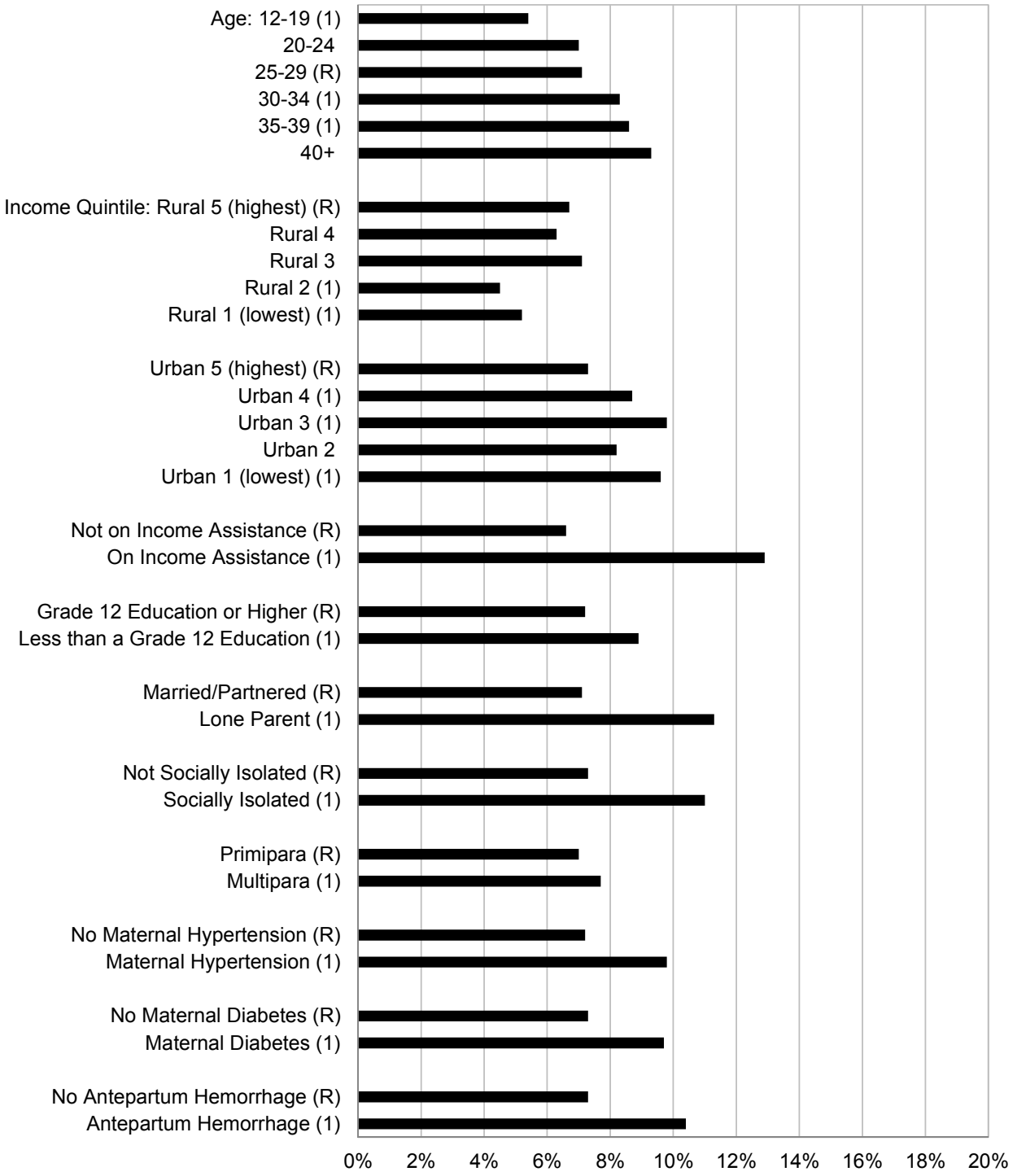
Figure 3.8.3: Proportion of Women who were Diagnosed with Psychological Distress in the Eight Months Prior to Giving Birth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.8.4: Proportion of Women who were Diagnosed with Psychological Distress in the Eight Months Prior to Giving Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) group (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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3.9 Antenatal Hospitalization

Background

Antenatal hospitalization is an indicator of maternal morbidity, and is defined as admission to hospital for physical or psychological conditions resulting from, or aggravated by, pregnancy which does not lead to delivery (Bacak, Callaghan, Dietz, & Crouse, 2005; Liu et al., 2007). In Canada, the rate of antenatal hospitalization declined from 24.0 per 100 deliveries in 1991/92 to 15.1 per 100 deliveries in 2001/02 to 2002/03 (Liu et al., 2007). Women may be hospitalized during pregnancy for a number of reasons including threatened preterm labour, severe vomiting, antenatal hemorrhage, cervical incompetence, mental health issues, genitourinary disorders, hypertension, diabetes, known and suspected fetal anomalies, and intestine, liver or gallbladder disorders (Bacak et al., 2005; Liu et al., 2007). Threatened preterm labour is the most common cause for hospitalization, accounting for 23.6% of all admissions in Canada, 1991–2003 (Liu et al., 2007). Age appears to be a factor in antenatal hospitalizations. Young women (aged 19 and younger) have an increased rate of admission compared to women aged 30 to 35 (27.1% versus 11.5% per 100 respectively). The majority of antenatal hospitalizations (77%) occurred among women aged 20 to 24 (Liu et al., 2007). Younger women are more likely to be admitted for threatened preterm labour and severe vomiting, while antenatal hemorrhage and hypertensive disorders are the leading causes of admission for older women (Liu et al., 2007). The declining rates of antenatal hospitalization may be explained by increasing prevalence of options to in–hospital care such as antenatal home care programs (Bacak et al., 2005; Liu et al., 2007) and day care programs.

Calculation of Indicator

The rate of antenatal hospitalization was calculated as a ratio of non–delivery hospitalization episodes per 100 deliveries. An episode was defined as a single, continuous stay in the hospital system, irrespective of transfers between hospitals. These episodes included all hospitalizations in which a woman was pregnant but did not deliver during the hospitalization of interest (i.e., all hospitalizations between initial date of pregnancy up to, but not including, hospitalizations resulting in a delivery). Each episode in the antenatal period that a woman had was included in the count. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, Sociodemographic and Other Characteristics associated were calculated for 2007/08–2008/09. The reasons for antenatal hospitalization were determined in a method similar to that described by Liu et al. (2007). We looked at the primary diagnosis for each antenatal hospitalization and grouped the diagnoses into 13 categories: Threatened Preterm Labour; Antenatal Hemorrhage; Hypertensive Disorders; Vomiting; Diabetes; Genitourinary Complications; Rupture Membranes; Abdominal Pain; Cervical Incompetence; Known or Suspected Fetal Problem; Intestine, Liver, and Gallbladder Disorders; Mental Disorder; and Other Causes. Refer to the Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 3.9.1
    - The Manitoba rate ranged from 11.6 per 100 deliveries (2001/02) to 11.0 per 100 deliveries (2008/09); the linear trend was significant; the rate decreased over time from a high of 15.2 per 100 deliveries in 2004/05 to a low of 11.0 per 100 deliveries in 2008/09.
    - The Winnipeg rate ranged from 8.4 per 100 deliveries (2001/02) to 7.6 per 100 deliveries (2008/09); the linear trend was significant; the rate decreased over time from a high of 11.6 per 100 deliveries in 2004/05 to a low of 7.6 per 100 deliveries in 2008/09.
    - The Brandon rate ranged from 16.0 per 100 deliveries (2001/02) to 9.9 per 100 deliveries (2008/09); the linear trend was significant; the rate decreased over time from a high of 22.2 per 100 deliveries in 2002/03 to a low of 5.0 per 100 deliveries in 2007/08.

    - The rate for the Rural South ranged from 11.6 per 100 deliveries (2001/02) to 10.9 per 100 deliveries (2008/09); the linear trend was significant; the rate decreased over time from a high of 16.1 per 100 deliveries in 2002/03 to a low of 10.9 per 100 deliveries in 2008/09.
- RHA (2007/08–2008/09), Figure 3.9.2
    - The Manitoba rate was 11.4 per 100 deliveries.
    - South Eastman (9.4 per 100 deliveries), Brandon (7.4 per 100 deliveries), Winnipeg (8.0 per 100 deliveries), and the Interlake (9.0 per 100 deliveries) were significantly lower than the Manitoba rate; while Central (13.4 per 100 deliveries), Parkland (21.0 per 100 deliveries), NOR–MAN (21.4 per 100 deliveries), and Burntwood (27.5 per 100 deliveries) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 3.9.3
    - The Winnipeg rate was 8.0 per 100 deliveries.
    - Fort Garry (5.2 per 100 deliveries) was significantly lower than the Winnipeg rate, while Downtown (9.7 per 100 deliveries) and Point Douglas (10.6 per 100 deliveries) were significantly higher.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 3.9.4
  There was a statistically significant difference in the proportion of women giving birth who had an antenatal hospitalization for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age, there were fewer antenatal hospitalizations.
    - Income Quintile – In both urban and rural areas, the lowest two income quintiles (Rural 1, 20.4%; Rural 2, 19.6%; Urban 1, 10.2%; and Urban 2, 8.8%) had higher rates of maternal antenatal hospitalizations than the highest income quintiles (Rural 5, 10.5% and Urban 5, 6.1%).
    - Income Assistance – 17.4 antenatal hospitalizations per 100 deliveries of women giving birth who were on income assistance compared to 10.5 antenatal hospitalizations per 100 deliveries of the women who were not on income assistance.
    - Maternal Education – 13.1 antenatal hospitalizations per 100 deliveries of women giving birth that had less than a Grade 12 education compared to 8.0 per 100 deliveries of those with a Grade 12 education.
    - Marital Status – 14.7 antenatal hospitalizations per 100 deliveries of women giving birth who were lone parents compared to 9.0 antenatal hospitalizations per 100 deliveries of those who were married/partnered.
    - Social Isolation – 11.5 antenatal hospitalizations per 100 deliveries of women giving birth who were socially isolated compared to 9.0 antenatal hospitalizations per 100 deliveries who were not socially isolated.
    - Parity – 12.1 antenatal hospitalizations per 100 deliveries of primiparous women compared to 10.4 antenatal hospitalizations per 100 deliveries of multiparous women.
    - Multiple Births – 23.2 antenatal hospitalizations per 100 deliveries of women having a multiple birth compared to 9.4 antenatal hospitalizations per 100 deliveries of women having a singleton birth.
- Primary Reason for Antenatal Hospitalization, Figure 3.9.5
    - The most frequent diagnoses associated with antenatal hospitalization were threatened preterm labour (16.1%), antenatal hemorrhage (9.4%), diabetes (8.8%), and hypertensive disorders (8.7%), plus a large category of "other causes" (33.5%).

Comparison to Other Findings

The rate of antenatal hospitalization in Manitoba of 11.4 per 100 deliveries in 2007/08–2008/09 is lower than the rate in Canada of 15.1 per 100 deliveries in 2001/02 to 2002/03 (Liu et al., 2007), likely due to continuing efforts to reduce hospital admissions and the development of alternative models of care, such as antenatal home care programs.

Limitations

This analysis was limited to non–delivery antenatal hospitalizations and our data do not include situations in which women were admitted during the **antepartum** period and remained in hospital until delivery. Our rates therefore underestimate the actual number of antenatal hospitalizations. We did not differentiate multiple admissions or hospital transfers of the same woman.

Summary

The rates of antenatal hospitalization have been declining over time (2001/02–2008/09) across all regions of the province except the North. The reasons for the higher rates of antenatal hospitalization in the North and the noticeable decline in rates of antenatal hospitalization in Brandon on the time trend graph require further exploration. The Winnipeg rate of 8.0 antenatal hospitalizations per 100 deliveries is considerably lower than the Manitoba rate of 11.4 per 100 deliveries. The lower rate in Winnipeg may be due to the availability of the antenatal home care program (Heaman, Robinson, Thompson, & Helewa, 1994; Helewa, Heaman, Robinson, & Thompson, 1993) and closer access to healthcare facilities than for women in some rural and northern areas. Parkland (21.0%), NOR–MAN (21.3%), and Burntwood (27.5%) had significantly higher rates of antenatal hospitalization compared to the Manitoba rate; while Downtown (9.7%) and Point Douglas (10.6%) had significantly higher rates that the Winnipeg rate. The most frequent diagnoses associated with antenatal hospitalization were threatened preterm labour, antenatal hemorrhage, diabetes, and hypertensive disorders. A higher rate of antenatal hospitalization was evident among women who were aged 24 and younger, on income assistance, a lone parent, socially isolated, or primiparous; had less than a Grade 12 education; lived in a low income quintile; or had a multiple birth.

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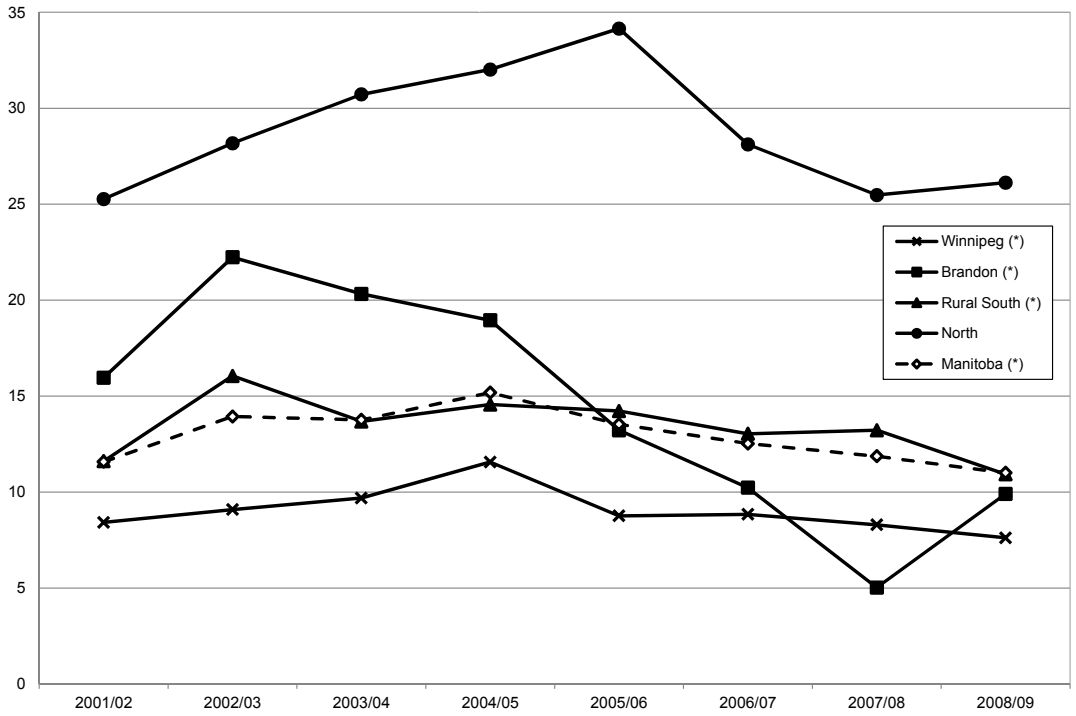
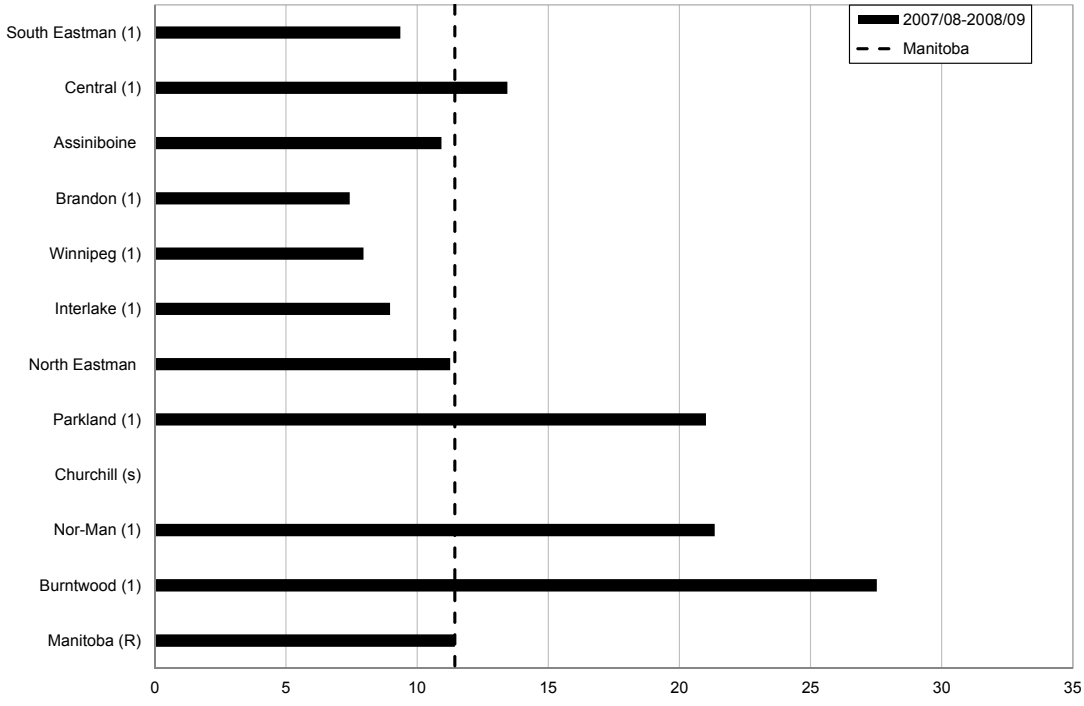
Figure 3.9.1: Rate of Antenatal Hospitalizations by Region and Year, 2001/02-2008/09
per 100 Deliveries



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

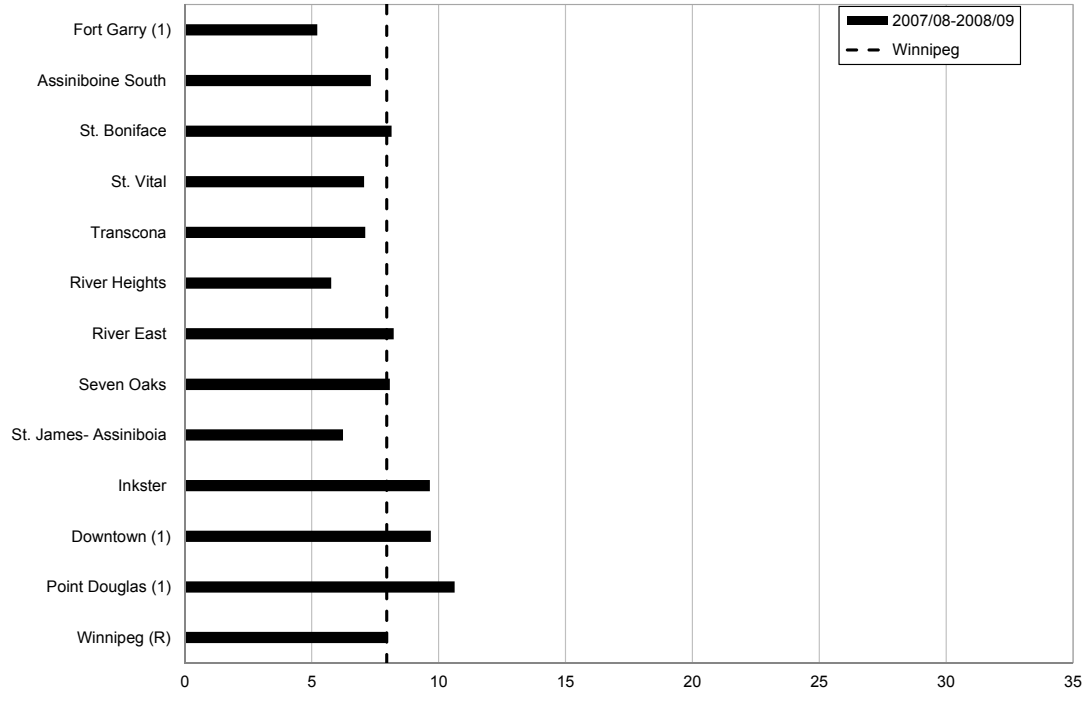
Figure 3.9.2: Rate of Antenatal Hospitalizations by RHA, 2007/08-2008/09
per 100 Deliveries



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

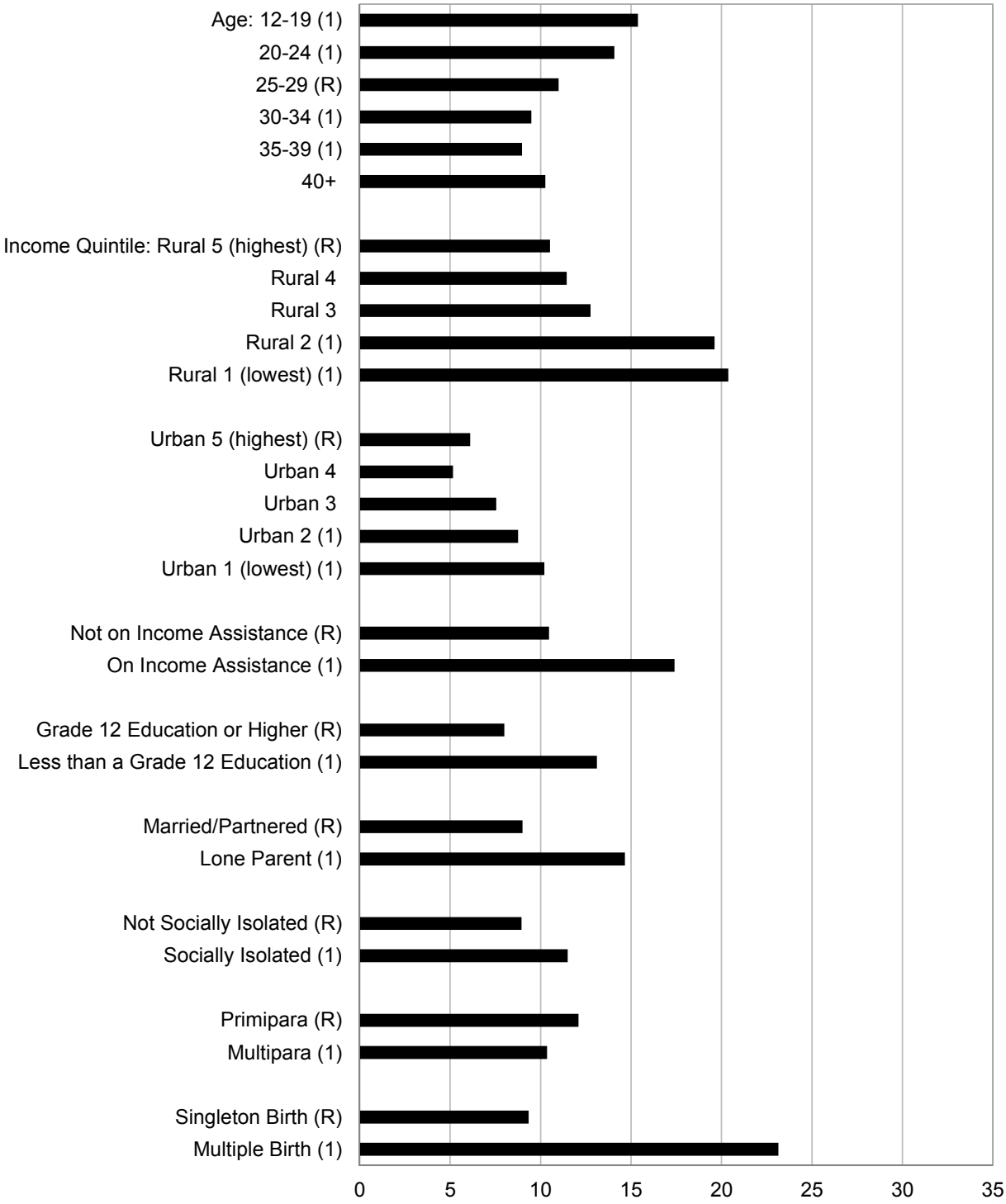
Figure 3.9.3: Rate of Antenatal Hospitalizations by Winnipeg CA, 2007/08-2008/09
per 100 Deliveries



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

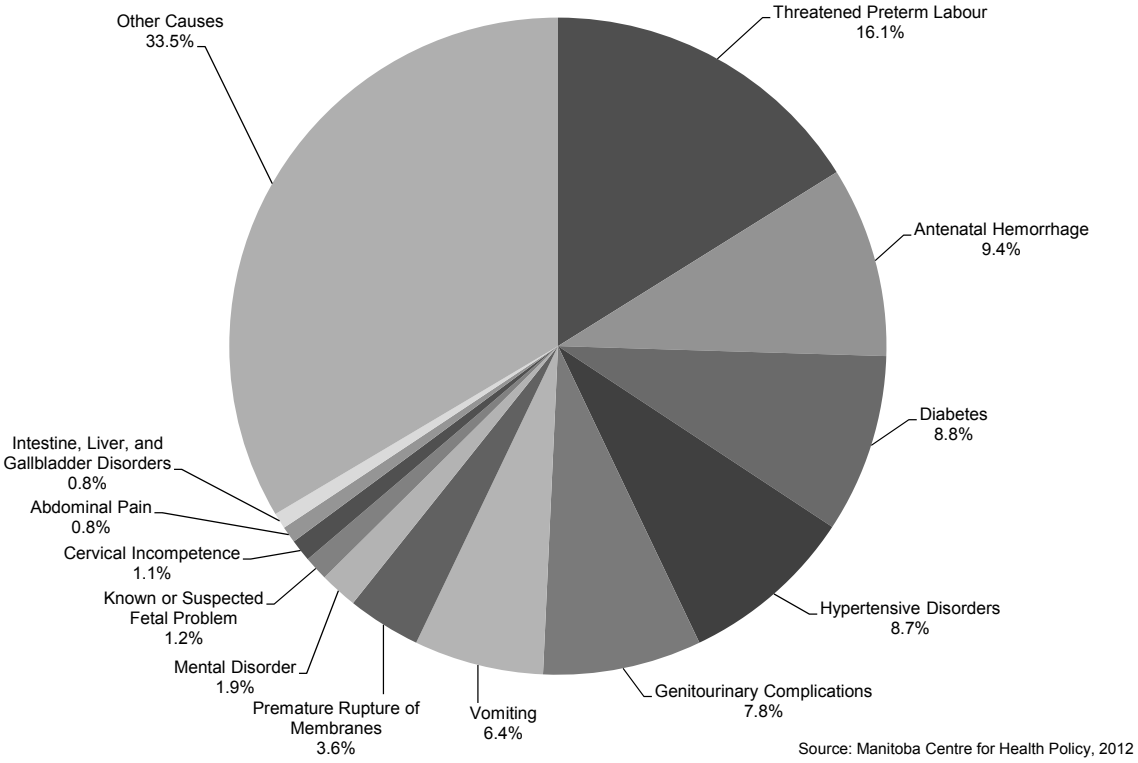
Figure 3.9.4: Rate of Antenatal Hospitalizations by Sociodemographic and Other Characteristics, 2007/08-2008/09
per 100 Deliveries



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 3.9.5: Primary Reason for Antenatal Hospitalization, 2007/08-2008/09



Source: Manitoba Centre for Health Policy, 2012

Chapter 4: Giving Birth

4.1 Travelling to Give Birth

Background

The report, *A National Birthing Initiative for Canada, states:*

> "Childbirth in rural and remote areas of Canada presents unique challenges in two ways for both women needing care and for care providers. First, the distances required to access facilities and specialized equipment, especially for high–risk pregnancies; and second, the lack of peer support for providers and coverage for their practices. Specifically, the challenges to the sustainability of rural maternity practice include the limited number of physicians available for on–call services; the lack of cesarean birthing capability; the lack of available anesthesia services; and the small number of births in rural areas. Decisions to regionalize maternity care have forced rural hospitals to close obstetrical units thus compounding the human resource problems. This has also had a serious impact on the viability of small communities and their ability to safely provide appropriate primary healthcare services, including maternity care. As a result, shortages are felt most acutely in rural and remote communities. Thus, many women in remote and rural communities, including women in aboriginal communities, often have to travel great distances to give birth, resulting in cultural, social, physical and financial problems for the mother, baby, family and community" (Society of Obstetricians and Gynaecologists of Canada, 2008, p.11)

A recent study conducted in B.C. showed that rural pregnant women who have to travel to access maternity services have increased rates of perinatal mortality, their newborns have increased numbers of Neonatal Intensive Care Unit care days, they have increased rates of induction of labour for logistical reasons and more unplanned out of hospital deliveries (Grzybowski, Stoll, & Kornelsen, 2011). Another study by these same authors indicated that pregnant women who had to travel more than one hour to access maternity services were 7.4 times more likely to experience moderate or severe stress compared to women who had local access to maternity services (Kornelsen, Stoll, & Grzybowski, 2011).

Calculation of the Indicator

Travelling to give birth can be measured in a number of ways. The first is to look at the proportion of women who gave birth outside of their RHA of residence. In some areas, travelling outside of one's RHA of residence may not represent a great distance. The second measure is to look at the distance travelled to give birth. By using the centroid of the postal code of the women's residence to the centroid of the postal code of the hospital where she gave birth, one can estimate the distance travelled. This is calculated "as the crow flies" and does not take into account that in many areas the distance travelled may be greater as the roads do not follow the most direct route. To determine what distance to look at, the distribution of distances was calculated using all deliveries to women who reside outside of Winnipeg. The distribution ranged from 0.73 km (5th percentile) to 473.95 km (95th percentile), with the median being 46.7 km and the 75th percentile being 113.8 km. The median and 75th percentile distances were used as the distance thresholds. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Winnipeg residents are excluded from these analyses. Refer to Appendix Table A.4 for more details.

Key Observations

- Outside of RHA of Residence
  - Time Trend (2001/02–2008/09), Figure 4.1.1
    - The Manitoba rate ranged from 46.3% (2003/04) to 47.5% (2005/06) and was relatively stable.
    - The Brandon rate ranged from 6.8% (2001/02) to 3.5% (2008/09); the linear trend was significant; the rate decreased over time from a high of 7.6% in 2002/03 to a low of 3.5% in 2008/09.
  - RHA (2007/08–2008/09), Figure 4.1.2
    - The Manitoba rate was 46.8%.
    - South Eastman (53.1%), Assiniboine (91.5%), Interlake (83.7%), North Eastman (98.9%), and Churchill (97.1%) were significantly higher than the Manitoba rate; while Central (29.9%), Brandon (3.9%), Parkland (17.0%), NOR–MAN (18.4%), and Burntwood (36.2%) were significantly lower.
  - Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.1.3
    There was a statistically significant difference in the proportion of women who travelled outside of their RHA to give birth for the following characteristics:
    - Maternal Age – Fewer women aged 20 to 24 (43.3%) travelled outside of their RHA to give birth than the reference group (25 to 29, 46.1%); while more women aged 30 to 34 (50.6%) and 35 to 39 (52.4%) travelled outside of their RHA than the reference group to give birth.
    - Income Quintile – Fewer women in the lower income quintiles (Rural 4, 47.2%; Rural 3, 51.5%; Rural 2, 44.3; and Rural 1, 52.8%) travelled outside of their RHA to give birth than the reference group (Rural 5, 58.9%).
    - Income Assistance – 31.5% of women on income assistance travelled outside of their RHA of residence to give birth, while 48.5% of women not on income assistance travelled outside of their RHA to give birth.
    - Maternal Education – 34.9% of women with less than a Grade 12 education travelled outside of their RHA of residence to give birth compared to 45.6% of those who had a Grade 12 education.
    - Marital Status – 41.7% of women who were lone parents travelled outside of their RHA of residence to give birth compared to 46.1% of those who were married/partnered.
    - Social Isolation – 32.6% of women who were socially isolated travelled outside of their RHA of residence to give birth compared to 43.7% of those who were not socially isolated.
    - Parity – 45.2% of multiparous women travelled outside of their RHA of residence to give birth compared to 50.0% primiparous women.
- More than 113.8km
  - Time Trend (2001/02–2008/09), Figure 4.1.4
    - The Manitoba rate ranged from 24.2% (2001/02) to 25.6% (2007/08) and was relatively stable.
    - The Brandon rate ranged from 6.4% (2001/02) to 3.2% (2008/09); the linear trend was significant; the rate decreased over time from a high of 6.6% in 2002/03 to a low of 3.2% in 2008/09.
    - The rate for the North ranged from 60.4% (2001/02) to 65.4% (2008/09); the linear trend was significant; the rate increased over time from a low of 60.4% in 2001/02 to a high of 66.6% in 2007/08.
  - RHA (2007/08–2008/09), Figure 4.1.5
    - The Manitoba rate was 25.2%.
    - Interlake (29.7%), North Eastman (31.8%), Churchill (97.1%), NOR–MAN (41.3%), and Burntwood (73.8%) were significantly higher than the Manitoba rate; while South Eastman (1.1%), Central (4.6%), Assiniboine (11.3%), and Brandon (3.8%) were significantly lower.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.1.6
  There was a statistically significant difference in the proportion of women who travelled more than 113.8 km to give birth for the following characteristics:
  - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age, there were fewer women travelling greater than 113.8 km to give birth.
  - Income Quintile –There is a significant relationship with area–level income. With each successive decrease in area–level income, there was an increase in the proportion of women who travelled greater than 113.8 km to give birth.
  - Marital Status – 19.8% of women who were lone parents travelled greater than 113.8 km to give birth compared to 10.1% of those who were married/partnered.
  - Parity – 27.1% of multiparous women travelled greater than 113.8 km to give birth compared to 21.5% of primiparous women.

- More than 46.7 km
  - Time Trend (2001/02–2008/09), Figure 4.1.7
    - The Manitoba rate ranged from 49.7% (2001/02) to 50.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 48.8% in 2002/03 to a high of 51.0% in 2007/08.
    - The Brandon rate ranged from 6.6% (2001/02) to 3.5% (2008/09); the linear trend was significant; the rate decreased over time from a high of 7.1% in 2002/03 to a low of 3.5% in 2008/09.
    - The rate for the North ranged from 67.4% (2001/02) to 72.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 67.4% in 2001/02 to a high of 73.2% in 2005/06.
  - RHA (2007/08–2008/09), Figure 4.1.8
    - The Manitoba rate was 50.6%.
    - Assiniboine (76.1%), Interlake (65.6%), North Eastman (76.2%), Parkland (57.4%), Churchill (97.1%), and Burntwood (79.5%) were significantly higher than the Manitoba rate; while South Eastman (26.1%), Central (31.2%), and Brandon (3.9%) were significantly lower.
  - Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.1.9
    There was a statistically significant difference in the proportion of women who travelled more than 46.7 km to give birth for the following characteristics:
    - Maternal Age – There was a significant relationship with maternal age. More mothers aged 12 to 19 (68.7%) and 20 to 24 (55.1%) travelled more than 46.7 km to give birth than the reference group (25 to 29; 46.2%).
    - Income Quintile –There was a significant relationship with area–level income. With each successive decrease in area–level income, there was an increase in the proportion of women who travelled more than 46.7 km to give birth.
    - Income Assistance – 45.6% of women on income assistance travelled more than 46.7 km to give birth, while 51.2% of women not on income assistance travelled more than 46.7 km to give birth.
    - Marital Status – 42.0% of women who were lone parents travelled greater than 46.7 km to give birth compared 36.7% of those who were married/partnered.
    - Social Isolation – 24.6% of women who were socially isolated travelled greater than 46.7 km to give birth compared to 31.5% of women who were not socially isolated.
    - Parity – 51.3% of multiparous women travelled greater than 46.7 km to give birth compared to 49.4% of primiparous women.
- Comparison of Travelling Outside of RHA of Residence and Travelling More than 113.8 km to Give Birth, Figure 4.1.10
  - 46.8% of women living outside of Winnipeg travelled outside of their RHA of residence to give birth, while 25.2% of these women travelled more than 113.8km to give birth.
  - In South Eastman, 53.1% of women travelled outside of the RHA to give birth, while 1.1% of women travelled more than 113.8 km to give birth.

  - In Central, 29.9% of women travelled outside of the RHA to give birth, while 4.6% of women travelled more than 113.8 km to give birth.
  - In Assiniboine, 91.5% of women travelled outside of the RHA to give birth, while 11.3% of women travelled more than 113.8km to give birth.
  - In Brandon, 3.9% of women travelled outside of the RHA to give birth, while 3.8% of women travelled more than 113.8 km to give birth.
  - In the Interlake, 83.7% of women travelled outside of the RHA to give birth, while 29.7% of women travelled more than 113.8 km to give birth.
  - In North Eastman, 98.9% of women travelled outside of the RHA to give birth, while 31.8% of women travelled more than 113.8 km to give birth.
  - In Parkland, 17.0% of women travelled outside of the RHA to give birth.
  - In Churchill, 97.1% of women travelled outside of the RHA and travelled more than 113.8 km to give birth.
  - In NOR–MAN, 18.4% of women travelled out of the RHA to give birth, while 41.3% of women travelled more than 113.8 km to give birth.
  - In Burntwood, 36.2% of women travelled out of the RHA to give birth, while 73.8% of women travelled more than 113.8 km to give birth.
- Comparison of Travelling Outside of RHA of Residence and Travelling More than 46.7 km to Give Birth, Figure 4.1.11
  - 46.8% of women living outside of Winnipeg travelled outside of the RHA to give birth, while 50.6% of these women travelled more than 46.7 km to give birth.
  - In South Eastman, 53.1% of women travelled out of the RHA to give birth, while 26.1% of women travelled more than 46.7 km to give birth.
  - In Central, 29.9% of women travelled out of the RHA to give birth, while 31.2% of women travelled more than 46.7 km to give birth.
  - In Assiniboine, 91.5% of women travelled out of the RHA to give birth, while 76.1% of women travelled more than 46.7 km to give birth.
  - In Brandon, 3.9% of women travelled out of the RHA to give birth, while 3.9% of women travelled more than 46.7 km to give birth.
  - In the Interlake, 83.7% of women travelled out of the RHA to give birth, while 65.6% of women travelled more than 46.7 km to give birth.
  - In North Eastman, 98.9% of women travelled out of the RHA to give birth, while 76.2% of women travelled more than 46.7 km to give birth.
  - In Parkland, 17.0% of women travelled out of the RHA to give birth, while 57.4% of women travelled more than 46.7 km to give birth.
  - In Churchill, 97.1% of women travelled out of the RHA and travelled more than 46.7 km to give birth.
  - In NOR–MAN, 18.4% of women travelled out of the RHA to give birth, while 51.2% of women travelled more than 46.7 km to give birth.
  - In Burntwood, 36.2% of women travelled out of the RHA to give birth, while 79.5% of women travelled more than 46.7 km to give birth.

Comparison to Other Findings

In the Canadian Maternity Experiences Survey (Public Health Agency of Canada, 2009), 25.6% of women reported travelling to another city, town, or community to give birth; but only 2.5% of women had to travel more than 100 km to give birth (although this proportion varied by region and was much higher for women living in the territories). As First Nations women living on reserves were not included in the Canadian Maternity Experiences Survey, this proportion will be an underestimate, particularly

in jurisdictions with a high number of First Nations people living on reserve, such as Manitoba. The proportion of women in Manitoba who travelled more than 100 km to give birth was much higher than that reported in the Canadian Maternity Experiences Survey, with more than a quarter of women travelling more than 113.8 km to give birth. Refer to Appendix Table A.4 for more details.

Limitations

Our method of calculating the distance travelled to give birth is a rough estimate, using the centroid of the postal code of the women's residence to the centroid of the postal code of the hospital where she gave birth. This is calculated "as the crow flies" and does not take into account that in many areas the distance travelled may be greater as the roads do not follow the most direct route. We did not analyze whether women travelled by road or air. Many women in remote communities are transported by air to give birth in hospitals in larger cities.

Summary

Almost half of women (46.8%) of women in Manitoba travel outside their RHA to give birth. In terms of distance travelled to give birth, one quarter (25.2%) of women travelled more than 113.8 km (the 75th percentile), while half (50.6%) travelled more than 46.7 km (the median distance). The rate of travelling more than 113.8 km was significantly higher in the RHAs of Interlake (29.7%), North Eastman (31.8%), Churchill (97.1%), NOR–MAN (41.3%), and Burntwood (73.8%) compared to the Manitoba rate. Women travelling more than 113.8 km to give birth were more likely to be younger (aged 24 and younger), live in lower–income quintiles (Rural 1, 2, 3 and 4), be lone parents, and be multiparous.

Reference List

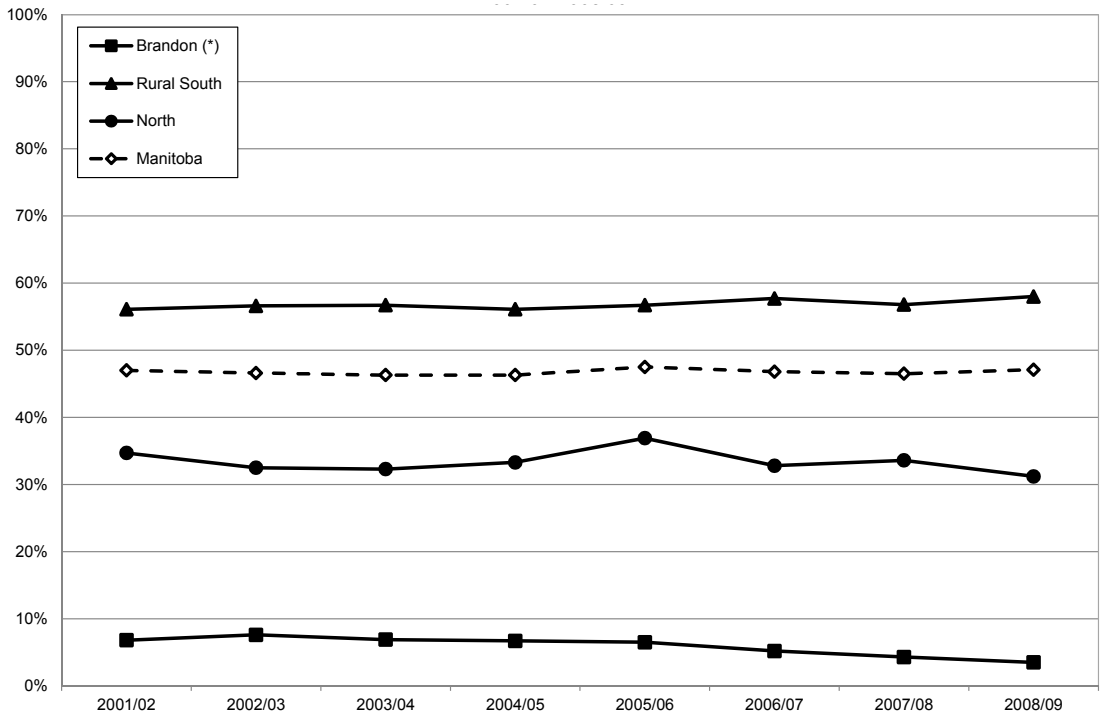
Grzybowski S, Stoll K, Kornelsen J. Distance matters: a population based study examining access to maternity services for rural women. *BMC Health Serv Res.* 2011;11:147.

Kornelsen J, Stoll K, Grzybowski S. Stress and anxiety associated with lack of access to maternity services for rural parturient women. *Aust J Rural Health.* 2011;19(1):9–14.

Public Health Agency of Canada. What mothers say: the Canadian Maternity Experiences Survey. PHAC. 2009. http://www.phac–aspc.gc.ca/rhs–ssg/pdf/survey–eng.pdf. Accessed May 4, 2011.

Society of Obstetricians and Gynaecologists of Canada. A National Birthing Initiative for Canada: An inclusive, integrated and comprehensive pan–Canadian framework for sustainable family–centered maternity and newborn care. Society of Obstetricians and Gynaecologists of Canada. 2008. http://www.sogc.org/projects/pdf/BirthingStrategyVersioncJan2008.pdf. Accessed January 9, 2012.

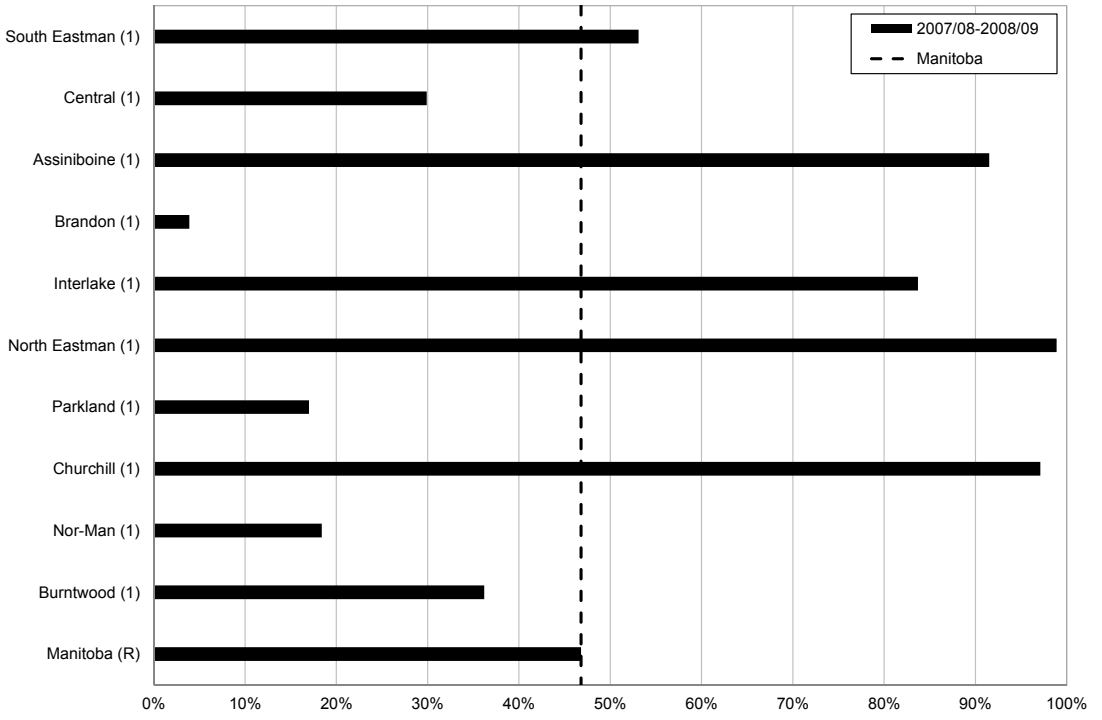
Figure 4.1.1: Proportion of Women who Travelled Outside of RHA of Residence to Give Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

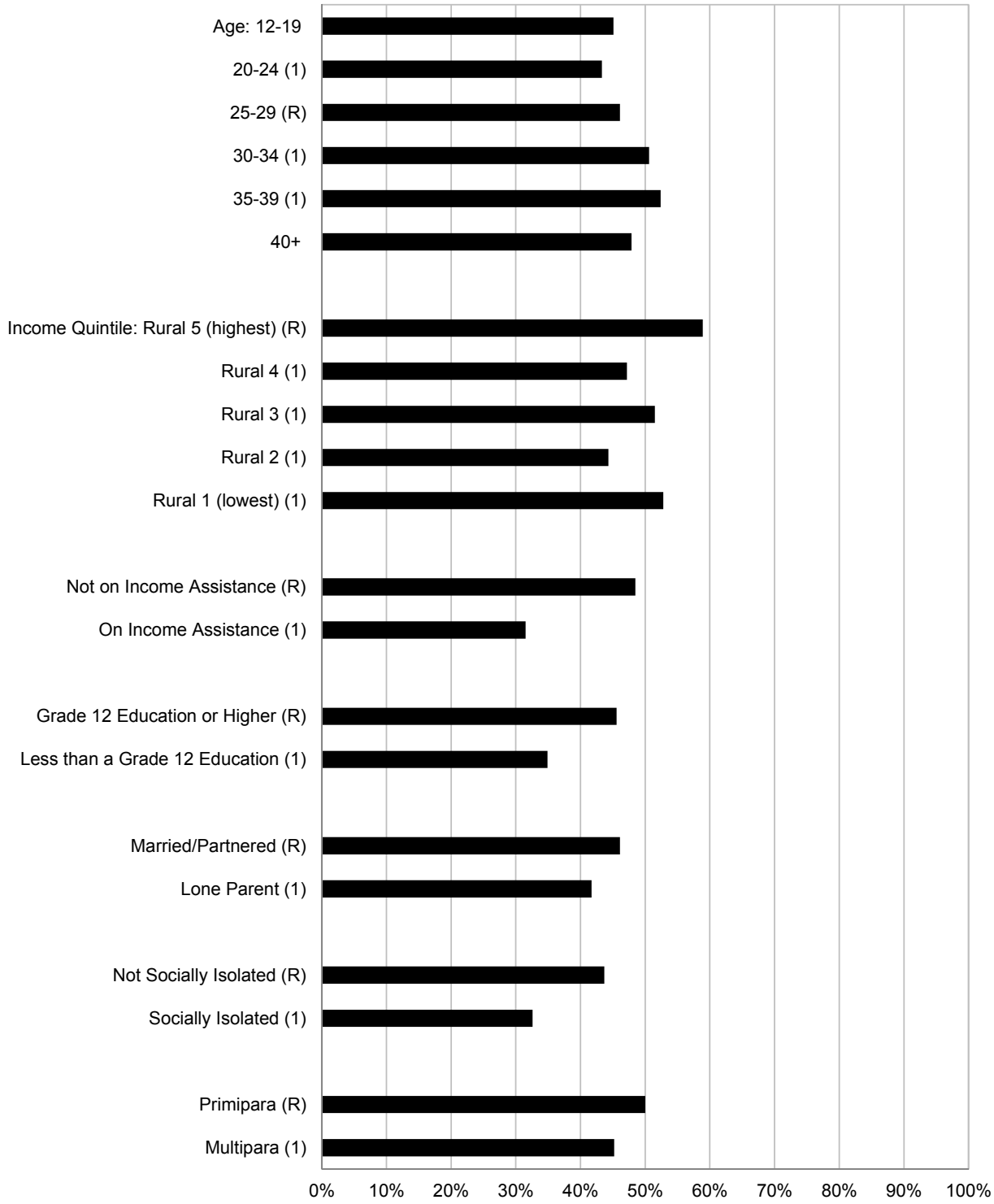
Figure 4.1.2: Proportion of Women who Travelled Outside of RHA of Residence to Give Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

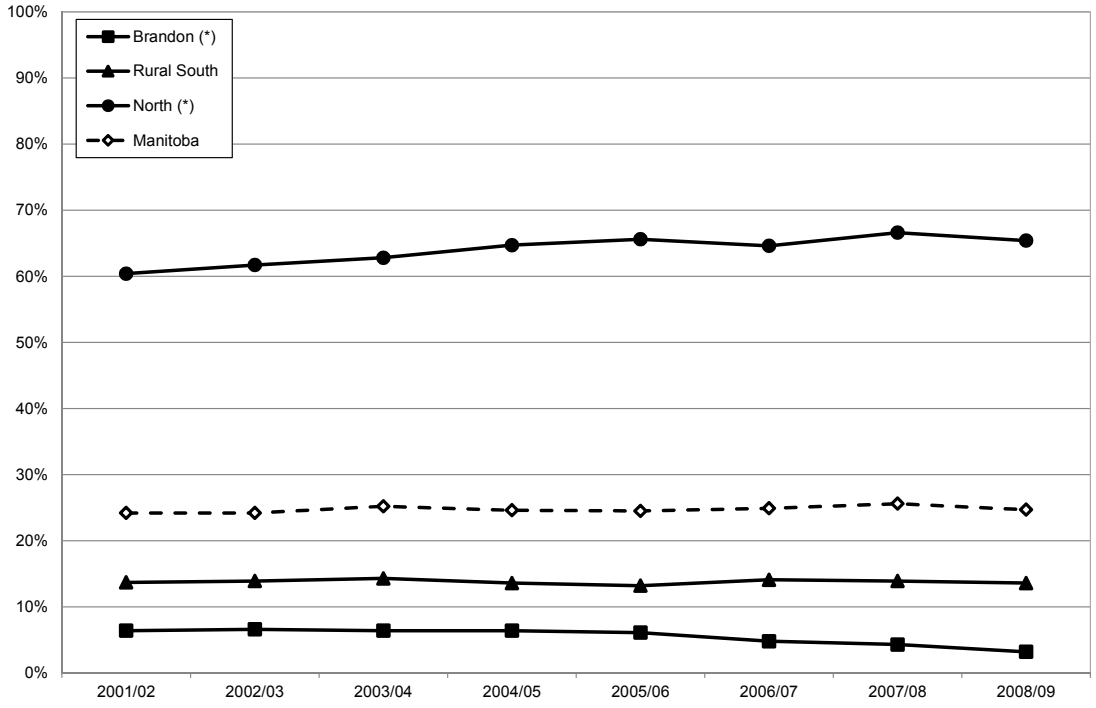
Figure 4.1.3: Proportion of Women who Travelled Outside of RHA of Residence to Give Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

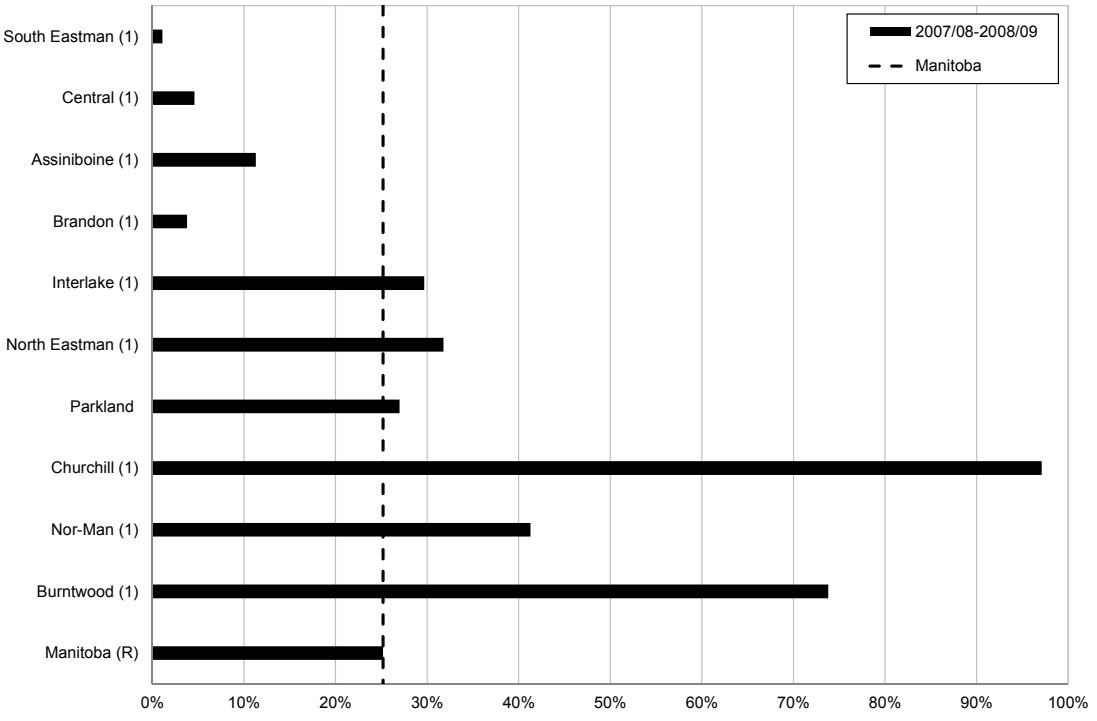
Figure 4.1.4: Proportion of Women who Travelled More than 113.8 km to Give Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

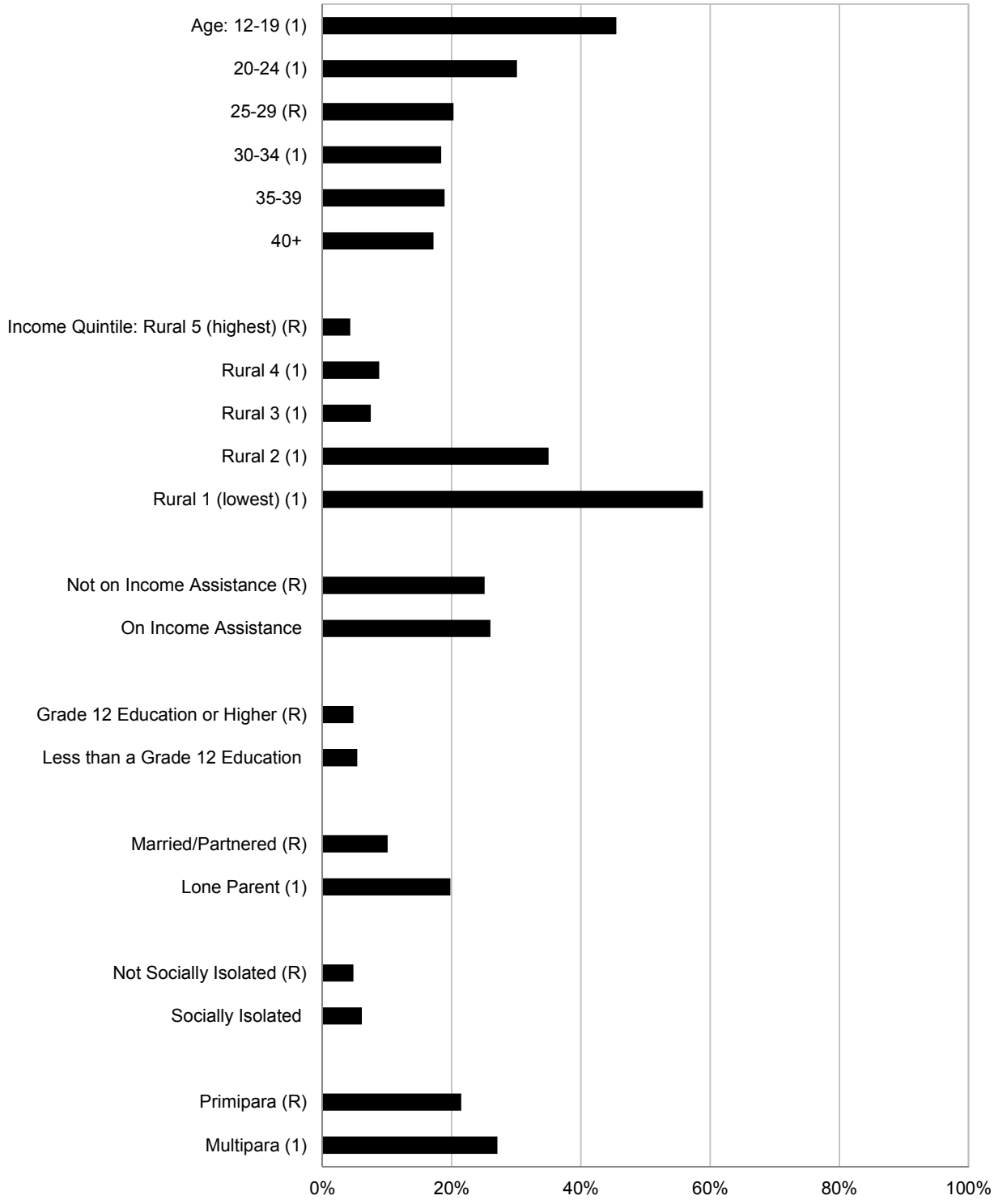
Figure 4.1.5: Proportion of Women who Travelled More than 113.8 km to Give Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

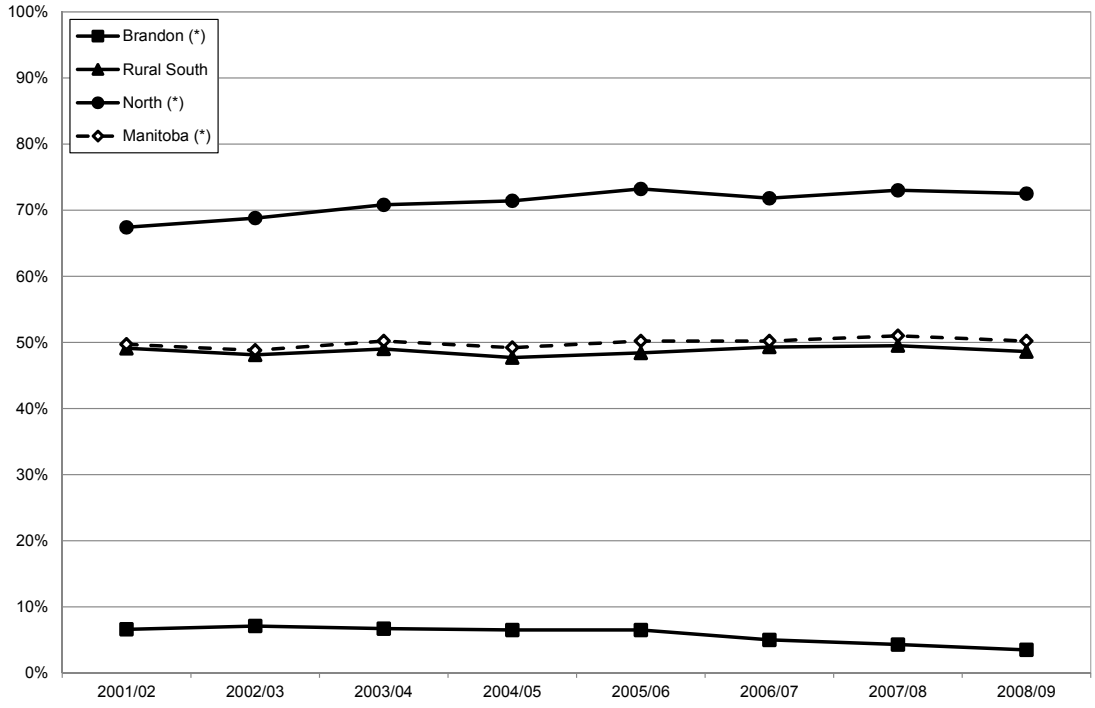
Figure 4.1.6: Proportion of Women who Travelled More than 113.8 km to Give Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

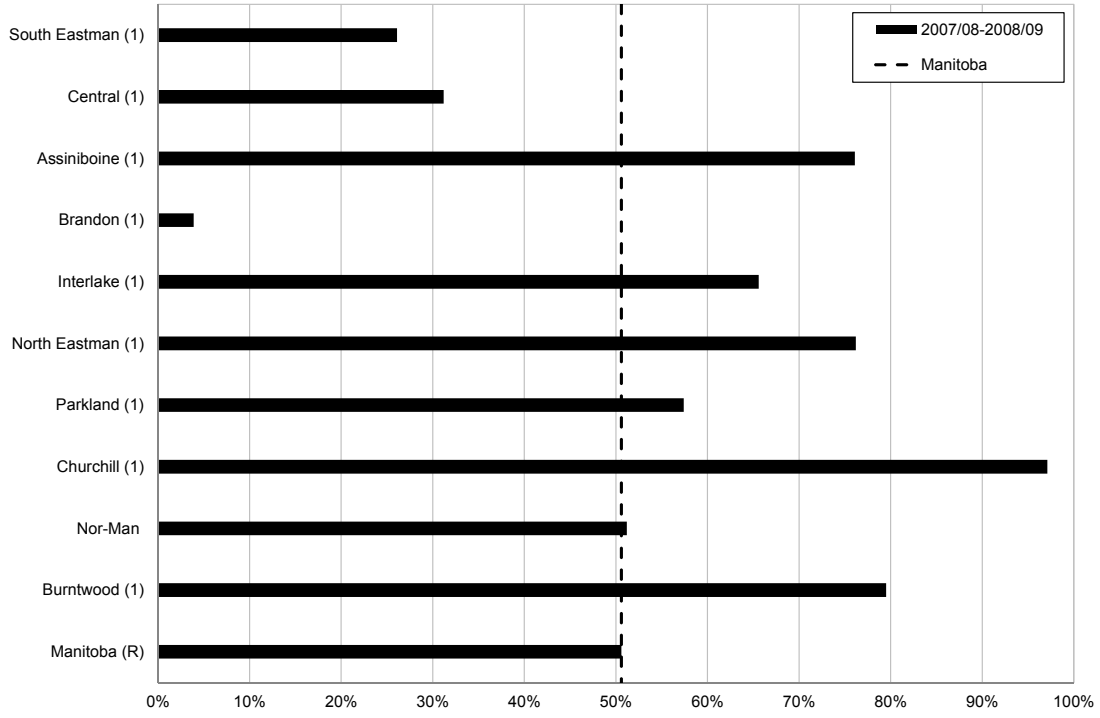
Figure 4.1.7: Proportion of Women who Travelled More than 46.7 km to Give Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

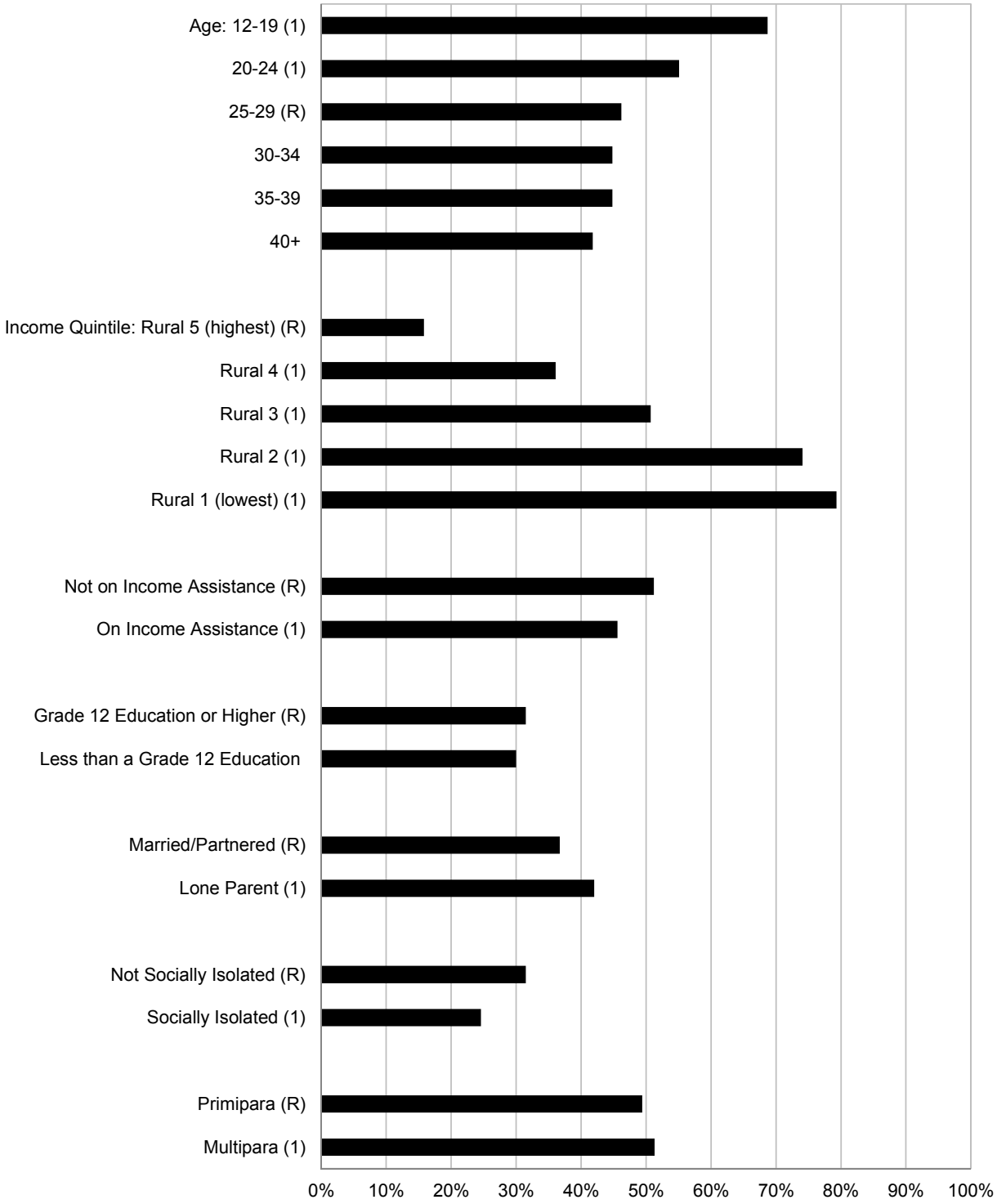
Figure 4.1.8: Proportion of Women who Travelled More than 46.7 km to Give Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

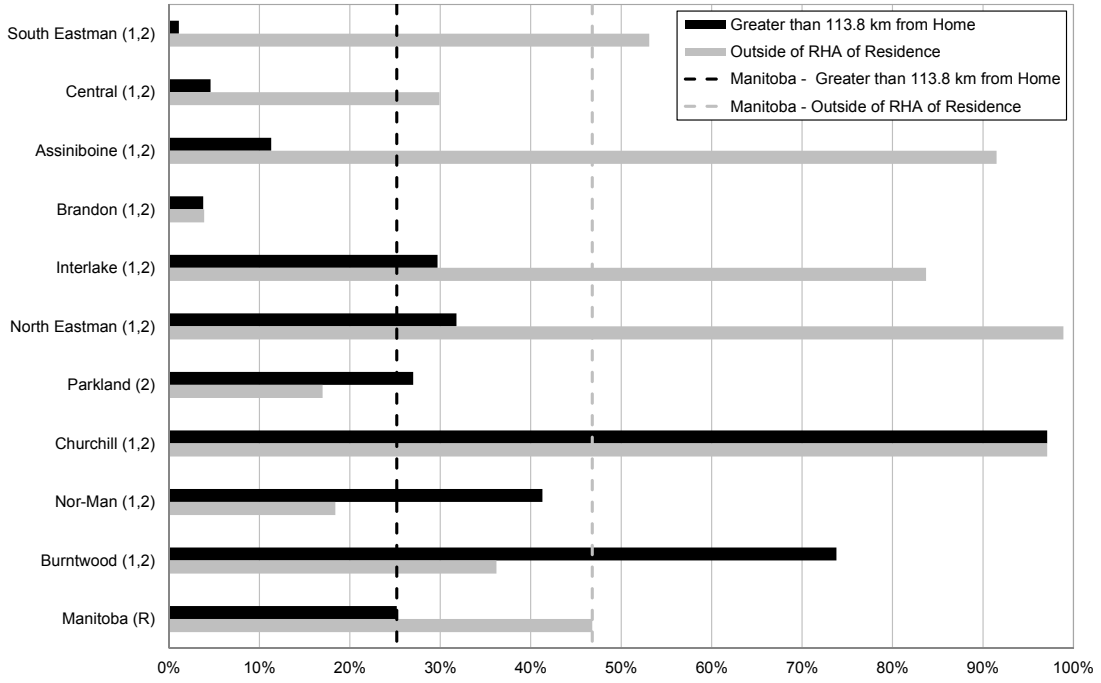
Figure 4.1.9: Proportion of Women who Travelled More than 46.7 km to Give Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

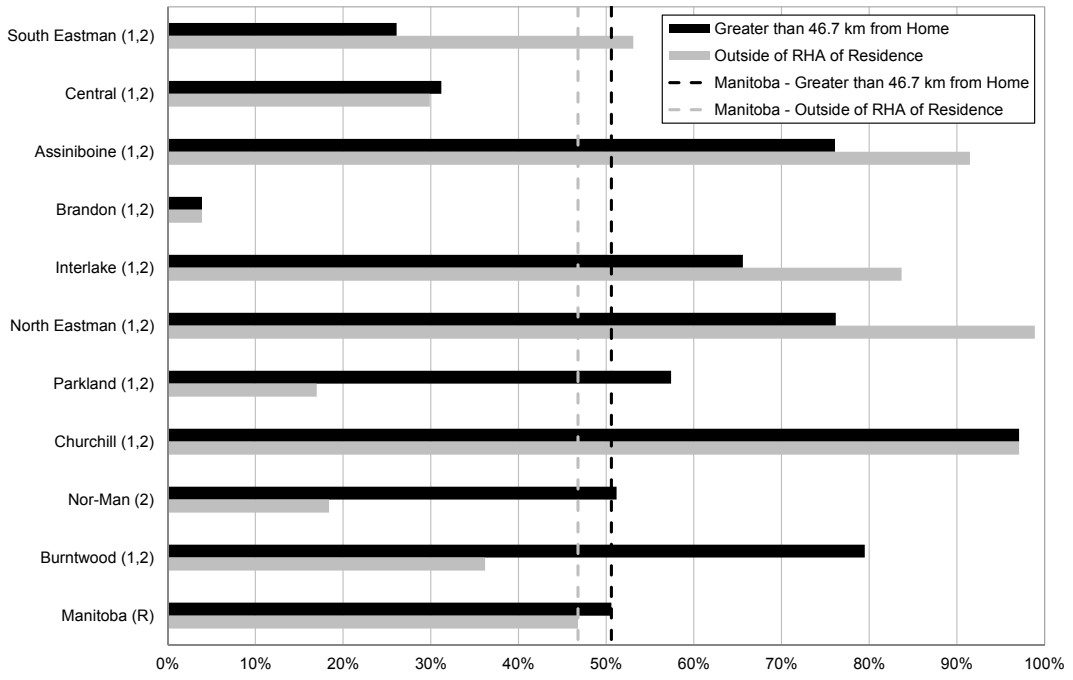
Figure 4.1.10: Proportion of Women who Travelled Either More than 113.8 km or Outside of RHA of Residence to Give Birth by RHA, 2007/08-2008/09



'1' indicates the "Greater than 113.8 km from Home " rate was statistically different from the Manitoba rate (p<0.01)
'2' indicates the "Outside of RHA of Residence" rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.1.11: Proportion of Women who Travelled Either More than 46.7 km or Outside of RHA of Residence to Give Birth by RHA, 2007/08-2008/09



'1' indicates the "Greater than 46.7 km from Home" rate was statistically different from the Manitoba rate (p<0.01)
'2' indicates the "Outside of RHA of Residence" rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.2 Healthcare Provider for Delivery

Background

The Society of Obstetricians and Gynaecologists of Canada (SOGC), in collaboration with other health professional associations, developed *A National Birthing Initiative for Canada*, to ensure that Canadian women and their babies receive appropriate care during pregnancy, delivery, and recovery (Society of Obstetricians and Gynaecologists of Canada, 2008). According to this report, obstetricians in Canada attend over 80% of births. However, there are only 1,650 obstetrician/gynecologists in Canada; and of these, only 1,050 provide **intrapartum** care and approximately 600 plan to retire within the next five years (Society of Obstetricians and Gynaecologists of Canada, 2008). In the National Physician Survey 2004, only 13% of family physicians reported involvement in intrapartum care in 2004 (a drop from 17% in 2001) (Society of Obstetricians and Gynaecologists of Canada, 2008). This decrease in the proportion of family physicians providing intrapartum care has occurred for a variety of reasons, including concerns about their personal lives, lack of confidence with obstetrical skills, inadequate fee structures, and the perceived threat of malpractice suits (Canadian Institute for Health Information (CIHI), 2004).

There has been an increase in the number of midwives providing delivery (intrapartum) care for women as more provinces legislate midwifery care. Currently midwifery has been legislated in British Columbia, Alberta, Manitoba, Saskatchewan, Ontario, Quebec, Nova Scotia, New Brunswick, Nunavut, and the Northwest Territories (CMRC, 2012). The Midwifery Act in Manitoba was passed in 1997 and was proclaimed in June of 2000. In Manitoba, the goals for implementing the midwifery program were to: ensure women had increased access of primary care from a midwife; target priority populations—single, adolescent aged 19 and younger, immigrant/newcomer, Aboriginal, socially isolated, poor and other at–risk women; and fully integrate midwives into the Regional Health Authorities around the province (Manitoba Health, 2002). Refer to Table 4.2.1 for information on number of practicing and non–practicing midwives per RHA from 2001–2010.

Table 4.2.1: College of Midwives of Manitoba Membership Information, 2001-2010

Year	Status		RHAs							
	Practicing	Non-Practicing	Winnipeg RHA	Brandon RHA	Nor-Man RHA	Burntwood RHA	South Eastman RHA	Central RHA	Churchill RHA	Independent
2001	22	1	15	3	0	2	2	0		
2002	28	2	20	2	2	2	1	1		
2003	31	2	19	3	2	2	2	3		1
2004	30	5	19	2	1	2	3	3		1
2005	30	5	18	4	1	1	3	3	1	1
2006	29	6	17	4	1	1	4	2		
2007	30	7	16	4	2	1	3	4		
2008	33	11	15	4	4	3	3	4		
2009	40	12	22	5	2	3	3	5		
2010	40	11	21	6	3	1	4	5		

The membership numbers and RHA of employment represent the situation as close to April 1 of that year as possible, therefore do not represent any changes that happened during the course of the year
The non-practising membership numbers include only those members that were once registered as practicing, they do not include those that never practiced
The chart does not reflect full-time or part-time Equivalent Full Time
This table is also presented as Table 3.7.1

Source: College of Midwives of Manitoba, 2012

Calculation of the Indicator

Delivery care was assigned to one of four provider types: General Practitioner or Family Physician, Obstetrician/Gynecologist, Midwife, or a Mix of Providers. The proportion of women receiving delivery care from each of these provider types was calculated by dividing the number of women in each category by the number of women giving birth in a given time and place. As delivery care is usually assigned to one practitioner, the category "a Mix of Providers" is only presented for the time trend graph (2001/02–2008/09) as rates by RHA and Winnipeg CA were largely suppressed. For each of the other provider types, rates by RHA and Winnipeg CA were calculated for two time periods, 2001/02–2002/03 and 2007/08–2008/09. Additionally, a more detailed analysis was done for delivery care provide by midwives. Time trend analyses by region (Winnipeg, Brandon, Rural South, North, and Manitoba) and location of birth (all births, home births, and hospital births with delivery care provided by a midwife) across 2001/02–2008/09 are presented. The RHA and Winnipeg CA rates for both home births and hospital births with delivery care provided by a midwife are presented for two time periods, 2001/02–2002/03 and 2007/08–2008/09. The Sociodemographic and Other Characteristics analysis for those receiving delivery care by a midwife is presented for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend by Provider Type (2001/02–2008/09), Figure 4.2.1
    - The rate for General Practitioner or Family Physician ranged from 30.0% (2001/02) to 21.0% (2008/09); the linear trend was significant; the rate decreased over time from a high of 30.0% in 2001/02 to a low of 21.0% in 2008/09.
    - The rate for Obstetricians/Gynecologists ranged from 66.8% (2001/02) to 73.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 66.8% in 2001/02 to a high of 73.7% in 2008/09.
    - The rate for Midwives ranged from 2.5% (2001/02) to 4.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.5% in 2001/02 to a high of 5.0% in 2006/07.
    - The rate for a Mix of Providers ranged from 0.8% (2001/02) to 0.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 1.2% in 2004/05 to a low of 0.6% in 2008/09.
- General Practitioner or Family Physician (2001/02–2002/03 and 2007/08–2008/09)
    - RHA, Figure 4.2.2
        - The Manitoba rate was 28.2% in 2001/02–2002/03 and 21.3% in 2007/08–2008/09.
        - South Eastman (45.0% and 37.2%), Central (71.4% and 65.9%), Parkland (63.4% and 79.1%), and NOR–MAN (65.0% and 72.5%) were significantly higher than the Manitoba rate in both time periods; while Winnipeg (13.3% and 8.3%) and North Eastman (21.5% and 17.3%) were significantly lower .
        - Brandon (38.0% and 14.9%) was significantly higher than the Manitoba rate in the first time period and lower in the second time period.
        - Assiniboine (16.2%), Interlake (18.0%), and Burntwood (2.1%) were significantly lower than the Manitoba rate in the second time period.
    - Winnipeg CA, Figure 4.2.3
        - The Winnipeg rate was 13.3% in 2001/02–2002/03 and 8.3% in 2007/08–2008/09.
        - Fort Garry (19.8% and 11.8%), St. Boniface (16.8% and 13.3%), and St. Vital (18.4% and 15.2%) were significantly higher than the Winnipeg rate in both time periods; while Seven Oaks (10.2% and 5.8%) and Point Douglas (10.4% and 4.4%) were lower.
        - River East (10.1%) was significantly lower than the Winnipeg rate in the first time period.
        - Assiniboine South (4.5%), Inkster (5.8%), and Downtown (6.4%) were significantly lower than the Winnipeg rate in the second time period.

- Obstetricians/Gynecologists, (2001/02–2002/03 and 2007/08–2008/09)
  - RHA, Figure 4.2.4
    - The Manitoba rate was 68.0% in 2001/02–2002/03 and 73.4% in 2007/08–2008/09.
    - Winnipeg (82.7% and 87.5%) and North Eastman (76.4% and 81.1%) were significantly higher than the Manitoba rate in both time periods; while South Eastman (44.8% and 46.1%), Central (27.1% and 28.3%), Parkland (34.7% and 13.8%), and NOR–MAN (30.0% and 17.4%) were lower.
    - Brandon (59.5% and 76.6%) was significantly lower than the Manitoba rate in the first time period and higher in the second.
    - Assiniboine (79.1%), Interlake (81.3%), and Burntwood (95.2%) were significantly higher than the Manitoba rate in the second time period.
  - Winnipeg CA, Figure 4.2.5
    - The Winnipeg rate was 82.7% in 2001/02–2002/03 and 87.5% in 2007/08–2008/09.
    - Fort Garry (75.2% and 83.9%), St. Boniface (78.7% and 80.9%), and St. Vital (77.1% and 81.2%) were significantly lower than the Winnipeg rate in both time periods; while Seven Oaks (88.1% and 92.4%) and Inkster (87.4% and 92.5%) were significantly higher in both time periods.
    - River East (86.0%) was significantly higher than the Winnipeg rate in the first time period, while Assiniboine South (92.3%) and Point Douglas (92.4%) were significantly higher in the second time period.
- Midwives
  - Time Trend by Region (2001/02–2008/09), Figure 4.2.6
    - The Manitoba rate ranged from 2.5% (2001/02) to 4.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.5% in 2001/02 to a high of 5.0% in 2006/07.
    - The Brandon rate ranged from 1.3% (2001/02) to 8.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.3% in 2001/02 to a high of 11.5% in 2006/07.
    - The rate for the Rural South ranged from 1.6% (2001/02) to 4.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.5% in 2002/03 to a high of 5.1% in 2007/08.
    - The rate for the North ranged from 1.3% (2001/02) to 5.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.3% in 2001/02 to a high of 5.6% in 2008/09.
  - Time Trend by Location of Birth (2001/02–2008/09), Figure 4.2.7
    - The rate of deliveries receiving care by a midwife ranged from 2.5% (2001/02) to 4.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.5% in 2001/02 to a high of 5.0% in 2006/07.
    - The rate of hospital births receiving care by a midwife ranged from 1.7% (2001/02) to 3.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.7% in 2001/02 to a high of 4.1% in 2006/07.
  - RHA (2001/02–2002/03 and 2007/08–2008/09), Figure 4.2.8
    - The Manitoba rate was 2.9% in 2001/02–2002/03 and 4.6% in 2007/08–2008/09
    - South Eastman (5.6% and 10.4%) was significantly higher than the Manitoba rate in both time periods.
    - Winnipeg (4.0%) was significantly higher than the Manitoba rate in the first time period, while Assiniboine (1.0%) was significantly lower.
    - Brandon (8.5%) and NOR–MAN (10.1%) were significantly higher than the Manitoba rate in the second time period, while North Eastman (1.2%) was significantly lower.
    - Interlake (0.5% and 0.6%) and Burntwood (1.7% and 2.6%) were significantly lower than the Manitoba rate in both time periods.
    - Central (1.1 % and 5.7%) was significantly lower than the Manitoba rate in the first time period and significantly higher in the second.

- Hospital Births, Figure 4.2.9
  - The Manitoba rate was 2.2% in 2001/02–2002/03 and 3.8% in 2007/08–2008/09.
  - South Eastman (3.9% and 8.6%) was significantly higher than the Manitoba rate in both time periods, while Interlake (0.5% and 0.5%) was lower.
  - Assiniboine (0.9%) was significantly lower than the Manitoba rate in the first time period.
  - Brandon (7.0%) and NOR–MAN (9.9%) were significantly higher than the Manitoba rate in the second time period
  - Central (0.6% and 4.7%) was significantly lower than the Manitoba rate in the first time period and higher in the second.
  - Winnipeg (2.9% and 3.2%) was significantly higher than the Manitoba rate in the first time period and lower in the second.
- Home Births, Figure 4.2.10
  - The Manitoba rate was 0.7% in 2001/02–2002/03 and 0.8% in 2007/08–2008/09.
  - South Eastman (1.7% and 1.8%) was significantly higher than the Manitoba rate in both time periods.
  - Winnipeg (1.1%) was significantly higher than the Manitoba rate in the first time period, while Interlake (0.0%) was significantly lower
  - Brandon (1.5%) was significantly higher than the Manitoba rate in the second time period, while Parkland (0.0%) was significantly lower.

- Winnipeg CA (2001/02–2002/03 and 2007/08–2008/09), Figure 4.2.11
  - The Winnipeg rate was 3.9% in 2001/02–2002/03 and 4.1% in 2007/08–2008/09.
  - Point Douglas (5.5%) was significantly higher than the Winnipeg rate in the first time period.
  - Seven Oaks (1.7% and 1.8%) and Inkster (1.6% and 1.7%) were significantly lower than the Manitoba rate in both time periods.
  - River Heights (7.4%) and Downtown (5.8%) were significantly higher than the Winnipeg rate in the second time period.
  - Hospital Births, Figure 4.2.12
    - The Winnipeg rate was 2.9% in 2001/02–2002/03 and 3.2% in 2007/08–2008/09
    - Seven Oaks (1.2% and 1.5%) and Inkster (1.3% and 1.5%) were significantly lower than the Winnipeg rate in both time periods.
    - River Heights (5.5%) was significantly higher than the Winnipeg rate in the second time period.
  - Home Births, Figure 4.2.13
    - The Winnipeg rate was 1.0% in both 2001/02–2002/03 and 2007/08–2008/09
    - Seven Oaks (0.5% and 0.0%) and Inkster (0.0% and 0.0%) were significantly lower than the Winnipeg rate in both time periods.
    - River Heights (1.8%) was significantly higher than the Winnipeg rate in the second time period
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.2.14
  There was a statistically significant difference in the proportion of women giving birth who received delivery care by a midwife for the following characteristics:
  - Maternal Age – Fewer women aged 12 to 19 (2.6%), 20 to 24 (3.9%) and 35 to 39 (3.8%) received delivery care by a midwife than the reference group (25 to 29, 5.1%).
  - Income Quintile – In rural areas, there was a significant relationship with area–level income. With each successive decrease in rural area–income there were fewer women receiving delivery care by a midwife. In urban areas, more women in Urban 3 (5.6%) and Urban 2 (5.6%) received delivery care by a midwife than in the reference group (Urban 5, 3.9%).
  - Income Assistance – 2.3% of women on income assistance received delivery care by a midwife compared to 4.7% of those not on income assistance.
  - Maternal Education – 2.0% of women with less than a Grade 12 education received delivery care by a midwife compared to 5.1% of those with a Grade 12 education.

- Marital Status – 1.7% of women who were lone parents received delivery care by a midwife compared to 5.2% of those who were married or partnered.
- Parity – 5.2% of multiparous women received delivery care by a midwife compared to 3.5% of primiparous women.

Comparison to Other Findings

In the Canadian Maternity Experiences Survey (Public Health Agency of Canada, 2009), women were asked what type of healthcare provider had delivered their baby. Overall, 69.5% of women in Canada reported that their primary birth attendant was an obstetrician/gynecologist-, 14.6% family physician, 4.7% a nurse or nurse practitioner, and 4.3% a midwife. In Manitoba in 2007/08–2008/09, 73.4% of women received delivery care from an obstetrician/gynecologist, 21.3% from a family physician, and 4.6% from a midwife.

Limitations

We restricted our analysis of data from the Midwifery Discharge Summary Report database to determining the proportion of women who received midwifery care for both home and hospital births. The data on whether women were from one of the priority populations were not analyzed; therefore we are unable to report on the proportion of women receiving midwifery care who were newcomers or Aboriginal. Other databases at MCHP were used to determine the age and income level of women receiving delivery care from a midwife.

Summary

The proportion of women receiving delivery care from an obstetrician increased significantly over time, while the proportion receiving delivery care from a family practice physician declined, which is consistent with national trends. The majority of women in Manitoba in 2007/08–2008/09 received delivery care from an obstetrician/gynecologist (73.4%), but this varied by RHA. Burntwood (95.2%), Winnipeg (87.5%), Interlake (81.3%), North Eastman (81.1%), Assiniboine (79.1%), and Brandon (76.6%) had significantly higher rates; South–Eastman (46.1%), Central (28.3%), Parkland (13.8%), and NOR–MAN (68.0%) had significantly lower rates than Manitoba overall. Conversely, South Eastman (37.2%), Central (65.9%), Parkland (79.1%), and NOR–MAN (72.5%) had significantly higher rates of women receiving delivery care from a general or family practitioner. The proportion of women receiving delivery care from a midwife increased significantly over time, following implementation of midwifery in July 2001. In 2007/08–2008/09, 3.8% of women received delivery care from a midwife in hospital, while 0.8% received delivery care from a midwife at home, for a total of 4.6% of births. The proportion of women receiving delivery care from a midwife may be dependent on availability of midwives in the RHA, which varied over time (Table 4.2.1). Interestingly, the spike in the proportion of women receiving delivery care from a midwife in Brandon in 2006/07 does not seem to be related to a change in supply of midwives. Women were more likely to receive delivery care from a midwife if they lived in the highest income rural area (Rural 5) or in Urban 2 or Urban 3 income quintiles; were married/partnered, multiparous, or not on income assistance; or had a Grade 12 education. Women of younger (aged 24 and younger) and older age (aged 35 to 39) were less likely to receive delivery care from a midwife. There was no difference in whether a woman was socially isolated. These results suggest that the goals for priority populations designated to receive midwifery care (e.g., adolescent, single, socially isolated, poor) are not being fully met.

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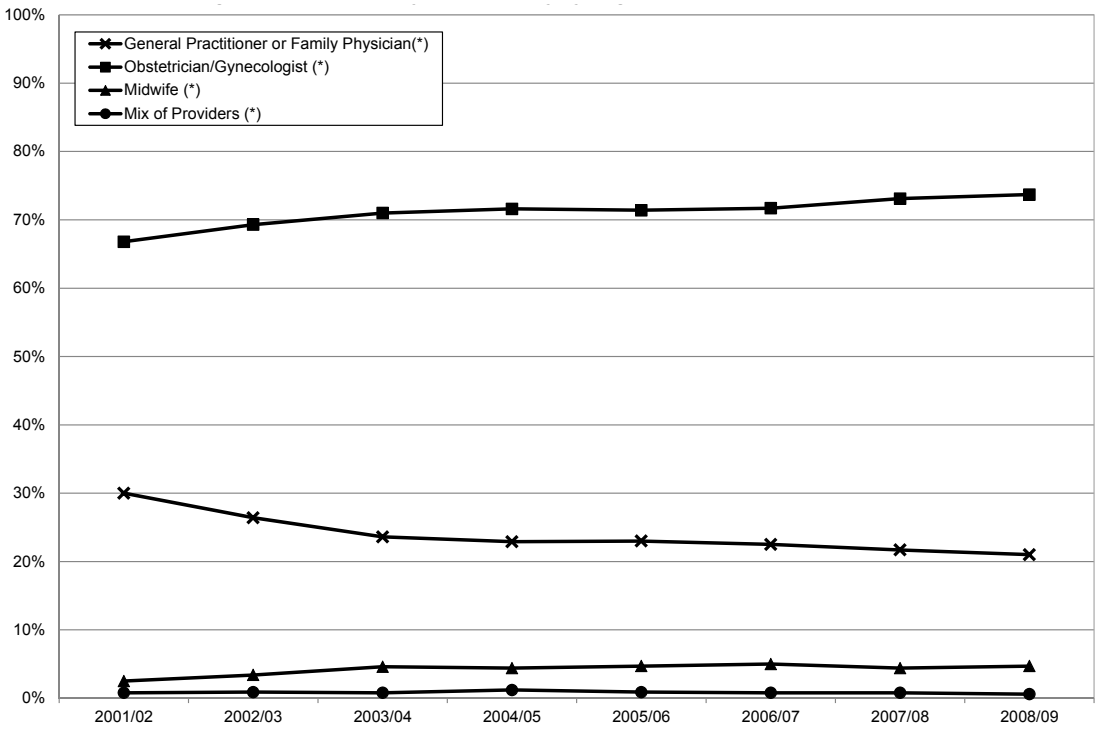
Society of Obstetricians and Gynaecologists of Canada. A National Birthing Initiative for Canada: An inclusive, integrated and comprehensive pan–Canadian framework for sustainable family–centered maternity and newborn care. Society of Obstetricians and Gynaecologists of Canada. 2008. http://www.sogc.org/projects/pdf/BirthingStrategyVersioncJan2008.pdf. Accessed January 9, 2012.

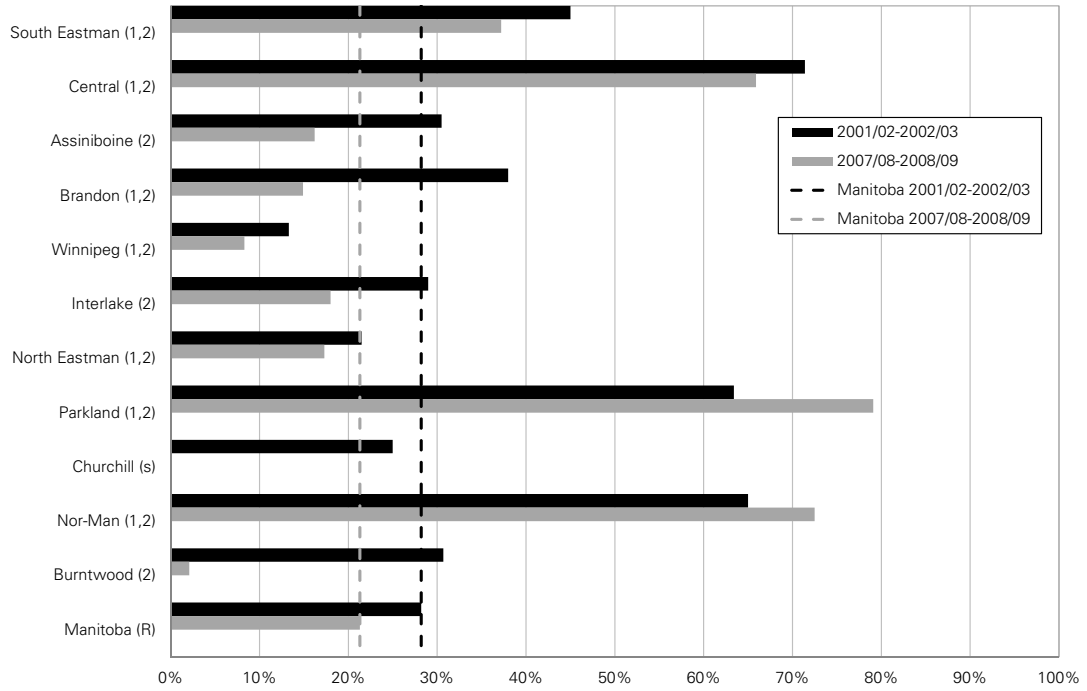
Figure 4.2.1: Provider Type for Delivery by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

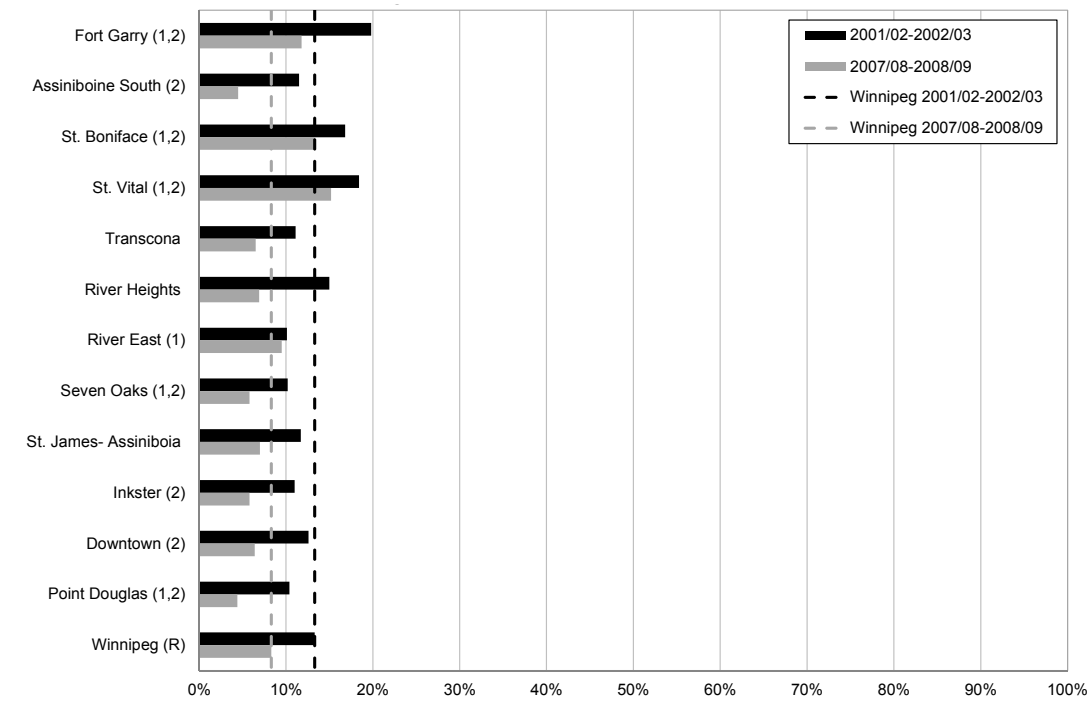
Figure 4.2.2: Proportion of Women Receiving Delivery Care by a General Practitoner or Family Physician by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

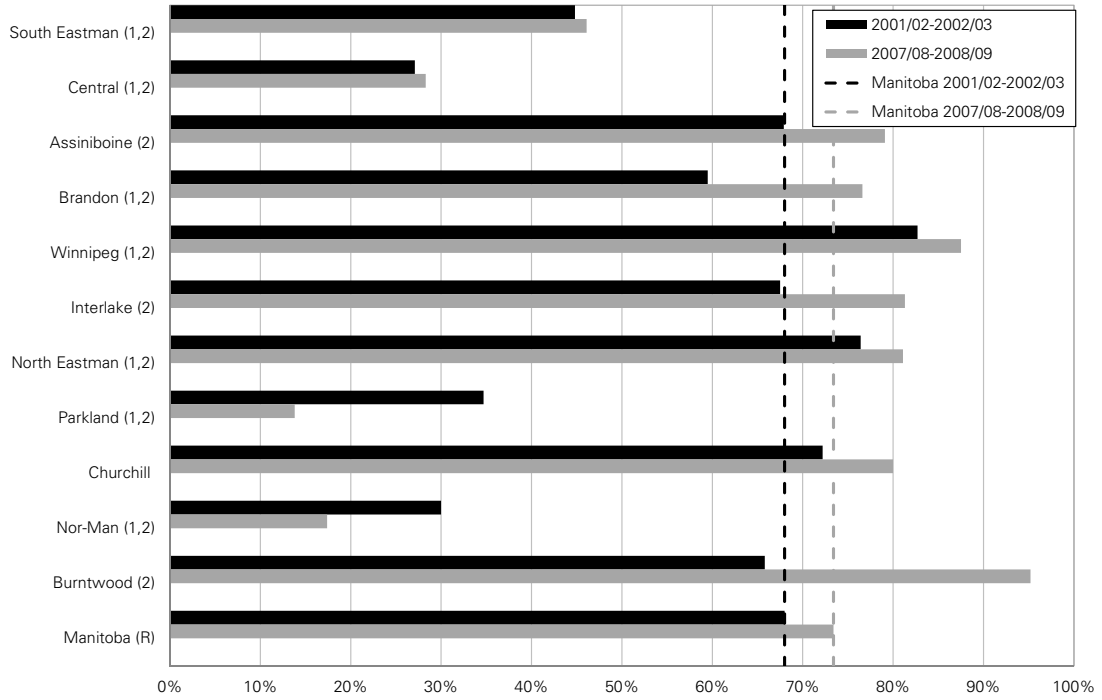
Figure 4.2.3: Proportion of Women Receiving Delivery Care by a General Practitioner or Family Physician by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2001/02 -2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2007/08 -2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

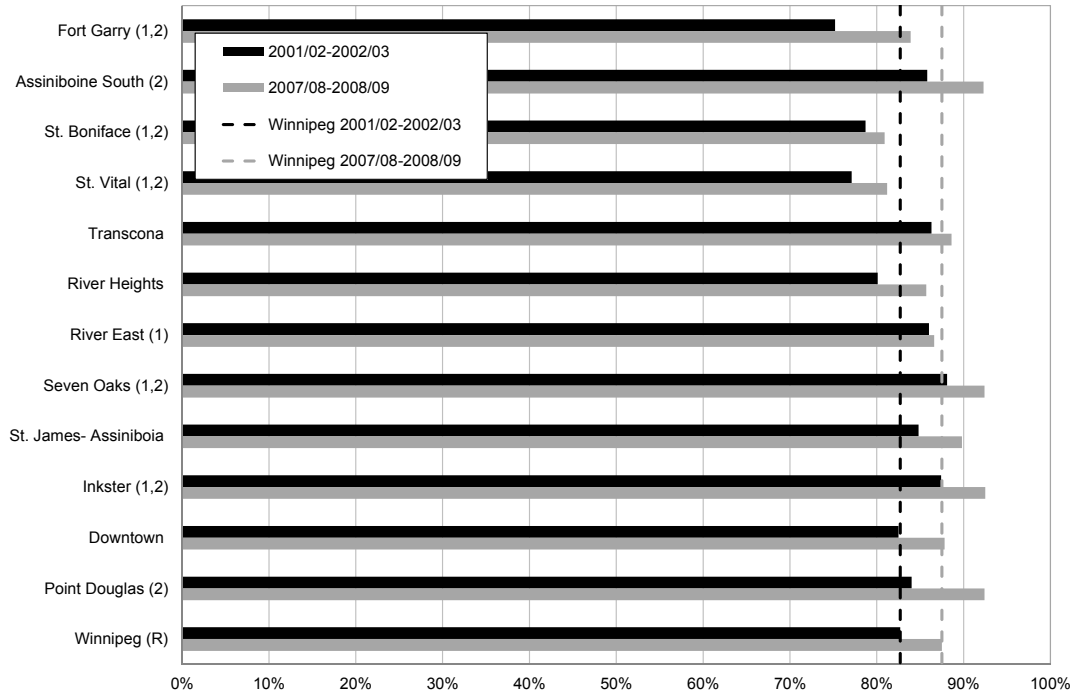
Figure 4.2.4: Proportion of Women Receiving Delivery Care by an Obstetrician/Gynecologist by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

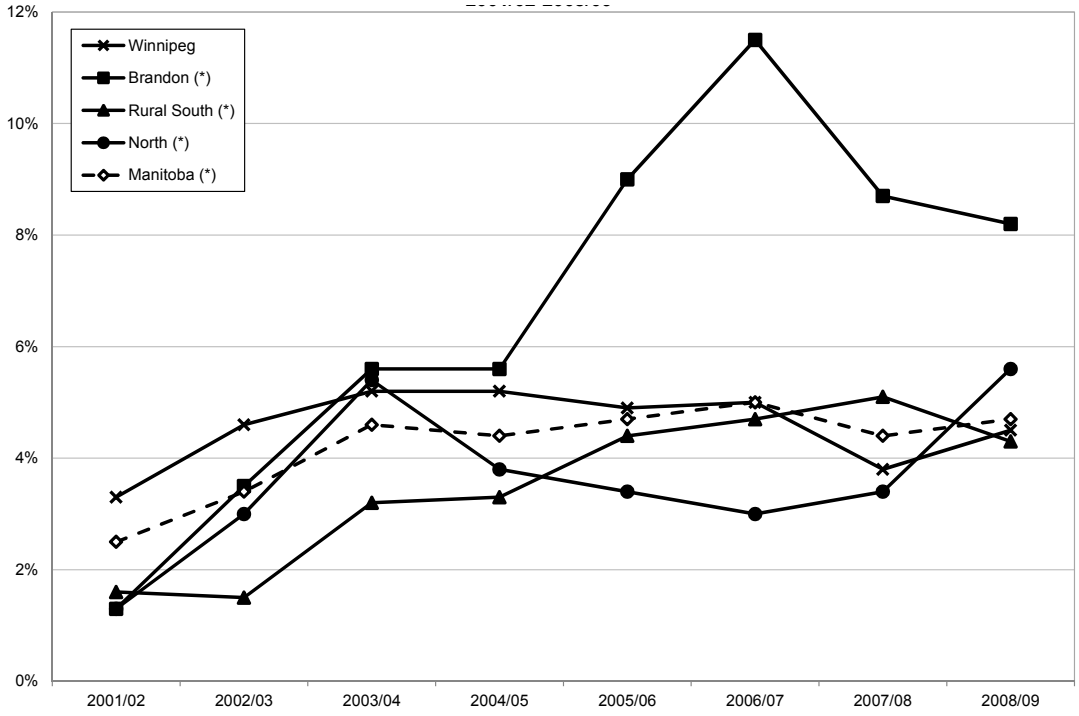
Figure 4.2.5: Proportion of Women Receiving Delivery Care by an Obstetrician/Gynecologist by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

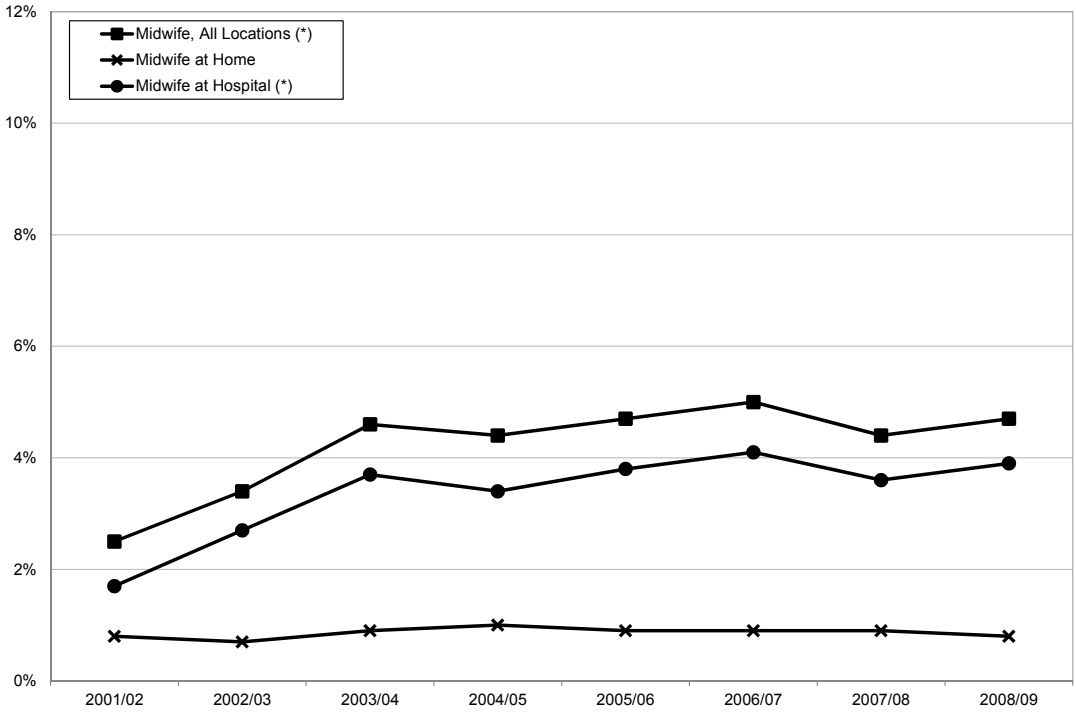
Figure 4.2.6: Proportion of Women Receiving Delivery Care by a Midwife by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

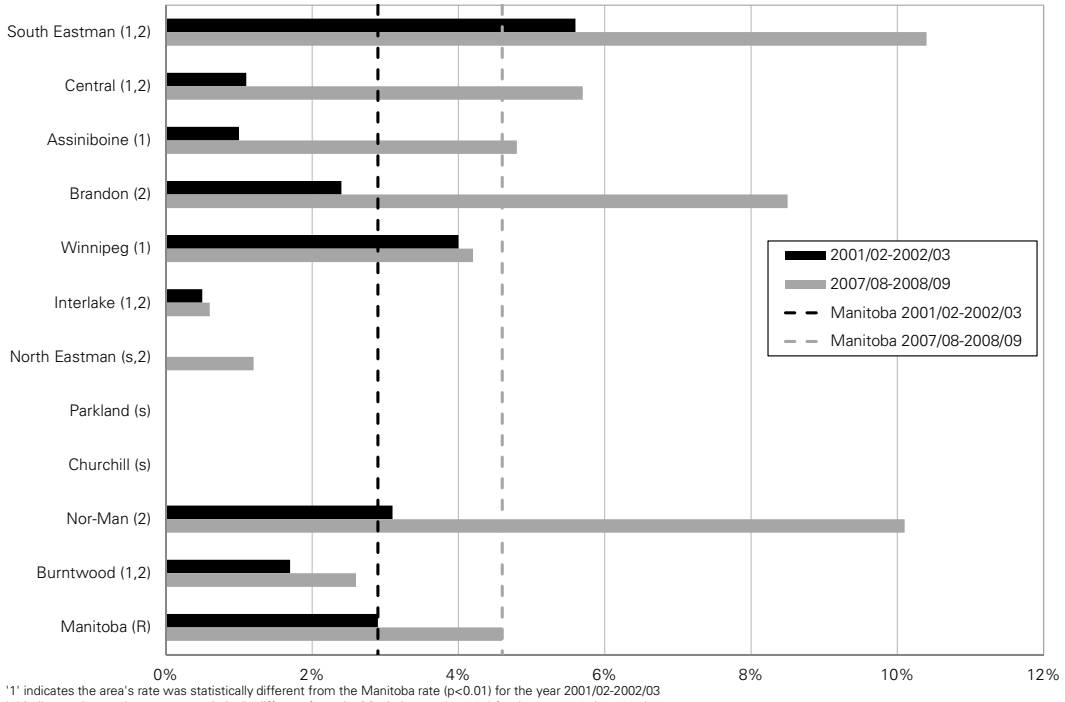
Figure 4.2.7: Proportion of Women Receiving Delivery Care by a Midwife by Birth Location and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

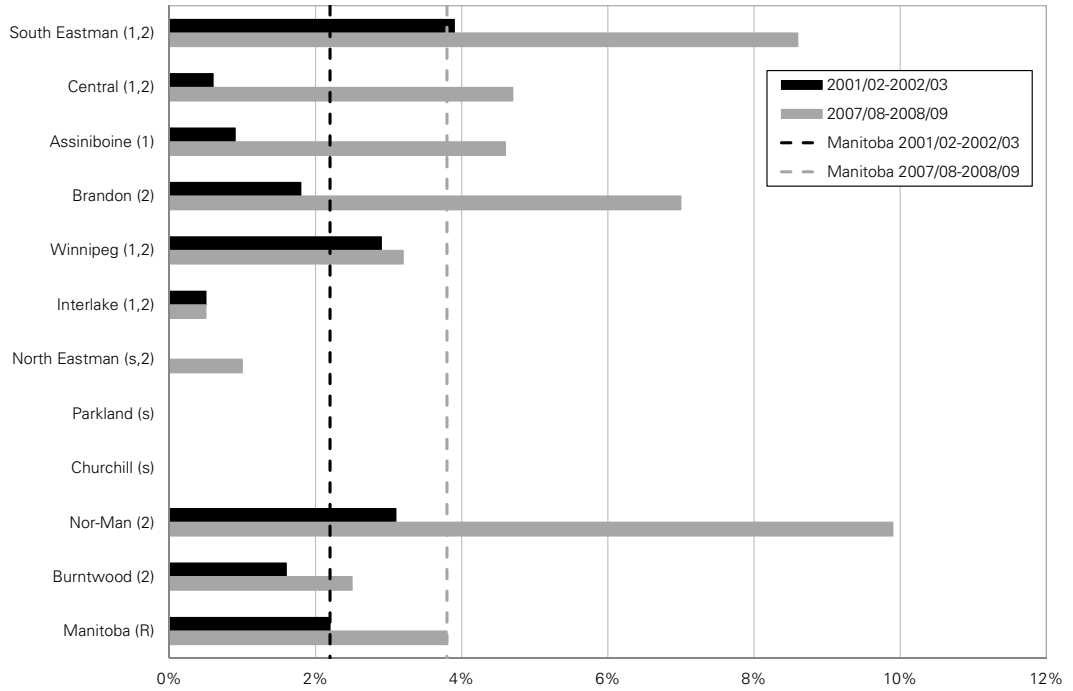
Figure 4.2.8: Proportion of Women Receiving Delivery Care by a Midwife by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the year 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

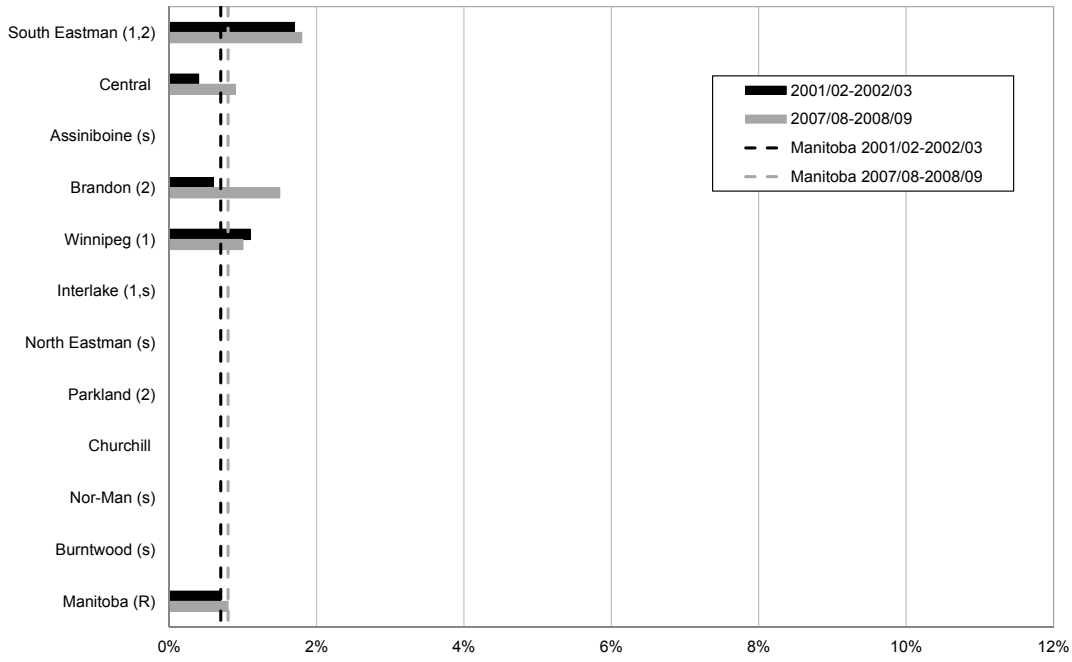
Figure 4.2.9: Proportion of Women Receiving Delivery Care in a Hospital by a Midwife by RHA, 2001/02 -2002/03 and 2007/08-2007/08



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

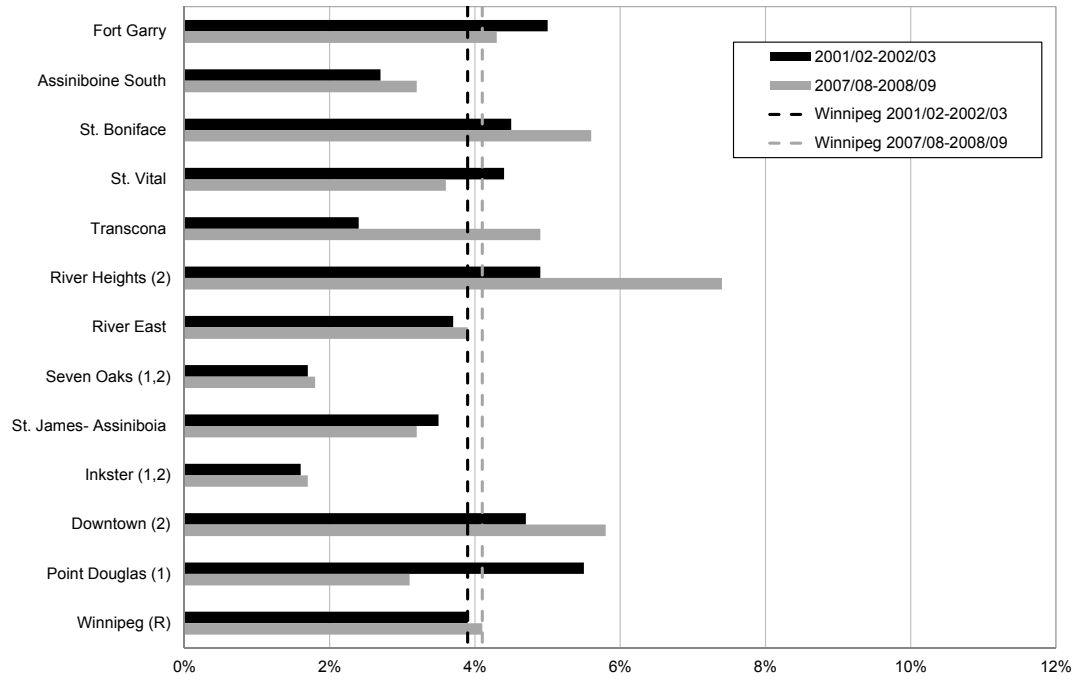
Figure 4.2.10: Proportion of Women Receiving Delivery Care at Home by a Midwife by RHA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Manitoba rate (p<0.01) for the years 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

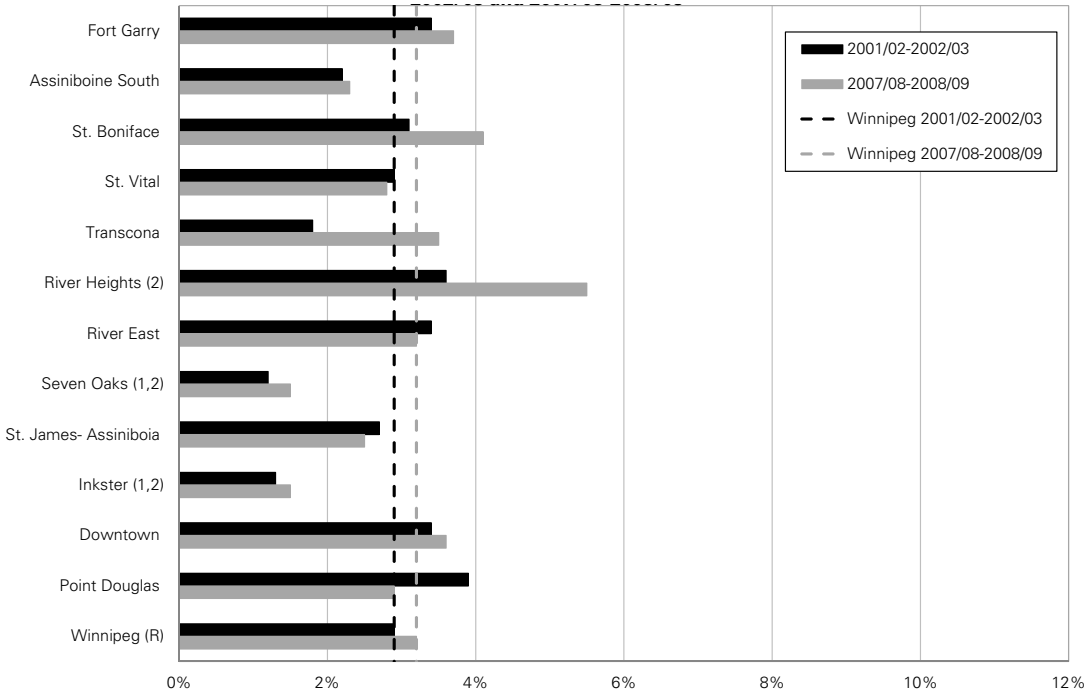
Figure 4.2.11: Proportion of Women Receiving Delivery Care by a Midwife by Winnipeg CA, 2001/02-2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2001/02-2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the year 2007/08-2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

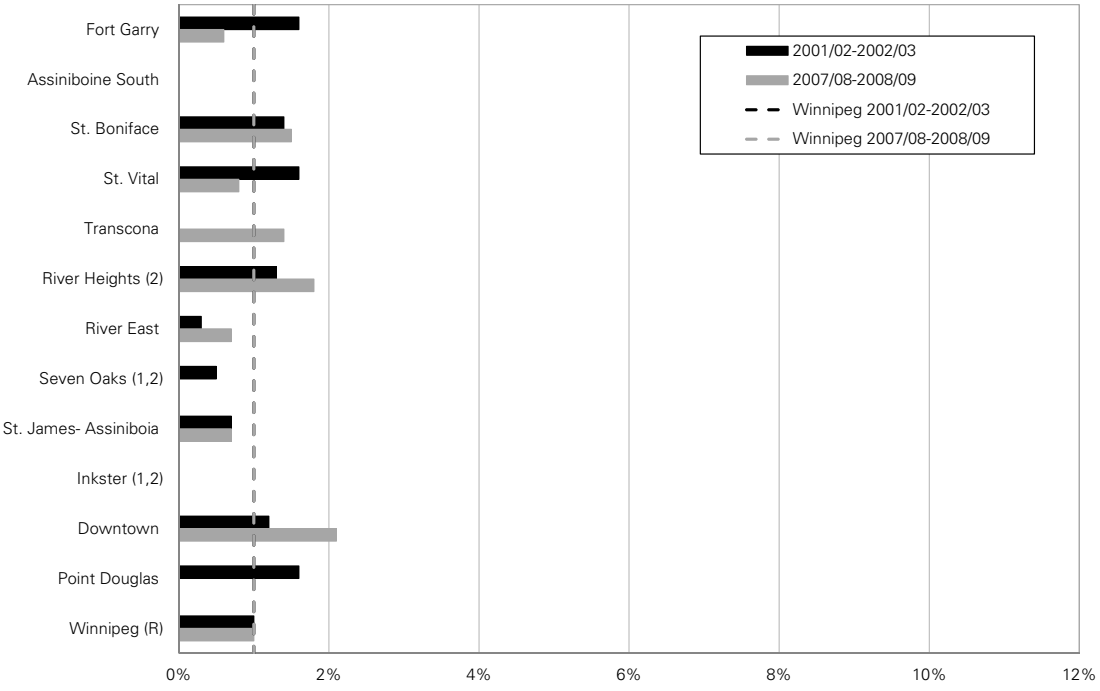
Figure 4.2.12: Proportion of Women Receiving Delivery Care at a Hospital by a Midwife by Winnipeg CA, 2001/02 -2002/03 and 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2001/02 -2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08 -2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.2.13: Proportion of Women Receiving Delivery Care at Home by a Midwife by Winnipeg CA, 2001/02 and 2007/08



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2001/02 -2002/03
'2' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01) for the years 2007/08 -2008/09
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.2.14: Proportion of Women Receiving Delivery Care by a Midwife by Sociodemographic and Other Characteristics, 2007/08-2008/09

'1' indicates the group's rate was statistically different from the reference (R) group (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.3 Induction of Labour

Background

One of the most common interventions in maternity care is induction of labour. One in five pregnant women are induced across Canada, although in some provinces the rate is one in four. The major indication for induction of labour is postterm pregnancy, although there has also been a rise in indicated inductions of labour preterm due to perceived pregnancy complications. The rate of induction for the postterm pregnancy increased following the publication of the Canadian postterm pregnancy randomized controlled trial in 1992 and the subsequent Society of Obstetricians and Gynaecologists of Canada (SOGC) guideline published in 1997 (Hannah et al., 1992; Hannah & Maternal–Fetal Medicine Committee of the Society of Obstetricians and Gynaecologists of Canada, 1997). This guideline recommended that women with an uncomplicated pregnancy that reached 41 to 42 weeks should be offered elective delivery. Subsequent data has shown reduction in deliveries at 42 weeks from 7% in 1980 to 2.9% in 1995 attributed to a significant increase in induction of labour at 41 weeks. This was also associated with a significant reduction in stillbirth rate for patients at 41 weeks from 2.8/1,000 total births in 1980 to 0.9/1,000 total births in 1995 (Sue–A–Quan, Hannah, Cohen, Foster, & Liston, 1999). In 2006, a Cochrane Collaboration meta–analysis was done, which included 19 trials of RCT on induction of labour at 41 and 42 completed weeks. It showed that when 41 and 42 weeks groups were analyzed together, there was a significant reduction in stillbirth and meconium aspiration without an increase in cesarean births for women induced at or after 41 weeks (Gülmezoglu, Crowther, & Middleton, 2006). In Manitoba, women who reach 41 weeks gestation are offered induction of labour in compliance with the national standards.

Calculation of the Indicator

This indicator reports the proportion of women giving birth who received induction of labour. Both live births and stillbirths are included. It is defined as the number of women giving birth whose labour was induced (medical, surgical, and combined methods) divided by the number of women giving birth in a given time and place. Due to coding changes, these analyses are limited to 2004/05–2008/09. All home births attended by a midwife were coded as not being induced. Time trends were calculated across 2004/05–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2004/05–2008/09), Figure 4.3.1
    - The Manitoba rate ranged from 21.5% (2004/05) to 20.3% (2008/09); the linear trend was significant; the rate decreased over time from a high of 21.5% in 2004/05 to a low of 18.5% in 2006/07.
    - The Winnipeg rate ranged from 19.4% (2004/05) to 18.1% (2008/09); the linear trend was significant; the rate decreased over time from a high of 19.4% in 2004/05 to a low of 15.8% in 2006/07.
    - The rate for the Rural South ranged from 21.0% (2004/05) to 19.3% (2008/09); the linear trend was significant; the rate decreased over time from a high of 21.0% in 2004/05 to a low of 18.3% in 2007/08.
- RHA (2007/08–2008/09), Figure 4.3.2
    - The Manitoba rate was 19.7%
    - South Eastman (16.5%), Central (17.0%), and Winnipeg (17.6%) were significantly lower than the Manitoba rate (19.7%); while Assiniboine (25.9%), Brandon (24.8%), and Burntwood (32.0%) were significantly higher

- Winnipeg CA (2007/08–2008/09), Figure 4.3.3
  - Winnipeg rate was 17.6%.
  - Seven Oaks (14.5%) was significantly lower than Winnipeg rate (17.6%).
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.3.4
  There was a statistically significant difference in the proportion of women giving birth who received induction of labour for the following characteristics:
  - Income Quintile – In both Rural 1 (23.5%) and Rural 2 (24.5%), more women received induction of labour than the reference group (Rural 5, 19.2%).
  - Income Assistance – 17.6% of women who were on income assistance received induction of labour compared to 20.1% of women who were not on income assistance.
  - Social Isolation – 15.6% of women who were socially isolated received induction of labour compared to 18.9% of women who were not socially isolated.
  - Parity – 16.9% of multiparous women received induction of labour compared to 24.4% of primiparous women.
  - Maternal Hypertension – 42.7% of women with hypertension received induction of labour compared to 17.5% of women who did not have hypertension.
  - Maternal Diabetes – 39.2% of women with diabetes received induction of labour compared to 18.4% of women who did not have diabetes.
  - Intrauterine Growth Restriction – 45.3% of women who had an intrauterine growth restriction received induction of labour compared to 19.4% of women who did not have an intrauterine growth restriction.
  - **Premature Rupture of Membranes** – 41.8% of women whose membranes prematurely ruptured received induction of labour compared to 16.0% of women whose membranes did not prematurely rupture.
  - **Oligohydramnios Diagnosis** – 66.7% of women who had an oligohydramnios diagnosis received induction of labour compared to 19.6% of women who did not have such a diagnosis.
  - Gestation – 28.4% of women who had a preterm birth, 21.0% who had an early term birth, and 45.8% of women who had a **postterm birth** received induction of labour. All three rates were significantly higher than the reference group (**term births**, 17.9%).

Comparison to Other Findings

The total rate of induction of labour (medical and/or surgical) in Canada ranged from 20.7 (1995–96) to a high of 23.7 (2001–02) to 21.8 (2004/05) per 100 hospital deliveries (Public Health Agency of Canada, 2008). The Manitoba rate for induction of labour ranged from 21.5% to 18.5% from 2004/05–2008/09 and has shown a slight decrease over time. In 2007/08 to 2008/09, the Manitoba rate was 19.7% and the Winnipeg rate was 17.6%, both somewhat lower than the Canadian rates.

Limitations

Coding for surgical induction of labour may be inconsistent across hospitals. Labour induction rates may erroneously include cases where the labour was not induced but where existing labour was augmented. We did not provide separate rates for surgical and medical induction. This data does not address issues of the association between induction of labour and cesarean birth rates, nor maternal and perinatal outcomes with induction of labour.

Summary

The rate of induction of labour in Manitoba decreased slightly from 21.5% to 20.3% and in Winnipeg from 19.4% to 18.1% (2004/05–2008/09). This decline in the rate may have resulted from a policy of not inducing women until after 41 completed weeks that was introduced at the tertiary centers in Winnipeg in the mid–1990's, resulting in a lower induction rate of 17.6% (2007/08–2008/09) for Winnipeg

(Personal Communication, Dr. M. Helewa, May 1, 2012). It may also be the result of a slight reduction of indicated inductions at a preterm gestational age.

Several factors were associated with induction of labour. Induction rates were higher in women who were primiparous, not on social assistance, or not socially isolated; had hypertension, diabetes, intrauterine growth restriction, premature rupture of membrane, or oligohydramnios; lived in lower rural income quintile areas; or had early preterm, early term, or postterm pregnancies.

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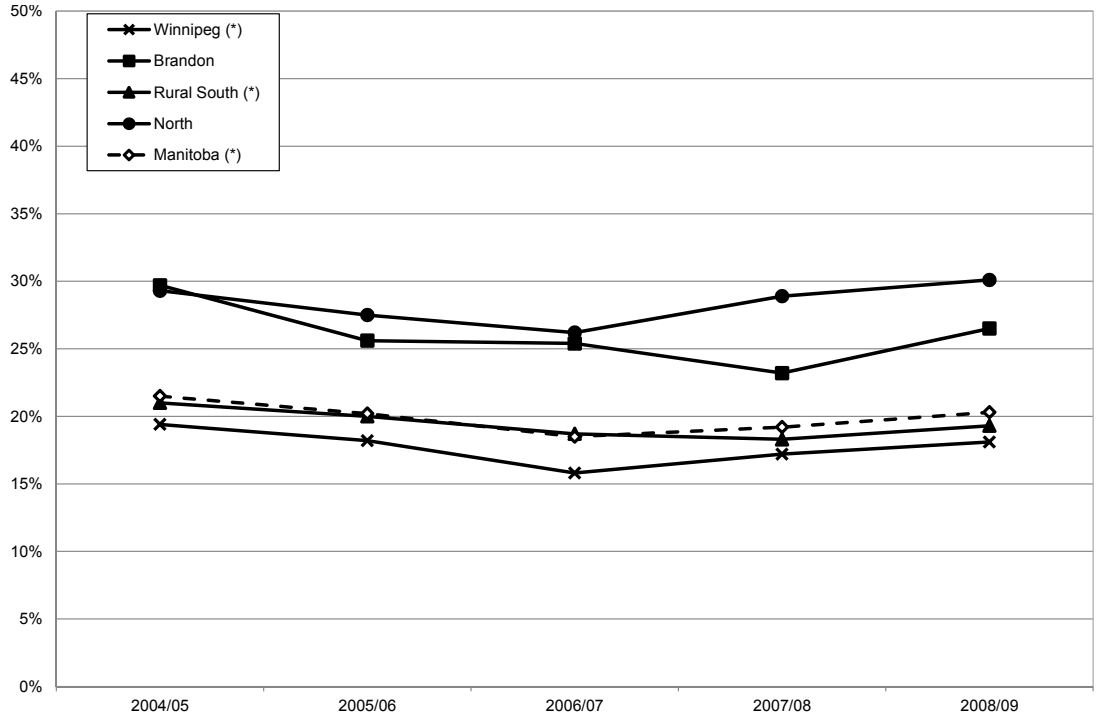
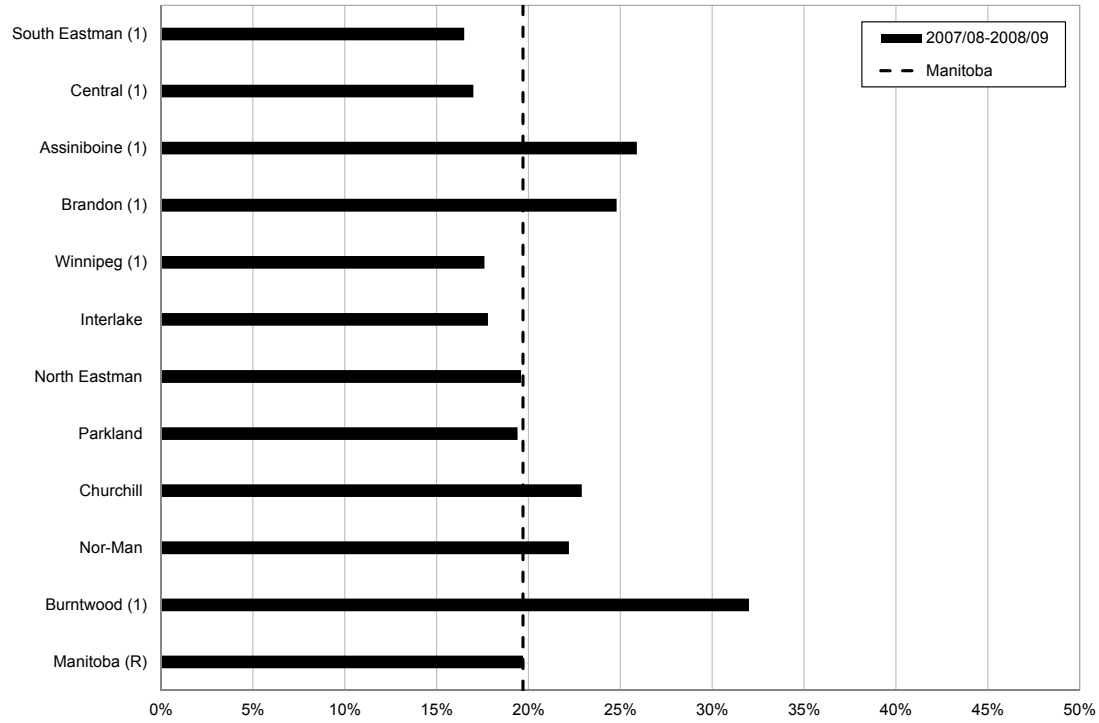
Figure 4.3.1: Proportion of Women Receiving Induction of Labour (Medical/Surgical/Other) by Region and Year, 2004/05-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

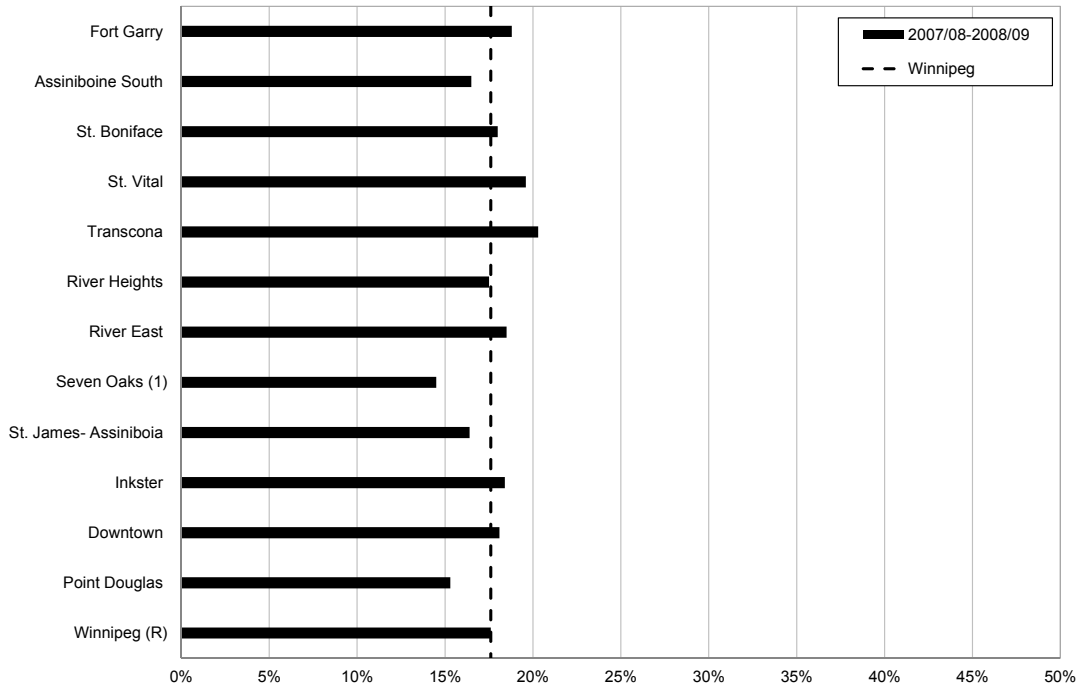
Figure 4.3.2: Proportion of Women Receiving Induction of Labour (Medical/Surgical/Other) by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.3.3: Proportion of Women Receiving Induction of Labour (Medical/Surgical/Other) by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.3.4: Proportion of Women Receiving Induction of Labour (Medical/Surgical/Other) by Sociodemographic and Other Characteristics, 2007/08-2008/09

'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.4 Vaginal Births with Epidural Anesthesia

Background

One of the most effective pain relief methods in labour is an epidural anesthetic. Epidural anesthetics are divided into those with "low dose motor block" and those with "high dose motor block". The former allows for ambulation by the patient and does not seem to affect the duration of labour, particularly duration of the second stage, nor increase the potential for a cesarean birth (Wilson, MacArthur, Cooper, Shennan, & COMET Study Group UK, 2009). There are also the "continuous" infusion epidural and the "patient controlled" epidural anesthetic. The latter has been shown to be associated with lower anesthetic dose, less motor blockade and fewer operative vaginal deliveries (Capogna, Camoricia, Stirparo, & Farcomeni, 2011; van der Vyver, Halpern, & Joseph, 2002).

Calculation of the Indicator

This indicator reported the proportion of women with vaginal births that received **epidural anesthesia**. Due to coding changes that occurred, these analyses are limited to 2004/05–2008/09. All home births were coded as not having received an epidural. We limited our analyses to 2004/05–2008/09 in order to use the intervention anesthesia technique to define epidural anesthesia separately from spinal anesthesia. Cases where there was with a missing anesthesia code (n=732) were excluded. Time trends were calculated across 2004/05–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Others Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2004/05–2008/09), Figure 4.4.1
  - The Manitoba rate ranged from 35.0% (2004/05) to 38.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 35.0% in 2004/05 to a high of 39.0% in 2007/08.
  - The Winnipeg rate ranged from 43.9% (2004/05) to 46.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 43.9% in 2004/05 to a high of 47.0% in 2005/06.
  - The Brandon rate ranged from 44.2% (2004/05) to 54.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 44.2% in 2004/05 to a high of 55.7% in 2007/08.
  - The rate for the Rural South ranged from 26.4% (2004/05) to 32.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 26.4% in 2004/05 to a high of 33.4% in 2007/08.
- RHA (2007/08–2008/09), Figure 4.4.2
  - Manitoba rate was 38.8%.
  - South Eastman (26.4%), Central (25.5%), NOR–MAN (7.9%), and Burntwood (18.3%) were significantly lower than the Manitoba rate; while Assiniboine (49.1%), Brandon (54.9%), and Winnipeg (46.7%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 4.4.3
  - The Winnipeg rate was 46.7%.
  - Downtown (39.5%) and Point Douglas (41.8%) were significantly lower than the Winnipeg rate, while Fort Garry (51.1%) and River East (50.6%) were higher.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.4.4
  There was a statistically significant difference in the proportion of women who had a vaginal birth with epidural anesthesia for the following characteristics:
  - Maternal Age – 43.4% of women aged 12 to 19 who gave birth vaginally received epidural anesthesia, significantly higher than the reference group (women aged 25 to 29, 38.0%); while 34.9% of women aged 35 to 39 who gave birth vaginally received epidural anesthesia, significantly lower than the reference group.
  - Income Quintile
    - In three of the rural income quintiles, the proportion of women who gave birth vaginally and received an epidural anesthesia was significantly lower than the reference group (Rural 4, 27.1%; Rural 2, 25.9%; Rural 1, 28.8% compared to 31.8% in Rural 5).
    - In the lowest urban income quintile, the proportion of women who gave birth vaginally and receiving an epidural anesthesia was significantly lower than the reference group (Urban 1, 43.7% compared to 50.5% in Urban 5).
  - Income Assistance – 35.6% of women on income assistance who gave birth vaginally received epidural anesthesia, compared to 39.3% of those women not on income assistance.
  - Maternal Education – 35.7% of women with less than a Grade 12 education and gave birth vaginally received epidural anesthesia compared 43.6% of those who had completed Grade 12.
  - Marital Status – 45.5% of women who were lone parents and gave birth vaginally received epidural anesthesia compared to 40.6% of those who were married/partnered.
  - Social Isolation – 35.1% of women who were socially isolated and gave birth vaginally received epidural anesthesia compared to 42.2% of those who were not socially isolated.
  - Parity – 28.4% of multiparous women giving birth vaginally received epidural anesthesia compared to 56.3% of primiparous women.
  - Prenatal Maternal Psychological Distress – 44.8% of women who had prenatal psychological distress and gave birth vaginally received epidural anesthesia compared to 37.8% of those without such a diagnosis.
  - Induction – 54.7% of women who were induced and gave birth vaginally received epidural anesthesia compared to 34.7% of those who were not induced.
  - Maternal **Length of Stay** – 54.9% of women with a length of stay of three or more days and gave birth vaginally received epidural anesthesia compared to 30.4% of those women with a length of stay of less than three days.

Comparison to Other Findings

While the Manitoba rate has shown an upward trend in the use of epidurals over the period of observation, the rate remains lower than those reported by other jurisdictions outside Manitoba. The BORN Ontario (Niday Perinatal Database, 2012) showed that in Ontario in 2008/09, 63% of primiparas and 39% of multiparas received an Epidural anesthetic for labour. These rates are higher than the Manitoba rates of 56% for primiparas and 28% for multiparas. The Canadian Perinatal Health Report (PHAC, 2008) does not provide information on epidural rates.

Limitations

Our analysis was limited to vaginal births; the proportion of women in labour who had an epidural anesthetic and then went on to deliver by cesarean is not known. Our data sources do not differentiate between high dose and low dose epidurals, or between continuous infusion versus patient controlled epidural anesthetic.

Summary

The rate of epidural anesthetic for vaginal births in Manitoba was 38.8% for 2007/08–2008/09. There are significant regional variations in rates of epidural anesthesia, with lower rates in South Eastman, Central, NOR–MAN, and Burntwood; the extent to which this is due to availability of the Anesthesiologists is

not known. Women who gave birth vaginally were more likely to have an epidural anesthetic if they were younger (aged 12 to 19), had maternal psychological distress, were a lone parent, had their labour induced, or had a maternal length of stay of three or more days. Women were less likely to receive an epidural anesthetic if they were on income assistance, multiparous, or socially isolated; lived in a low income area (Rural 1, Rural 2, Urban 1); or had less than a Grade 12 education.

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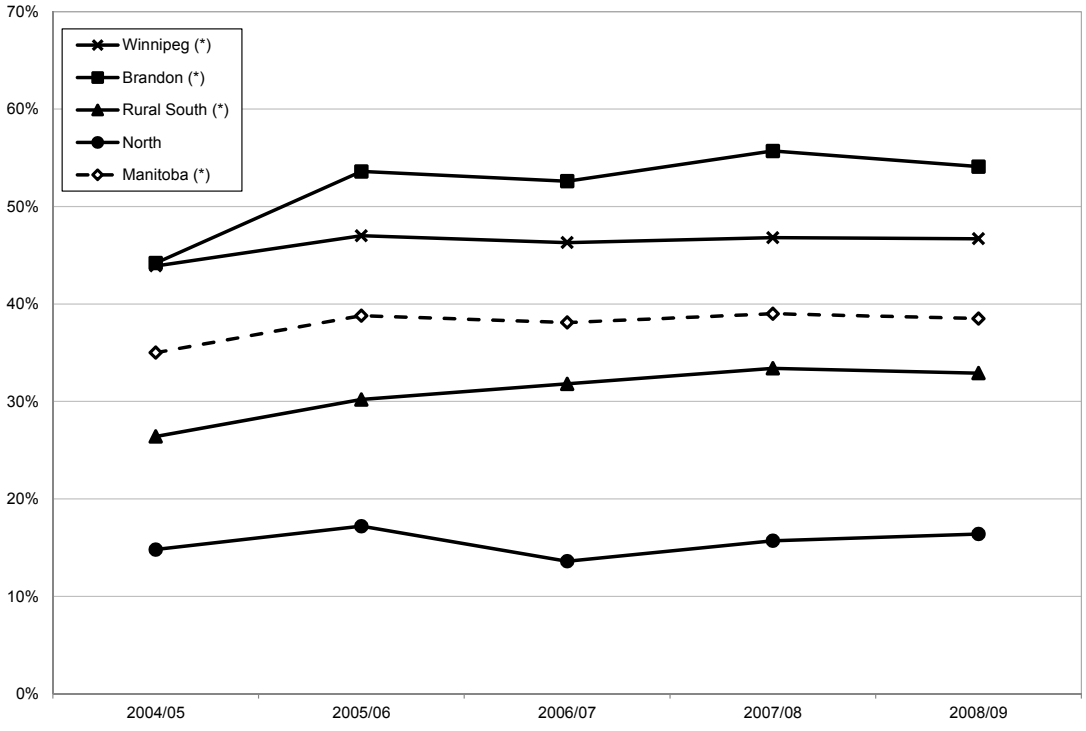
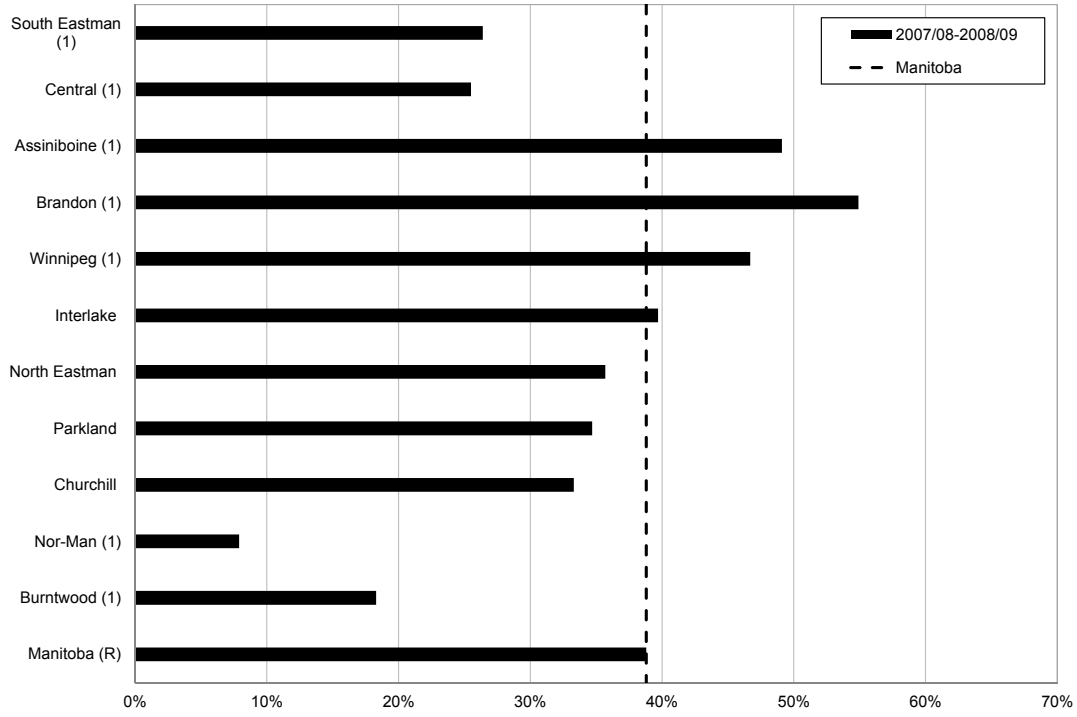
Figure 4.4.1: Proportion of Vaginal Births with Epidural Anesthesia by Region and Year, 2004/05-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

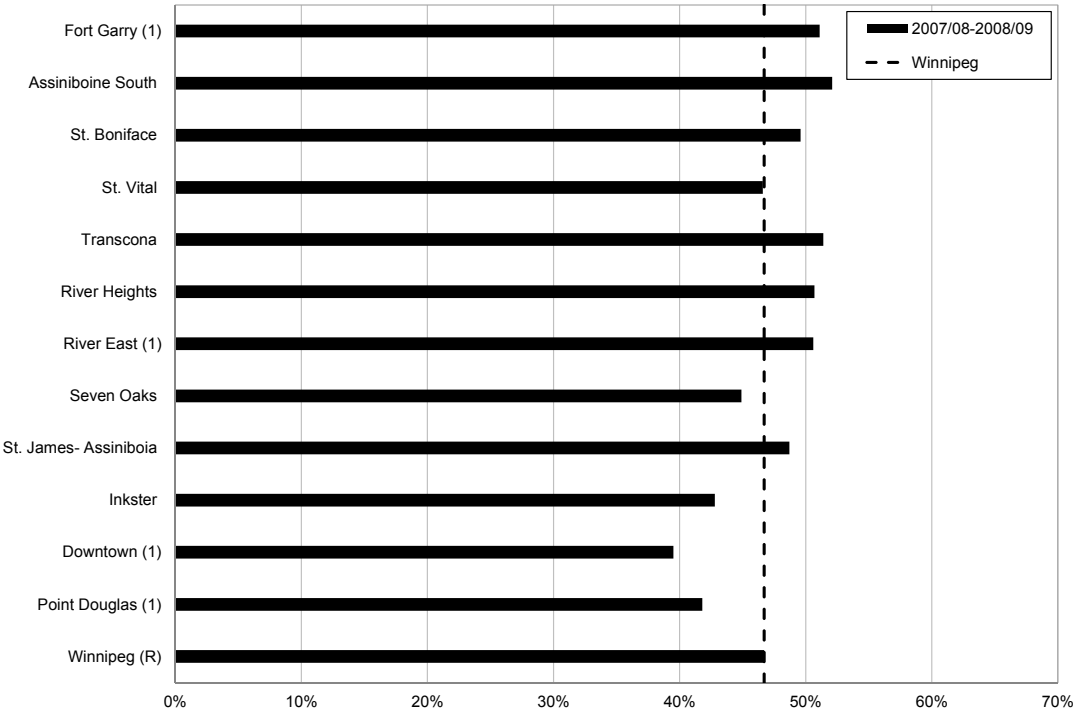
Figure 4.4.2: Proportion of Vaginal Births with Epidural Anesthesia by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

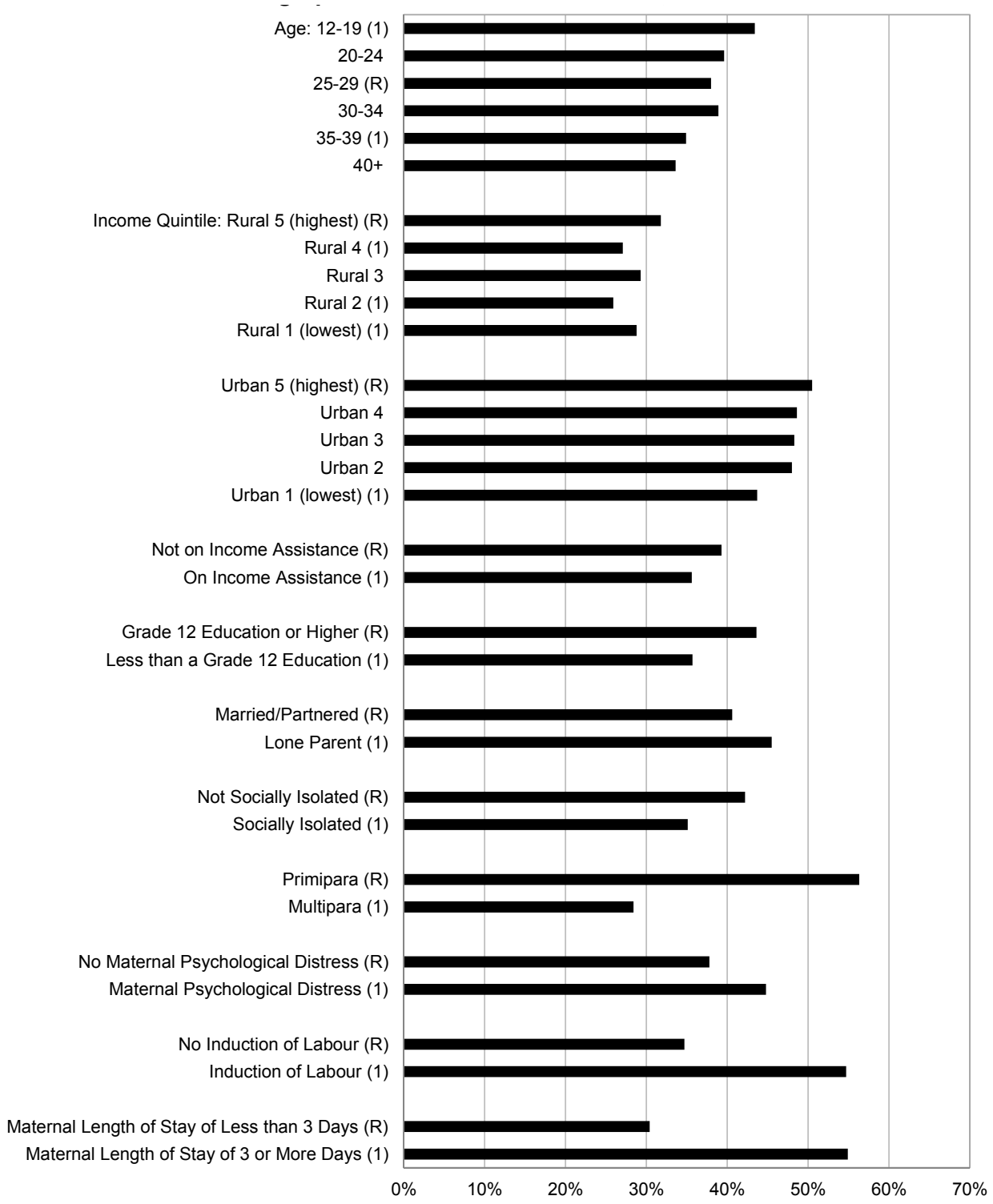
Figure 4.4.3: Proportion of Vaginal Births with Epidural Anesthesia by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.4.4: Proportion of Vaginal Births with Epidural Anesthesia by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.5 Assisted Vaginal Birth

Background

Assisted vaginal birth, also known as operative vaginal delivery, is defined as a birth which is assisted by the use of **forceps** or **vacuum extraction**. While rates of cesarean birth are increasing, the rates of assisted vaginal birth are declining, although there is a great deal of variation internationally (Goetzinger & Macones, 2008). A variety of factors influence the decision to operatively assist a vaginal birth, including practitioner training and experience, instrument preference, and on–going debate regarding short and long–term risks of operative vaginal delivery versus cesarean delivery (Abenhaim, Morin, Benjamin, & Kinch, 2007; Menacker & Hamilton, 2010). There are also concerns regarding the possibility of litigation, as birth injuries associated with assisted vaginal birth is a frequent source of malpractice lawsuits (Goetzinger & Macones, 2008; Zwecker, Azoulay, & Abenhaim, 2011). Indications for assisted vaginal birth may be related to fetal or maternal factors which have resulted in inadequate progress during the second stage of labour. Each case must be carefully considered to determine if operative vaginal delivery is an appropriate option. In general, the use of forceps has been associated with greater incidence of facial bruising and lacerations in the neonate as well as increased rates of episiotomy and third and fourth degree perineal laceration. Application of the vacuum extractor has been linked to an increased risk of neonatal morbidities such as intracranial bleeding, **jaundice**, and cephalohematoma (Goetzinger & Macones, 2008).

Calculation of the Indicator

Assisted vaginal births were calculated as the proportion of vaginal births that were assisted by the means of forceps or vacuum extraction. All home births attended by a midwife were coded as vaginal births that were not assisted. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 4.5.1
    - The Manitoba rate ranged from 8.2% (2001/02) to 9.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 8.1% in 2002/03 to a high of 9.1% in 2008/09.
    - The Winnipeg rate ranged from 8.9% (2001/02) to 10.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 8.5% in 2002/03 to a high of 10.6% in 2008/09.
    - The Brandon rate ranged from 12.6% (2001/02) to 11.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 12.6% in 2001/02 to a low of 6.6% in 2005/06.
    - The rate for the North ranged from 6.6% (2001/02) to 7.5% (2008/09); the linear trend was significant; the rate increased over time from a low of 6.3% in 2002/03 to a high of 9.5% in 2007/08.
- RHA (2007/08–2008/09), Figure 4.5.2
    - Manitoba rate was 8.8%.
    - Central (6.6%), North Eastman (5.8%), and NOR–MAN (4.6%) were significantly lower than the Manitoba rate, while Winnipeg (10.1%) was significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 4.5.3
    - Winnipeg rate was 10.1%.
    - Point Douglas (6.6%) was significantly lower than the Winnipeg rate, while River Heights (12.9%) and Seven Oaks (13.1%) were higher.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.5.4
  There was a statistically significant difference in the proportion of women giving birth vaginally who had an assisted vaginal birth for the following characteristics:
  - Maternal Age – 11.3% of women aged 12 to 19 giving birth vaginally had an assisted vaginal birth and 12.6% of women aged 40 and older giving birth vaginally had an assisted vaginal birth; these rates were significantly higher than the reference group (25 to 29, 8.9%). Only 7.5% of those 20 to 24 giving birth vaginally had an assisted vaginal birth. This rate was significantly lower than the reference group (25 to 29, 8.9%).
  - Income Quintile – In rural areas, there were fewer vaginal births that were assisted in the lowest three income quintiles compared to the highest income quintile (Rural 1, 6.6%; Rural 2, 7.2%; Rural 3, 6.9% compared to 9.2% in Rural 5). In the urban areas, there were fewer vaginal births that were assisted in the lowest income quintile (Urban 1, 8.8%; Urban 5, 10.7%).
  - Income Assistance – 6.3% of women giving birth vaginally who were on income assistance had an assisted vaginal birth compared to 9.3% of women who were not on income assistance.
  - Maternal Education – 7.4% of the women giving birth vaginally who had less than a Grade 12 education had an assisted vaginal birth compared to 9.7% of those with a Grade 12 education.
  - Parity – 16.6% of primiparous women giving birth vaginally had an assisted vaginal birth compared to 4.2% of multiparous women.
  - Vaginal Birth with an Epidural – 14.7% of women giving birth vaginally and who had an epidural had an assisted vaginal birth compared to 5.2% of women who gave birth vaginally and did not have an epidural.

Comparison to Other Findings

In Canada, the rate of forceps deliveries declined significantly from 7.4% in 1995–1996 to 4.6% in 2004–2005, while the rate of vacuum extraction varied from 9.4% to 11.2% over the same time period. The overall operative vaginal delivery rate in Canada was 14.8% in 2004–2005 (Public Health Agency of Canada, 2008). In Manitoba, the overall rate of assisted vaginal births increased from 8.1% to 9.1% between 2001/2002 to 2008/2009 but remained much lower than the Canadian rate. It is interesting to note that this lower rate of assisted vaginal births in Manitoba, compared to the national level, is also associated with a lower cesarean birth rate in Manitoba compared to other provinces.

Limitations

"The use of operative instruments to assist vaginal delivery is considered a minor procedure. Coding of these procedures may therefore be incomplete, resulting in an underestimation of rates" (Public Health Agency of Canada, 2008). Our analysis did not differentiate assisted vaginal births by forceps or vacuum, although independent data from the tertiary centers in Winnipeg show a shift towards more use of vacuum than forceps (Personal communication, Dr. M. Helewa, May 1, 2012). In Canada, the vacuum extraction to forceps delivery ratio increased from 1.3 in 1995–1995 to 2.2 in 2004–2005 (Public Health Agency of Canada, 2008). Our data also do not differentiate low versus mid–pelvic operative vaginal deliveries. We did not assess the impact of forceps use on cesarean birth rates resulting from dystocia in the second stage.

Summary

In 2001/02–2008/09, the rate of assisted vaginal birth in Manitoba was 8.8%, while the Winnipeg rate was higher at 10.1%. Women who had assisted vaginal births were more likely to be either younger (aged 12 to 19) or older (aged 40 and older), primiparous, or have an epidural for pain control. Lower rates of assisted vaginal birth occurred in women who received income assistance, had less than a Grade 12 education, or lived in lower income areas (Rural 1, 2, or 3 and Urban 1).

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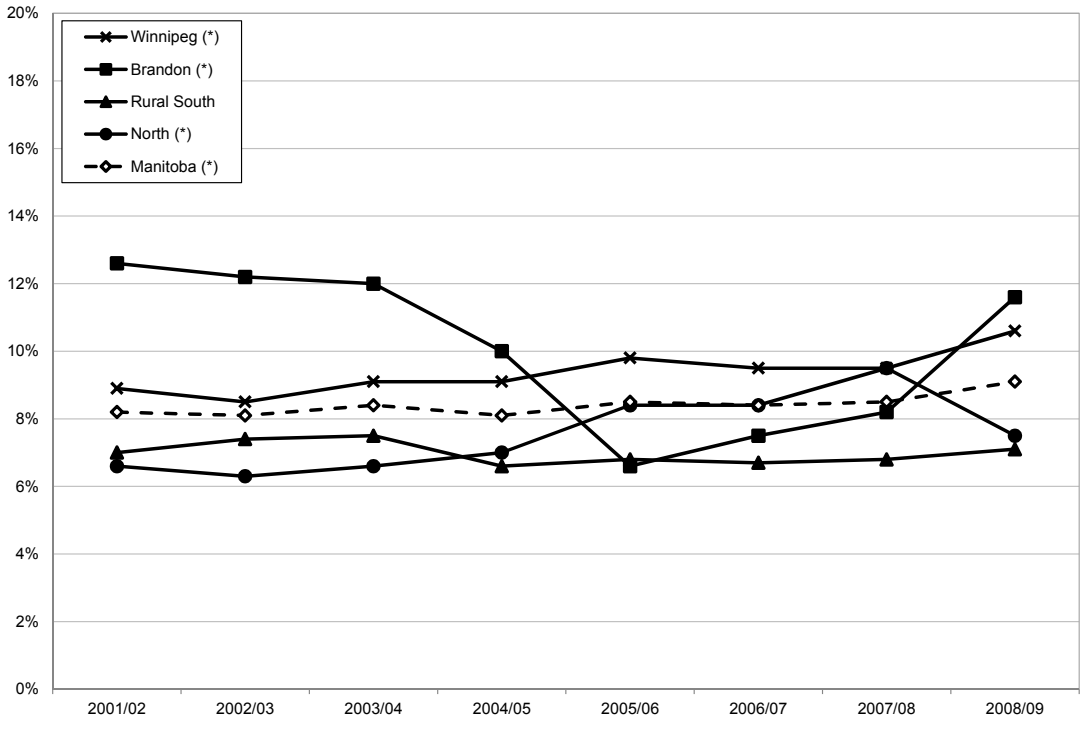
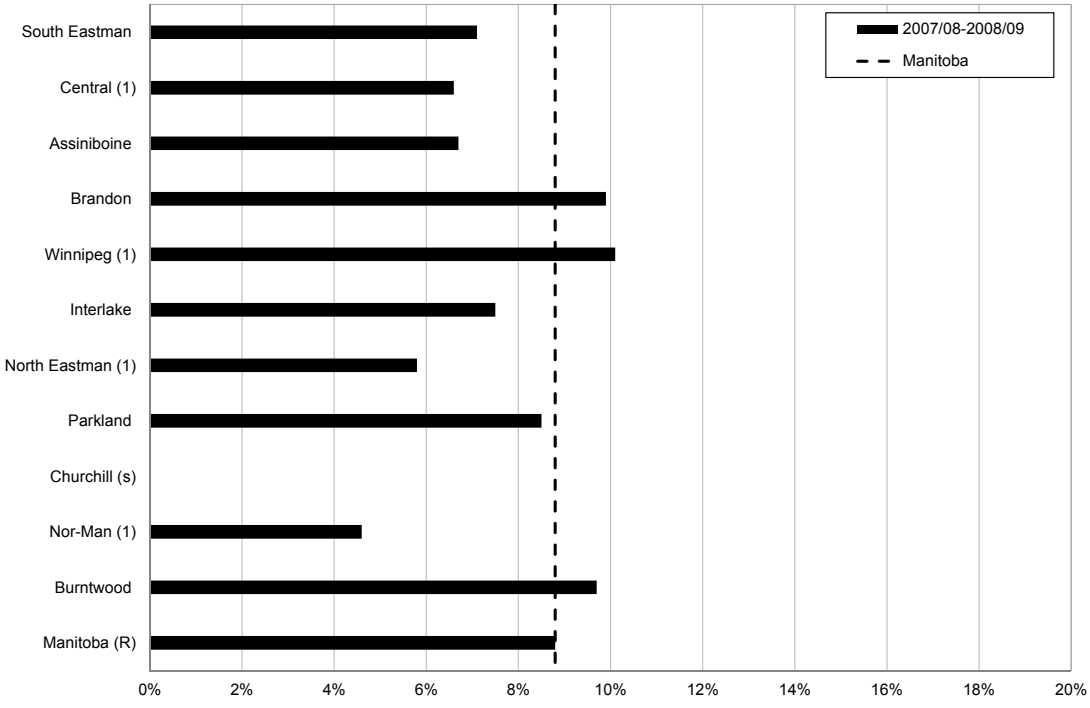
Figure 4.5.1: Proportion of Vaginal Births that were Assisted Vaginal Births by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

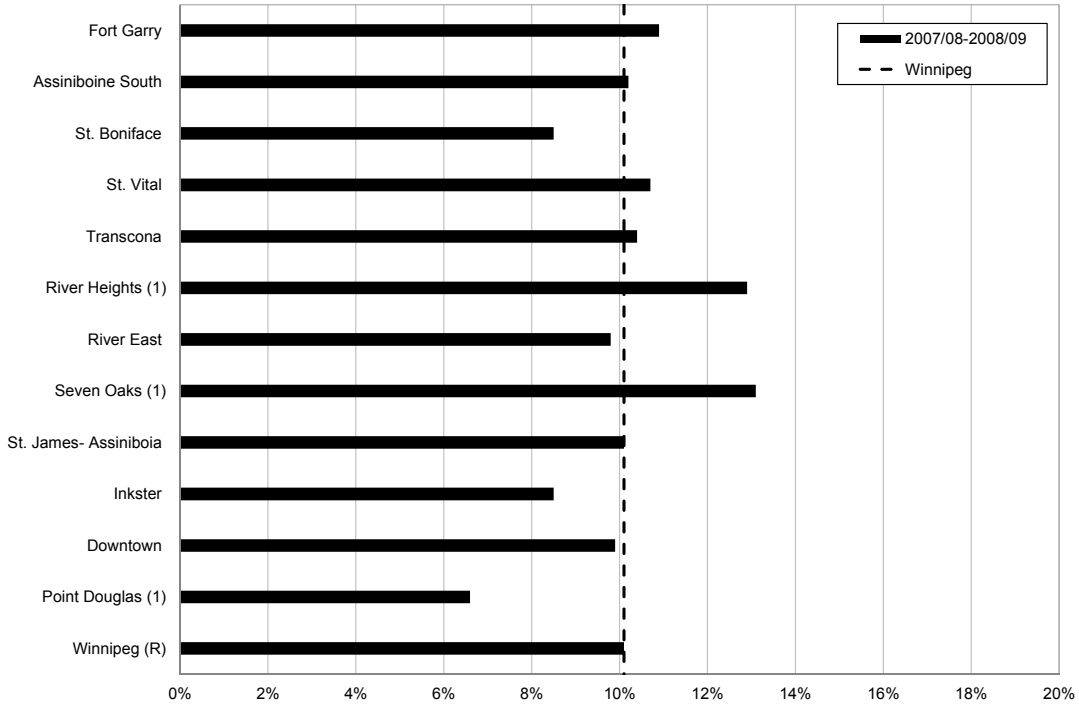
Figure 4.5.2: Proportion of Vaginal Births that were Assisted Vaginal Births by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

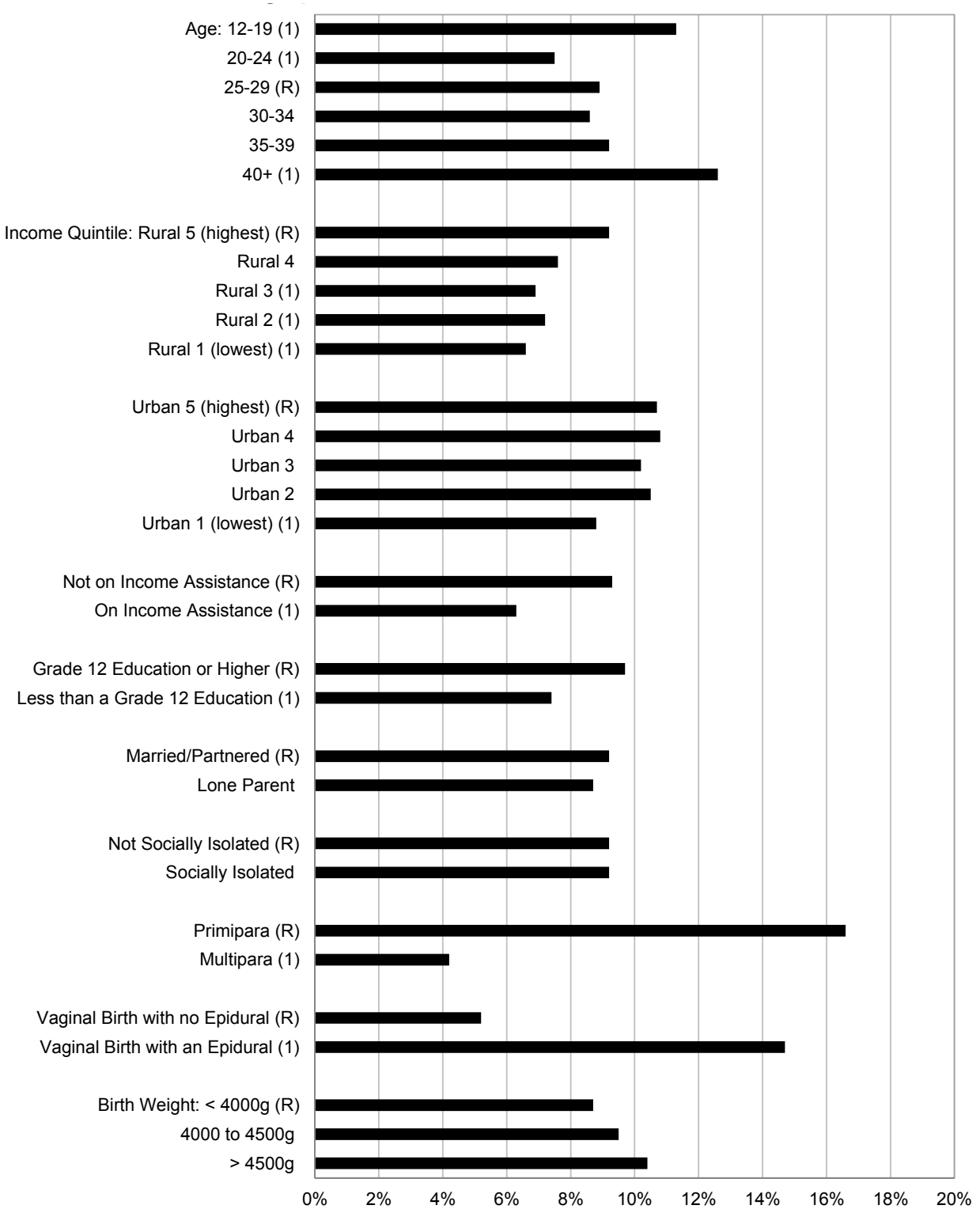
Figure 4.5.3: Proportion of Vaginal Births that were Assisted Vaginal Births by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.5.4: Proportion of Vaginal Births that were Assisted Vaginal Births by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.6 Cesarean Birth

Background

According to the Canadian Perinatal Health Report, the rate of cesarean births in Canada increased from 17.6% to 25.6% in the decade between 1995/96 and 2004/05 (Public Health Agency of Canada, 2008). This increase was mostly due to an increase in primary cesarean births (12.6% to 18.6% in this time period) and to a reduction in Vaginal Birth after a Cesarean (VBAC) (35.3% to 20% in the same time period). The main contributors to primary cesarean births in that decade were more frequent diagnosis of dystocia (6.7% to 10.3% of all deliveries), **breech presentation** (3% to 3.5% of all deliveries), and to a lesser degree for the diagnosis of "fetal distress" (1.6% to 2.6% of all deliveries).

This is more recently confirmed by the report *Perinatal Health Indicators for Canada 2011*, in which the rate of cesarean births in Canada further increased from 21.9% in 2001/2002 to 27.8% in 2009/2010. The primary cesarean birth rate increased from 16.1% to 19.7%, and the repeat cesarean birth rate increased from 71% to 81.7% in the same time period (Public Health Agency of Canada, 2012).There were regional variations in overall rates of cesarean births and in the indications for cesarean births. Nunavut, Saskatchewan, and Manitoba had the lowest rates of cesarean births in the country in 2004/2005. Manitoba remains a province with one of the lowest cesarean birth rates, significantly lower than the national average in 2010 (Public Health Agency of Canada, 2012).

Calculation of the Indicator

The cesarean birth rate is defined as the number of cesarean births expressed as a percent of the total number of hospital births (in a given place and time). Time trends were across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 4.6.1
    - The Manitoba rate ranged from 18.0% (2001/02) to 19.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 18.0% in 2001/02 to a high of 20.9% in 2005/06.
    - The Winnipeg rate ranged from 18.1% (2001/02) to 20.2% (2008/09); the linear trend was significant; the rate increased over time from a low of 18.1% in 2001/02 to a high of 20.7% in 2005/06.
    - The Brandon rate ranged from 21.3% (2001/02) to 29.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 19.1% in 2002/03 to a high of 29.3% in 2008/09.
    - The rate for the Rural South ranged from 18.2% (2001/02) to 19.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 18.2% in 2001/02 to a high of 21.8% in 2005/06.
- RHA (2007/08–2008/09), Figure 4.6.2
    - Manitoba rate was 19.8%.
    - Assiniboine (24.3%), Brandon (28.4%), and Parkland (24.9%) were significantly higher than the Manitoba rate; while Interlake (17.0%), North Eastman (16.1%), and Burntwood (15.0%) were significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 4.6.3
    - The Winnipeg rate was 19.9%.
    - St. Boniface (23.3%) was significantly higher than the Winnipeg rate.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.6.4
  There was a statistically significant difference in the proportion of women giving birth who had a cesarean birth for the following characteristics:
  - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age, there were more cesarean births.
  - Income Quintile – In both Rural 1 (17.7%) and Urban 1 (17.6%), there were fewer cesarean births than the reference groups (Rural 5, 20.3%; Urban 5, 20.9%).
  - Income Assistance – 15.2% of the women on income assistance had a cesarean birth compared to 20.6% of those women not on income assistance.
  - Maternal Education – 16.1% of women with less than a Grade 12 education had a cesarean birth compared to 22.0% of those with a Grade 12 education.
  - Marital Status – 16.2% of women who were lone parents had a cesarean birth compared to 21.4% of those who were married/partnered.
  - Parity – 18.8% of multiparous women had a cesarean birth compared to 21.6% of primiparous women.
  - Maternal Hypertension – 31.9% of women who had hypertension had a cesarean birth compared to 18.7% of those who did not have hypertension.
  - Maternal Diabetes – 33.4% of women who had diabetes had a cesarean birth compared to 18.9% of those who did not have diabetes.
  - **Antepartum Hemorrhage** – 30.0% of women who had an antepartum hemorrhage had a cesarean birth, compared to 19.3% of women who had no antepartum hemorrhage.
  - Placenta Previa/**Abruptio Placenta** – 55.6% of women who had a placenta previa/abruptio placenta diagnosis had a cesarean birth compared to 19.3% of women who did not have this diagnosis.
  - Induction – 17.1% of the women who were induced had a cesarean birth compared to 20.5% of women who were not induced.
  - Previous Cesarean Birth – 67.6% of women who had a previous cesarean birth had another cesarean birth compared to 13.8% of women who had not had a previous cesarean birth.
  - **Malpresentation** – 81.9% of women who had a breech malpresentation and 38.9% of women who had another type of malpresentation had a cesarean birth compared to 15.0% of women who had no malpresentation.
  - Fetal Distress – 32.5% of the women who experienced fetal distress during labour had a cesarean birth compared to 17.4% of women who did not experience fetal distress.
  - Multiple Births – 48.9% of women who had a multiple birth had a cesarean birth compared to 19.4% of those who had a singleton.
  - Birth Weight – 28.2% of women who gave birth to a baby weighing more than 4,500 grams had a cesarean birth compared to 20.9% of women who gave birth to a baby weighing 4,000 to 4,500 grams.
  - Gestation – 34.8% of women gave birth at less than 34 weeks gestation (early preterm), 29.1% of women who gave birth at 34 to 36 weeks gestation (late preterm), 24.8% of women who gave birth at 37 to 38 weeks (early term) gestation, and 23.7% of women who gave birth at 42 or more weeks gestation (postterm) had a cesarean birth which were significantly higher than the reference group (39 to 41 weeks, term; 17.0%).

Comparison to Other Findings

Manitoba remains a province with one of the lowest cesarean birth rates (19.9%) in Canada, significantly lower than the national average of 28.0% in 2008/09 (Public Health Agency of Canada, 2012). In Manitoba, the lower cesarean birth rate could be due to a lower tendency to diagnose dystocia, a policy

of prolonging the second stage of labour, aggressive oxytocin use, a more liberal access to vaginal breech deliveries (section 4.9 on **Vaginal Breech Births**), and a very low rate of cesarean births on demand. The VBAC rate in Manitoba is also relatively high (section 4.7 on VBAC).

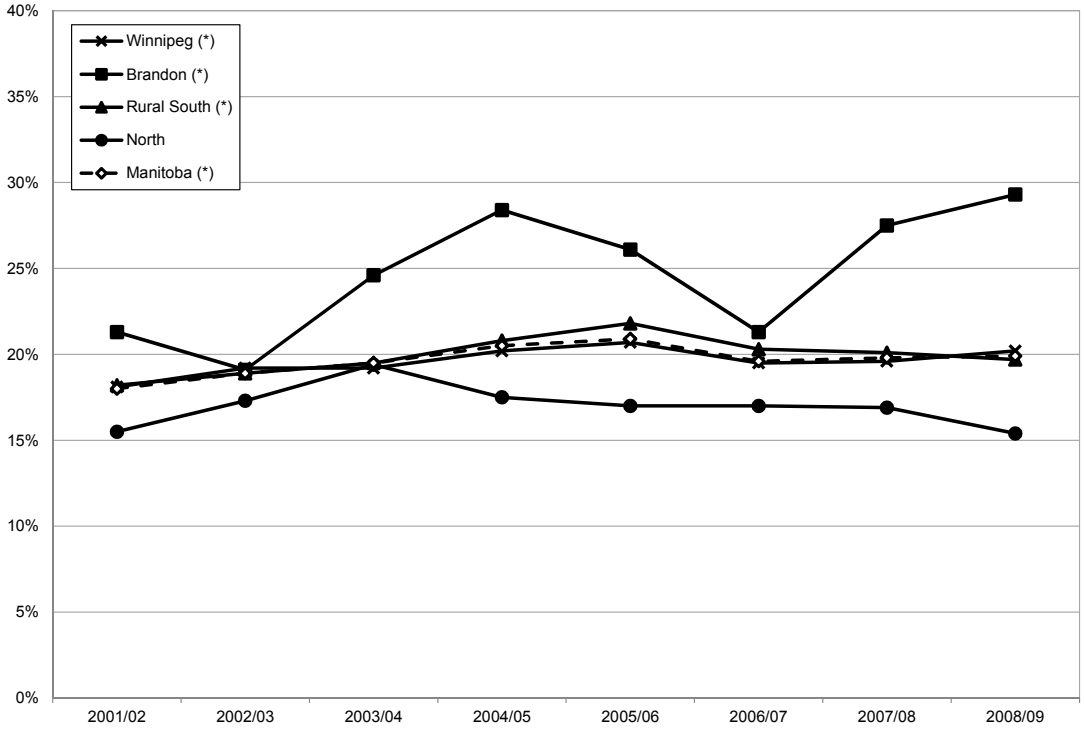
Limitations

We were unable to differentiate planned (elective) versus emergency cesarean birth due to coding changes that occurred in 2004/05. However, data on planned and emergency cesarean births has been available in the **hospital abstracts** from 2009/10 onwards, so analysis of these rates can be conducted in subsequent reports using more current data.

Summary

There has been a significant upward trend in cesarean births in Manitoba from 18.0% to 19.9% during the period of 2001/02 to 2008/09, but the overall cesarean birth rate remains much lower than the national rate of 28.0% in 2008/09 (Public Health Agency of Canada, 2012). There is also regional variation in cesarean birth rates in Manitoba; rates were highest in Brandon. The cesarean birth rate was significantly higher in women who were primiparous; had a breech presentation, twins, fetal **macrosomia** of more than 4500 grams, a previous cesarean birth, a placenta previa/abruptio placenta diagnosis, maternal hypertension, diabetes, antepartum hemorrhage, or baby with a gestational age of less than 38 weeks at delivery; or were of advanced maternal age. Our findings also support the results of the postdate pregnancy randomized trial (Hannah et al., 1992) in that the cesarean birth rate was lower in women who were induced versus those who were not. Our findings also showed that women who were married/partnered, those with higher education, those not on income assistance, and those living in higher income quintile area had higher cesarean birth rates.

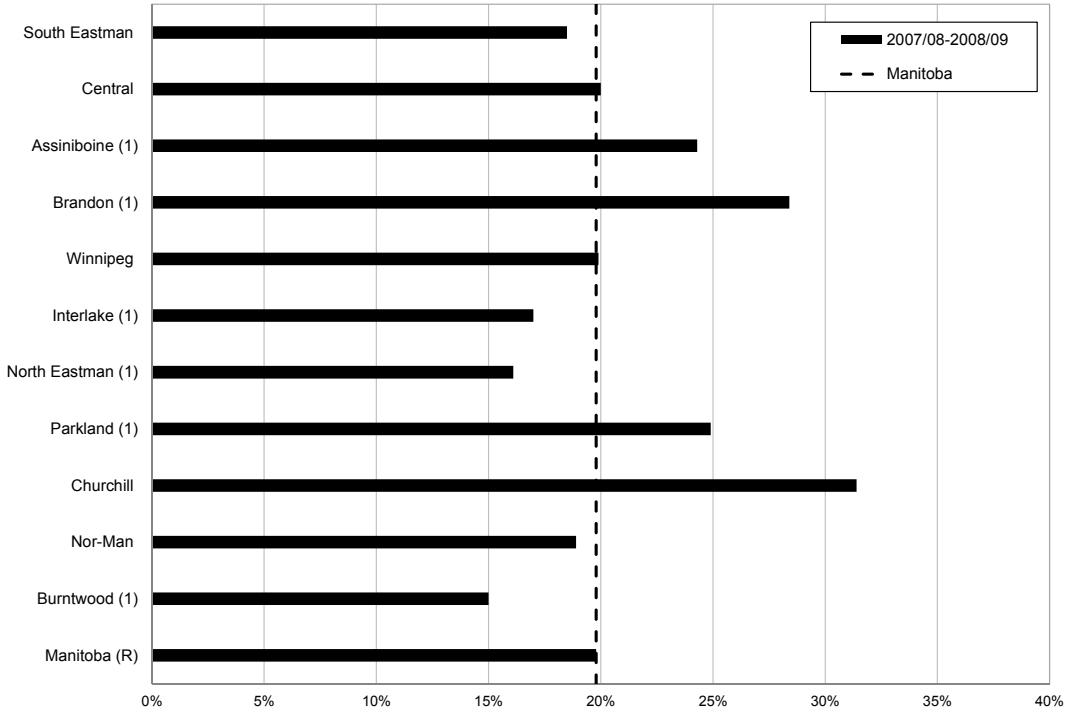
Figure 4.6.1: Proportion of Women who had a Cesarean Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

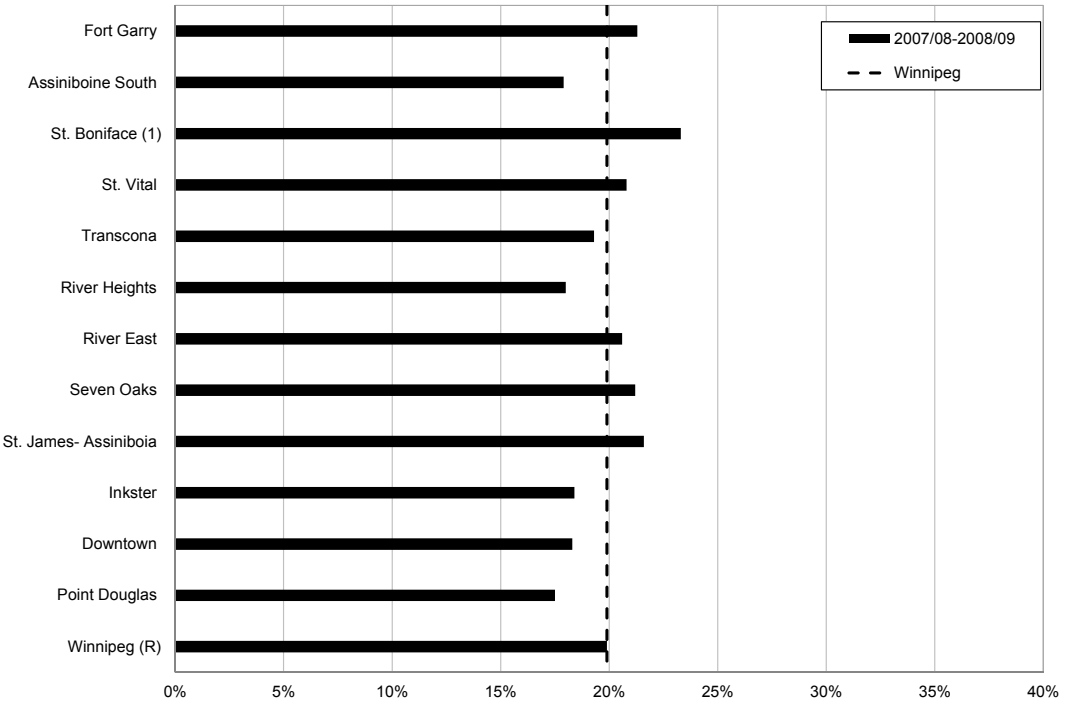
Figure 4.6.2: Proportion of Women who had a Cesarean Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

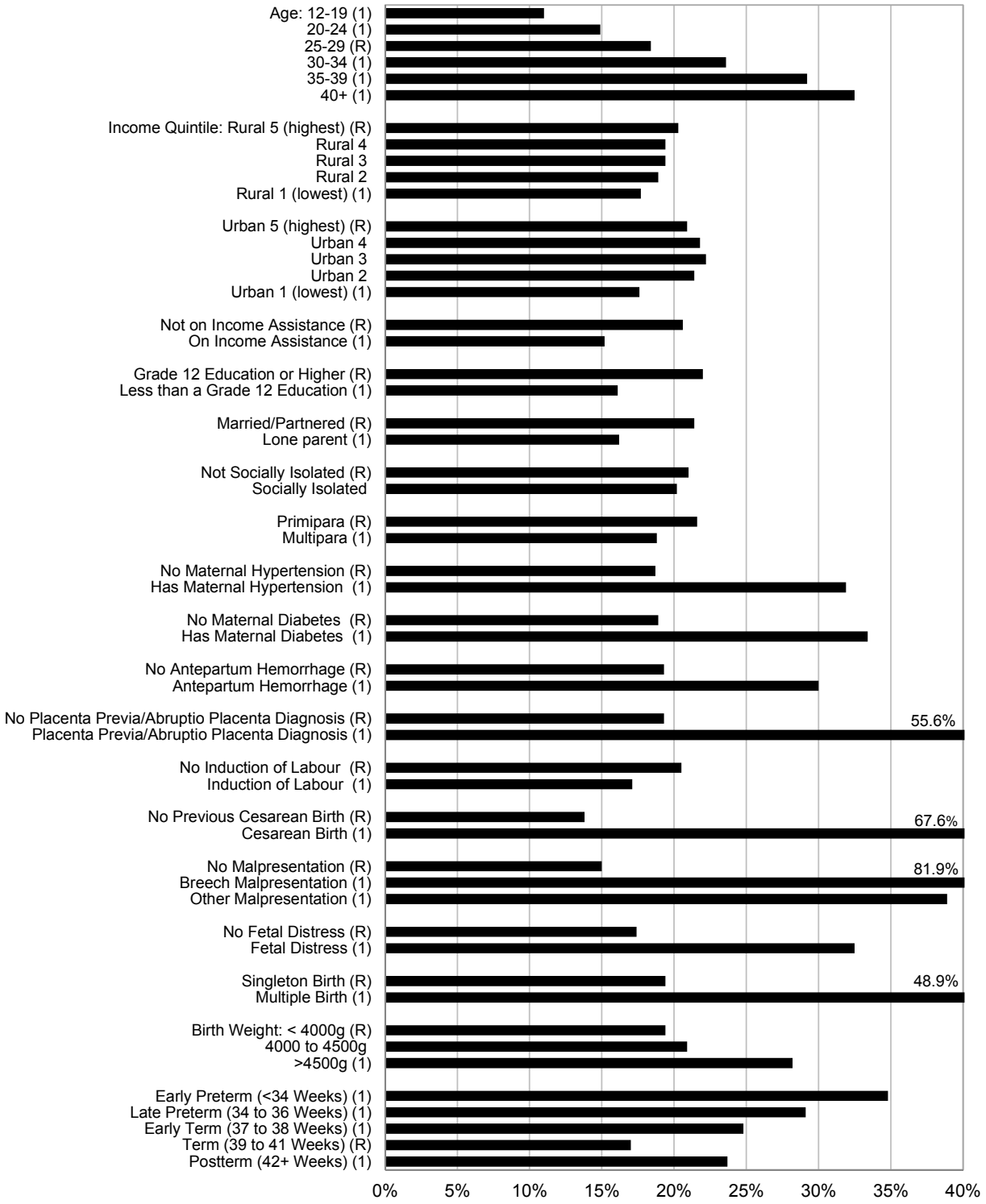
Figure 4.6.3: Proportion of Women who had a Cesarean Birth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.6.4: Proportion of Women who had a Cesarean Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Reference List

Hannah ME, Hannah WJ, Hellman J, Hewson S, Milner R, Willan A. Induction of labor as compared with serial antenatal monitoring in post–term pregnancy: A randomized controlled trial. *The New England Journal of Medicine.* 1992;326(24):1587–1592.

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4.7 Vaginal Birth After Cesarean (VBAC)

Background

With one fifth of pregnant women being delivered by cesarean birth in Manitoba, women are faced with two options for their subsequent delivery: a trial of labour or an elective cesarean birth. It is estimated that 50% to 80% of women having a trial of labour end up with a successful vaginal birth (Vaginal Birth after Cesarean or VBAC) depending on the report cited and stringency of the selectivity of patients (Cowan, Kinch, Ellis, & Anderson, 1994; Martel, MacKinnon, & Clinical Practice Obstetrics Committee, 2005; Stone, Halliday, Lumley, & Brennecke, 2000). However, VBAC rates have been dropping in various countries including Canada. Exaggerated perceived fear of uterine rupture and resultant fetal and neonatal compromise with trial of labour (Dodd, Crowther, Huertas, Guise, & Horey, 2004; Guidelines and Audit Committee, Varma, & Gupta, 2007; Holmgren, Scott, Porter, Esplin, & Bardsley, 2012; Thomas, Paranjothy, & Royal College of Obstetricians and Gynaecologists Clinical Effectiveness Support Unit, 2001) and the convenience by which an elective cesarean birth can be arranged and performed are contributing to this trend. However, an elective cesarean birth may be associated with short and long–term complications that include the operative risks of hemorrhage, infections, injury to abdominal organs, peripartum hysterectomy, neonatal respiratory distress syndrome, and subsequent long–term increased risk of placenta accreta, and infertility (Guidelines and Audit Committee et al., 2007). To date there has not been any randomized clinical trial comparing the outcomes between trial of labour versus elective repeat cesarean birth.

Calculation of the Indicator

VBAC was defined as the proportion of women with a prior cesarean birth who subsequently delivered vaginally. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. The analysis of indication for previous cesarean was limited to those women whose previous cesarean was in Manitoba and after 1999/2000. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 4.7.1
  - The Manitoba rate ranged from 32.5% (2001/02) to 29.1% (2004/05) and was relatively stable.
  - The rate for the North ranged from 42.8% (2001/02) to 32.3% (2008/09); the linear trend was significant; the rate decreased over time from a high of 42.8% in 2001/02 to a low of 28.8% in 2002/03.
- RHA (2007/08–2008/09), Figure 4.7.2
  - The Manitoba rate was 30.5%.
  - Assiniboine (21.1%), Brandon (20.8%), and NOR–MAN (14.4%) were significantly lower than the Manitoba rate (30.5%).
- Winnipeg CA (2007/08–2008/09), Figure 4.7.3
  - The Winnipeg rate was 31.4%.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.7.4
  There was a statistically significant difference in the proportion of women giving birth who had a VBAC for the following characteristics:
  - Maternal Age – 55.2% of women aged 12 to 19 who had a previous cesarean birth gave birth vaginally, significantly higher than the reference group (25 to 29, 32.9%). 23.7% of women aged 35 to 39 who had a previous cesarean birth gave birth vaginally, significantly lower than reference group.
  - Income Quintile – In both rural and urban areas, there were more VBACs in the lowest income quintiles (Rural 1, 34.1%; Urban 1, 38.4%) than in the reference groups (Rural 5, 26.5%, Urban 5, 31.1%).

- Income Assistance – 39.0% of women who had a previous cesarean birth and were on income assistance gave birth vaginally compared to 29.1% of women who were not on income assistance.
- Marital Status – 36.9% of women who had a previous cesarean birth and were lone parents gave birth vaginally compared to 28.1% of women who were married/partnered.
- Indication for Previous Cesarean Birth – 45.9% of women who had a breech malpresentation as an indication for a previous cesarean birth gave birth vaginally and 33.0% of women who had other malpresentation as an indication for a previous cesarean birth gave birth vaginally compared to 21.5% of women who had no malpresentation. This analysis was limited to those women whose previous cesarean was in Manitoba and after 1999/2000.

Comparison to Other Findings

The VBAC rate of 30.5% (2007/08 to 2008/09) in Manitoba is much higher than the rate of 8.5% (2006) in the United States (Gregory, Fridman, & Korst, 2010).

Limitations

Unfortunately, the available data from which this report was extracted did not have a code for "trial of labour", hence our inability to report on the trial of labour rates in Manitoba.

Summary

Despite the changing trends in VBAC rates in the rest of Canada and elsewhere, the rate of VBAC in Manitoba has remained stable over time. The North has been an exception; it had higher VBAC rates than urban areas, but has since dropped to be comparable with the urban VBAC rates and the provincial rate. Brandon, Assiniboine, and NOR–MAN had a lower than Manitoba VBAC rate.

Several sociodemographic and other characteristics were noted to be associated with a higher VBAC rates in our data. These included younger maternal age (aged 12 to 19), living in the lowest income quintile area, being on income assistance, being a lone parent, and having a previous cesarean birth done for malpresentation. These findings are consistent with data recorded in the literature (Weinstein, Benshushan, Tanos, Zilberstein, & Rojansky, 1996).

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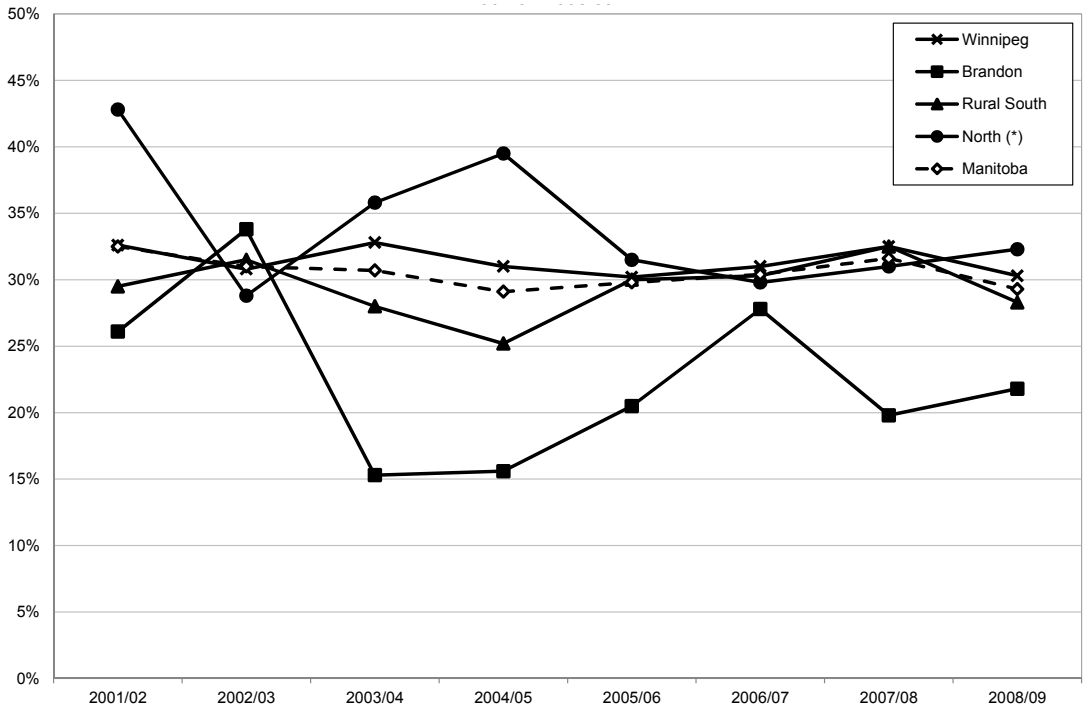
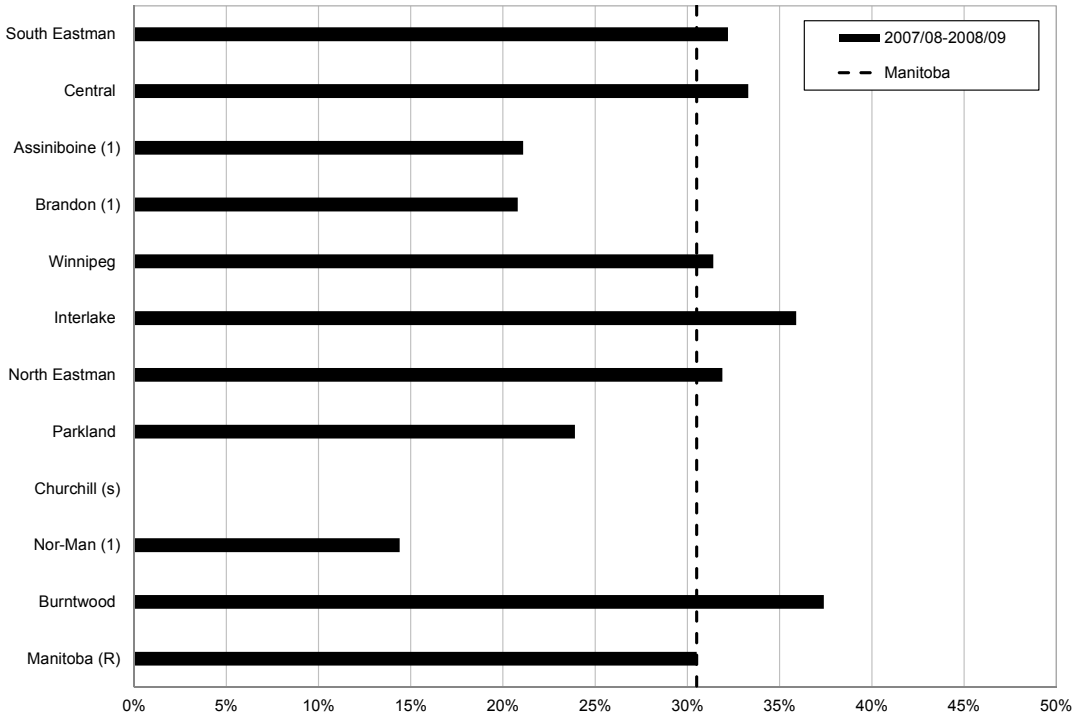
Figure 4.7.1: Proportion of Vaginal Births Among Women with a Previous Cesarean Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

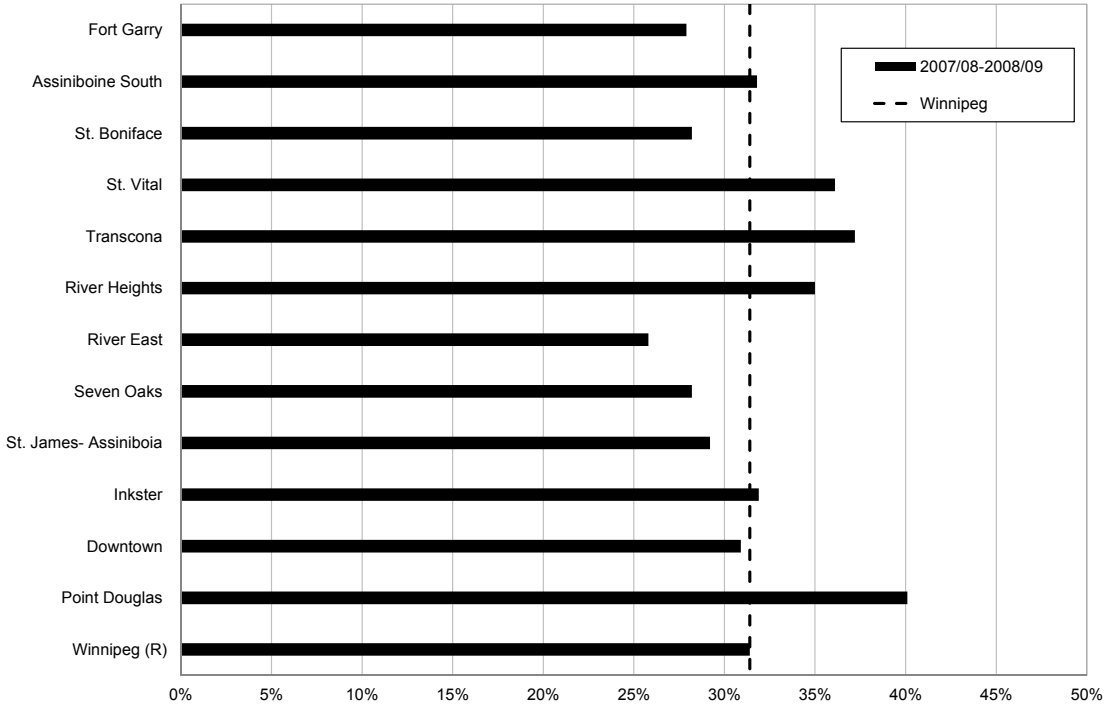
Figure 4.7.2: Proportion of Vaginal Births Among Women with a Previous Cesarean Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

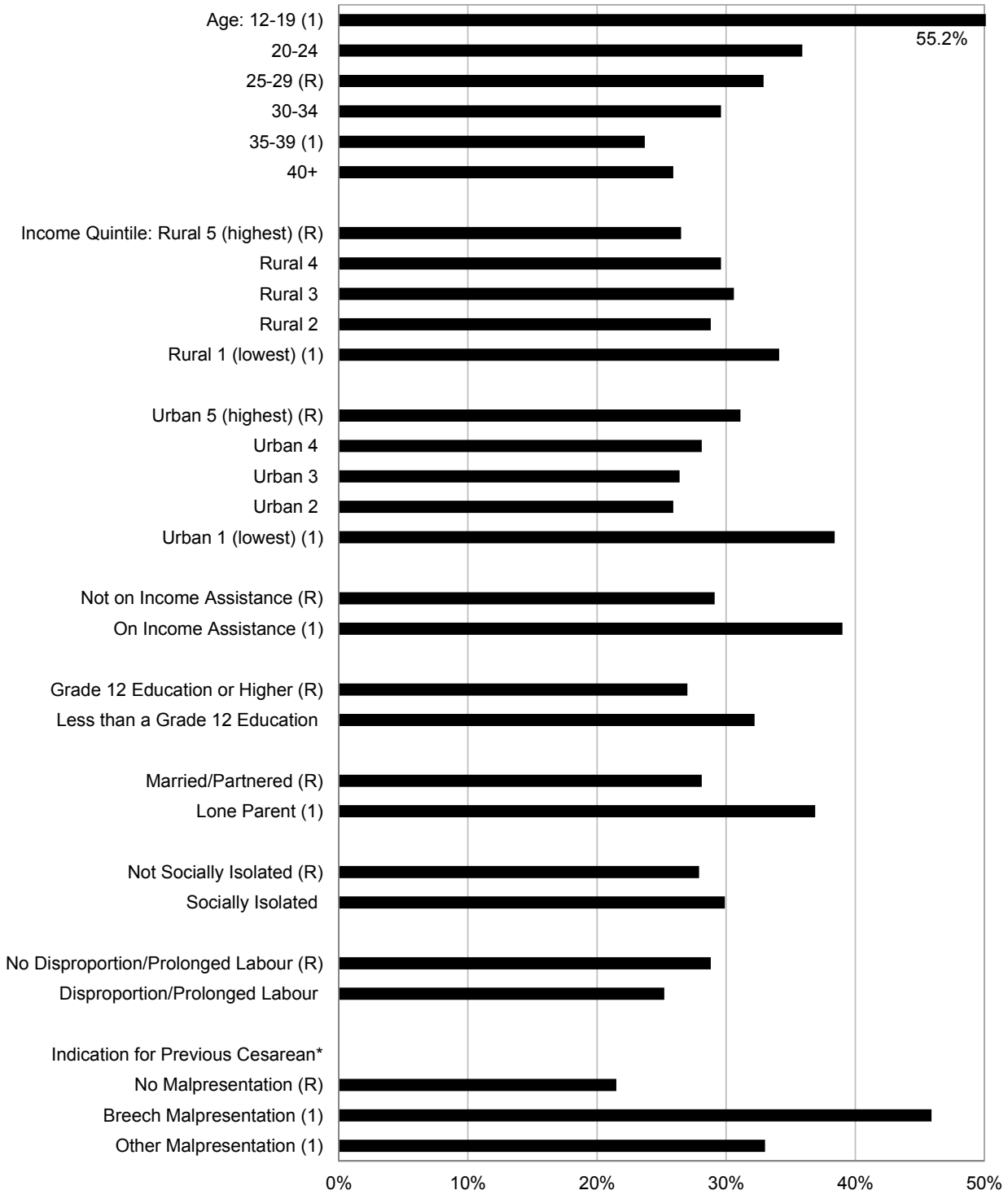
Figure 4.7.3: Proportion of Vaginal Births Among Women with a Previous Cesarean Birth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.7.4: Proportion of Vaginal Births Among Women with a Previous Cesarean Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers
* Limited to women whose previous Cesarean was in Manitoba and after 1999/2000

Source: Manitoba Centre for Health Policy, 2012

4.8 Breech Births

Background

In Canada, **breech births** account for approximately 4% of all births, accounting for nearly 14,000 cases per year (Statistics Canada, 2007). The rate of breech deliveries decreases with increasing gestational age at birth. At 28 weeks gestational age, for example, nearly 24% of babies are born as breech (Cunningham et al., 2005).

Calculation of the Indicator

The proportion of women who had a breech birth was determined by dividing the number of women with a breech delivery by the total number of women giving birth. All breech births (live births and stillbirths) were included in this analysis, regardless of the delivery method. For analysis of vaginal breech deliveries, please see section 4.9 on Vaginal Breech Births. Due to coding changes that occurred, these analyses were limited to 2004/05–2008/09. Time trends were calculated across 2004/05–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2004/05–2008/09), Figure 4.8.1
  - The Manitoba rate ranged 3.5% (2005/06) to 3.9% (2007/08) and was relatively stable.
- RHA (2007/08–2008/09), Figure 4.8.2
  - The Manitoba rate was 3.8%.
- Winnipeg CA (2007/08–2008/09), Figure 4.8.3
  - The Winnipeg rate was 4.1%.
  - St. Vital (5.7%) was significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 4.8.4
  There was a statistically significant difference in the proportion of women giving birth who had a breech birth for the following characteristics:
  - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age, there were more breech births.
  - Income Quintile – In both Rural 1 (2.8%) and Urban 1 (3.3%), there were fewer breech births than the reference groups (Rural 5, 4.2%; Urban 5, 4.2%).
  - Maternal Education – 2.9% of births to women with less than a Grade 12 education were breech compared to 4.1% of births to who had a Grade 12 education.
  - Marital Status – 2.8% of women who were lone parents had a breech birth compared to 4.1% of women who were married/partnered.
  - Parity – 3.4% of multiparous women had a breech birth compared to 4.6% of primiparous women.
  - Multiple Births – 24.8% of women who had multiple births had a breech birth compared to 3.5% of women who had a singleton birth.
  - Delivery Method – 15.9% of women who had a cesarean birth had a breech birth compared to 0.9% of women who had a vaginal birth.

Comparison to Other Findings

The rate of breech deliveries in Manitoba, ranging from 3.5% to 3.9% (2004/05–2008/09), is slightly lower than the Canadian rate of 4% reported by Statistics Canada (2007).

Summary

In Manitoba, the rate of breech deliveries remained stable at 3.5% to 3.9% over the period of observation, despite an increasing number of attempted external cephalic **versions** (Personal communication, Dr. M. Helewa, May 1, 2012). Several associated factors proved significant. Breech delivery was more likely in women who were aged 30 and older, primiparous, married/partnered or had a Grade 12 education. Breech delivery was also more likely in women with multiple births and in those having cesarean birth. It is unclear why these factors proved significant, although an older age group may be the underlying contributor to these observations. Rates of breech delivery were lower among women living in the lowest income quintile (Rural 1 and Urban 1).

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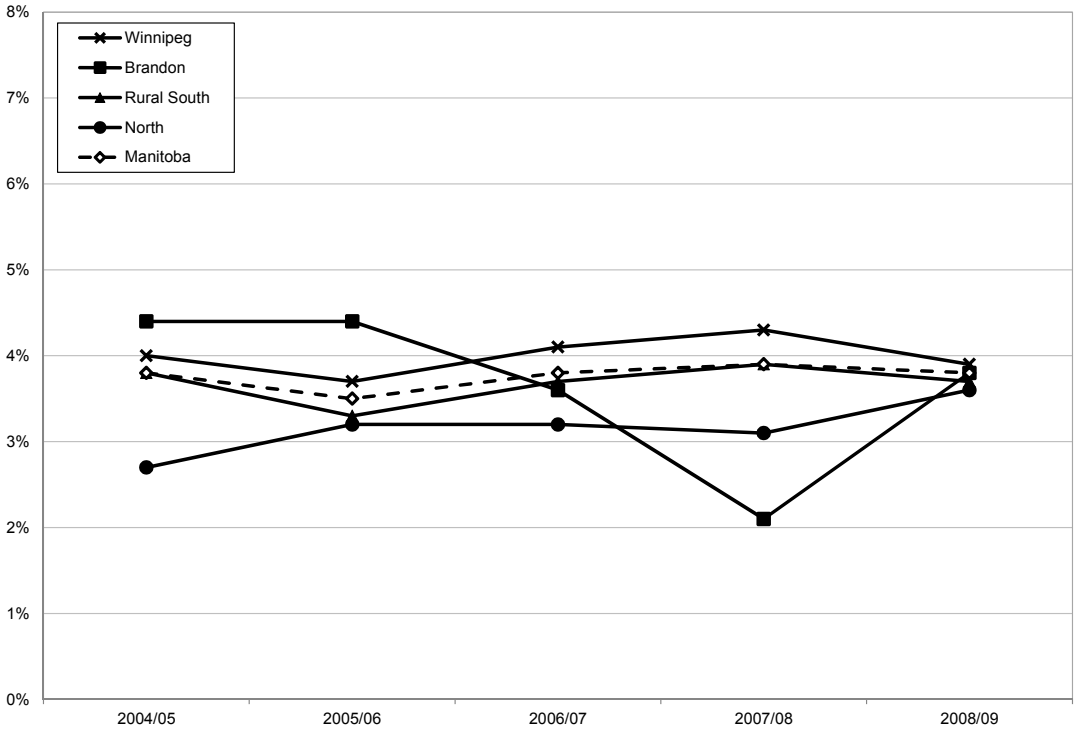
Statistics Canada. Births 2005. Statistics Canada. 2007. http://www.statcan.gc.ca/pub/84f0210x/84f0210x2005001–eng.pdf. Accessed August 8, 2011.

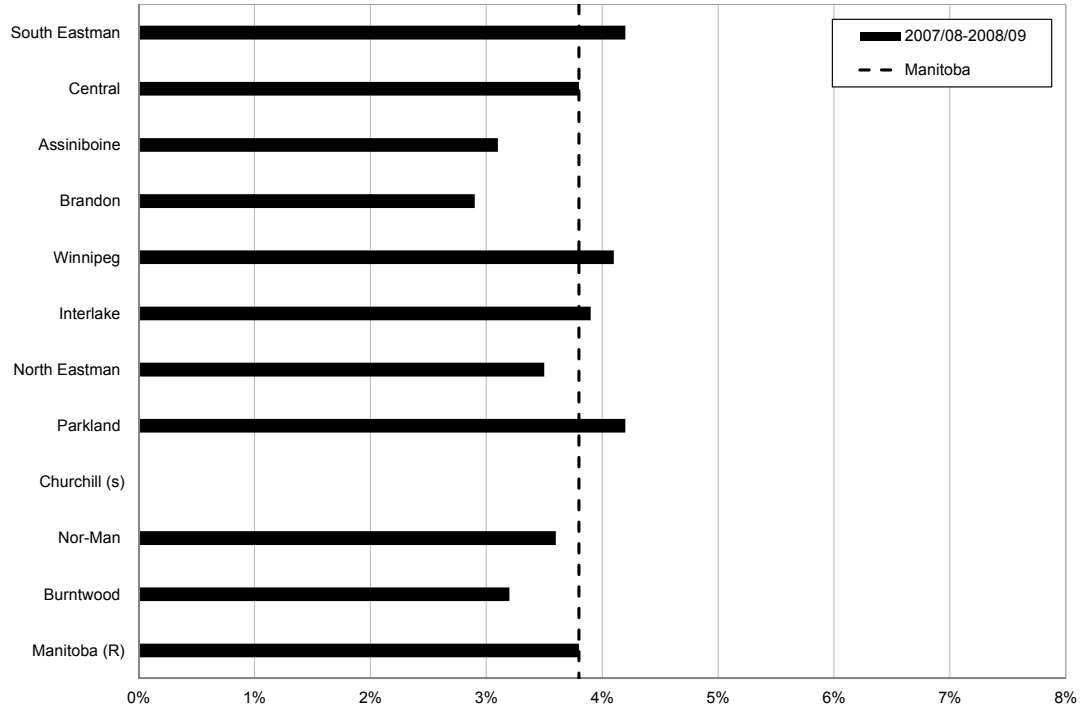
Figure 4.8.1: Proportion of Women with a Breech Birth by Region and Year, 2004/05-2008/09



* Indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

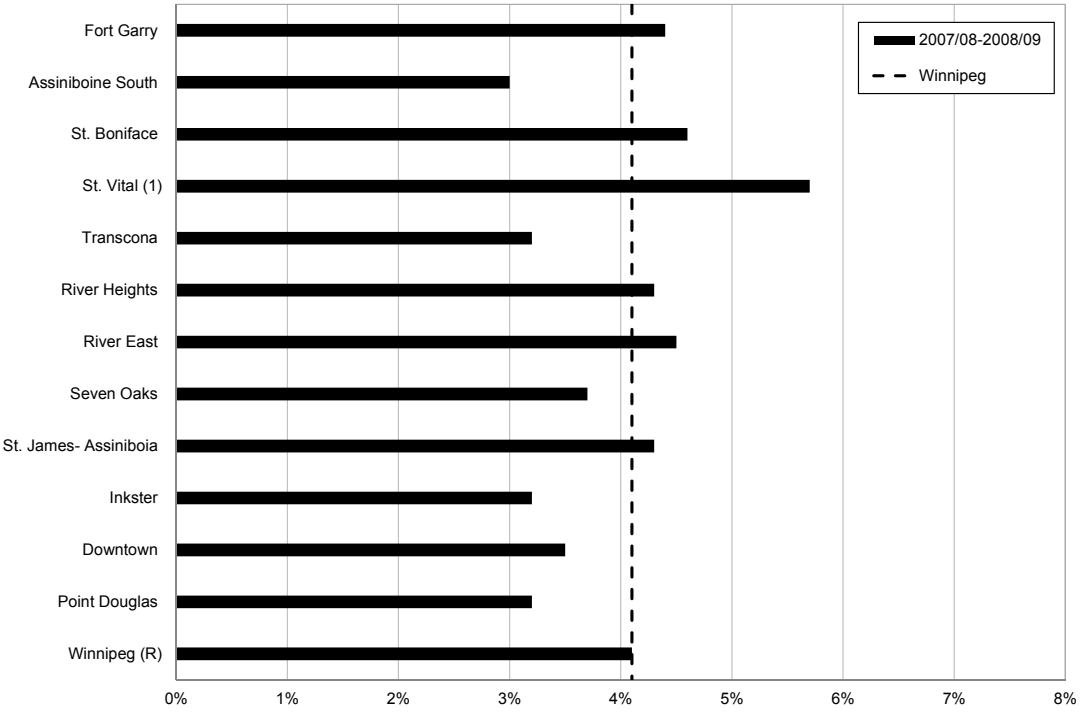
Figure 4.8.2: Proportion of Women with a Breech Birth by RHA, 2007/08–2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

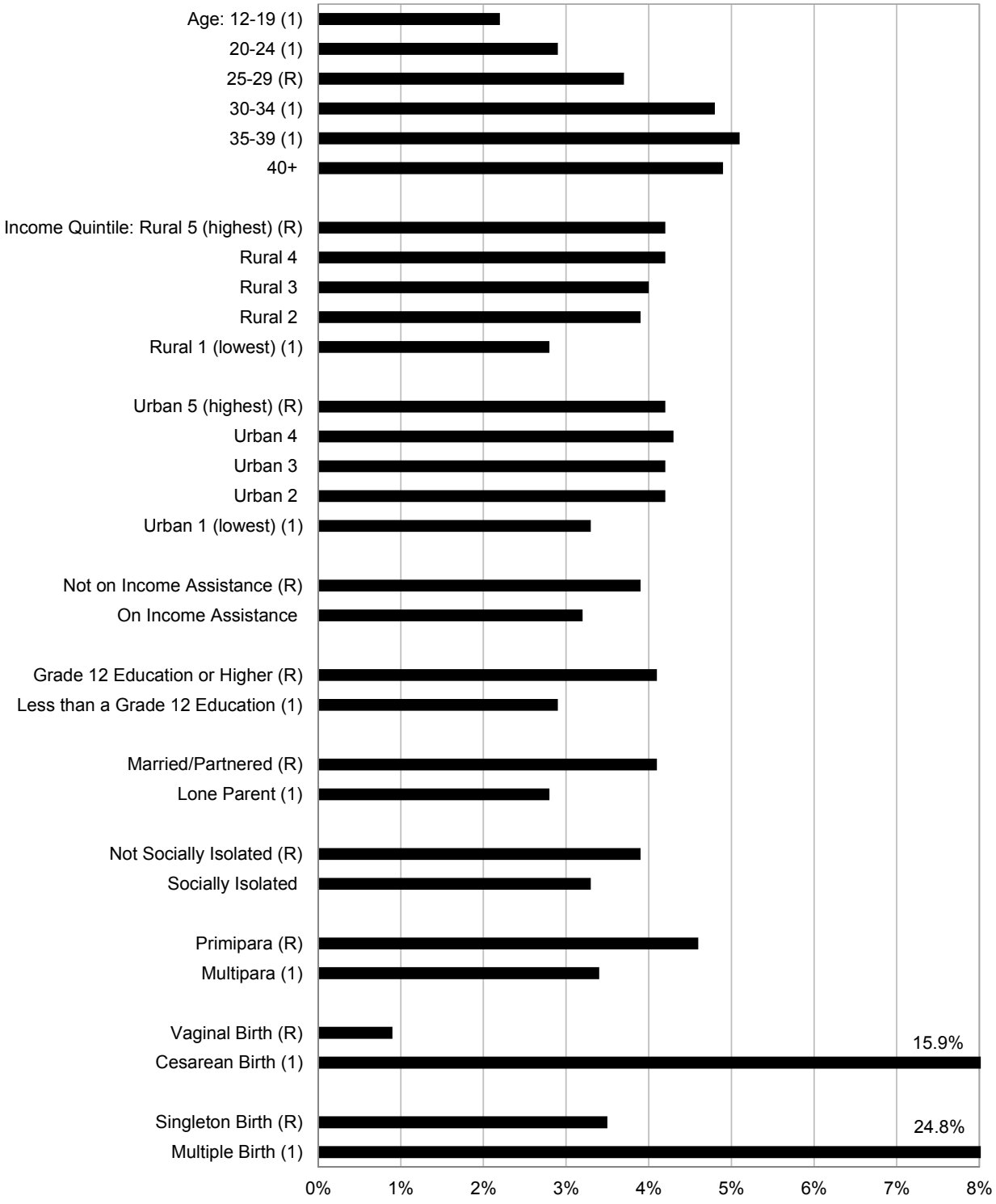
Figure 4.8.3: Proportion of Women with a Breech Birth by Winnipeg CA, 2007/08–2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.8.4: Proportion of Women with a Breech Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.9 Vaginal Breech Birth

Background

Following the publication of results of the Term Breech Trial, a large international multicenter randomized clinical trial in 2000 (Hannah et al., 2000), there was a dramatic upward shift in the proportion of term breech pregnancies being delivered by cesarean birth. This trial showed that in countries of low perinatal mortality such as Canada, serious short term neonatal morbidity was significantly higher in those women who were randomized to an attempt at vaginal birth compared to those where a cesarean birth was planned. There was no difference in maternal morbidity between the two groups. In a two–year follow up, however, there was no difference in childhood long–term morbidity nor mortality (Whyte et al., 2004).

However, this trial was subjected to significant criticism mostly related to concerns about selection of trial patients enrolled for randomization, perceived differences in intrapartum management among centers, and differences in skill levels of the healthcare provider at delivery in various centres (Hannah & Maternal–Fetal Medicine Committee of the Society of Obstetricians and Gynaecologists of Canada, 1997; Kostaska, 2004; Menticoglou, 2006). There were also concerns that the significant shift towards a cesarean birth for the term breech may contribute to the rising national cesarean birth rates and its associated long–term maternal morbidities in subsequent pregnancies, and that the pool of expertise for vaginal birth of breech pregnancies would get eroded with women losing the option of a vaginal birth when the baby presents as a breech. In Manitoba, most women are still counseled regarding their options for management of breech pregnancies at term and are being offered their choice of an attempt at vaginal birth or an elective cesarean birth. (Personal communication, Dr. M. Helewa, May 1 , 2012).

Calculation of the Indicator

The proportion of breech births that were delivered vaginally was determined by taking the number of vaginal breech births and dividing by the total number of breech births. Due to coding changes that occurred, these analyses were limited to 2004/05–2008/09. Time trends were calculated across 2004/05–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Others Characteristics were calculated for 2007/08–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2004/05–2008/09), Figure 4.9.1
    - The Manitoba rate ranged from 13.3% (2004/05) to 19.3% (2008/09); the linear trend was significant; the rate increased over time from a low of 9.6% in 2005/06 to a high of 19.3% in 2008/09.
    - The rate for the Rural South ranged from 13.7% (2004/05) to 20.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 9.8% in 2006/07 to a high of 20.7% in 2008/09.
- RHA (2004/05–2008/09), Figure 4.9.2
    - The Manitoba rate was 14.9%.
    - Assiniboine (6.9%) was significantly lower than the Manitoba rate (14.9%), while NOR–MAN (31.0%) was significantly higher.
- Winnipeg CA (2004/05–2008/09), Figure 4.9.3
    - The Winnipeg rate was 14.5%.

- Sociodemographic and Other Characteristics (2004/05–2008/09), Figure 4.9.4
  There was a statistically significant difference in the proportion of women with breech births that were delivered vaginally for the following characteristics:
  - Maternal Age – 22.1% of the women aged 12 to 19 who had a breech birth, had a vaginal breech birth. This was significantly higher than the reference group (25 to 29, 14.4%).
  - Income Quintile – 17.9% of the women living in Rural 1 and 19.9% of women living in Rural 4 who had a breech birth delivered vaginally. These rates were significantly higher than the reference group (Rural 5, 12.4%).
  - Income Assistance – 22.7% of the women on income assistance who had a breech birth delivered vaginally compared to 13.8% of those not on income assistance.
  - Parity – 19.1% of multiparous women who had a breech birth delivered vaginally compared to 10.5% of primiparous women.
  - Multiple Births – 43.3% of the women with multiple births that were breech delivered vaginally, compared to 12.4% of those who had singletons.
  - Gestation – 33.5% of women who had an early preterm breech birth delivered vaginally and 23.4% of women who had a late preterm breech birth delivered vaginally. These rates were significantly higher than the reference group who delivered at term (10.2%).

Limitations

We did not limit our analysis to term breech pregnancies, so the trends in term vaginal breech deliveries could not be specifically assessed.

Summary

The rate of vaginal beech births in Manitoba showed a significant increase over time, from 13.3% in 2004/05 to 19.3% in 2008/09. NOR–MAN had significantly higher rates of vaginal breech birth (31.0%) compared to the Manitoba rate, while Assiniboine had a significantly lower rate (6.9%). Approximately 10% of term breech pregnancies were delivered vaginally during this time period. Vaginal breech birth was more common in women who were younger (aged 12 to 19), on income assistance, or multiparous or lived in the lowest rural income quintile. Higher rates of vaginal breech birth were associated with multiple births and early preterm and late preterm births.

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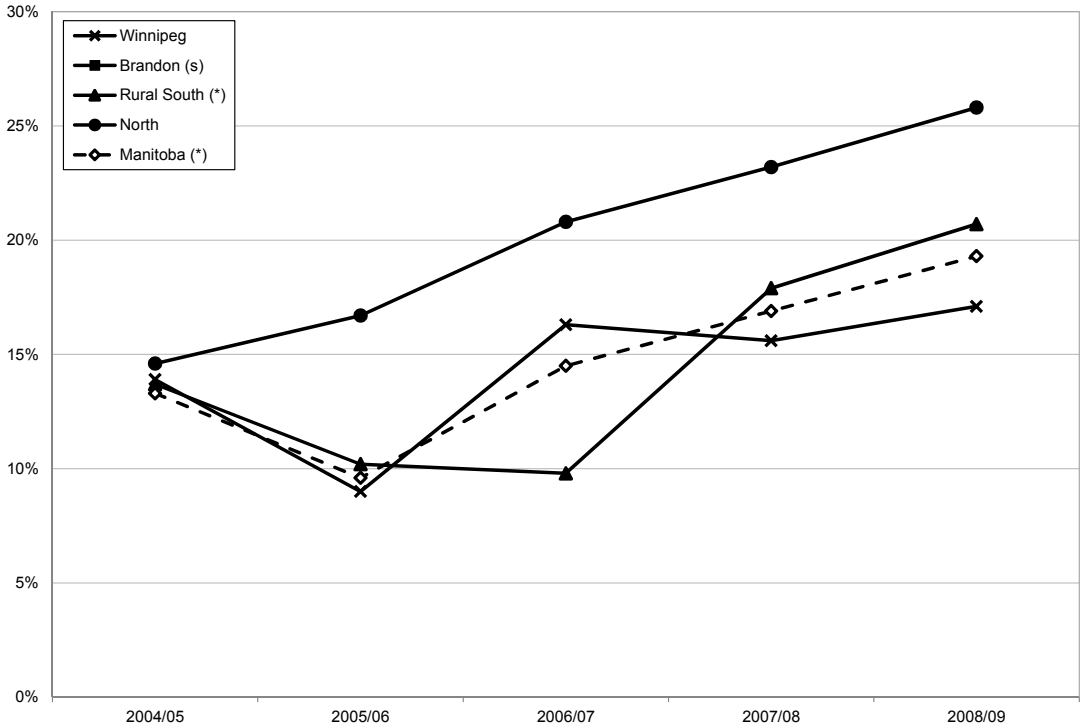
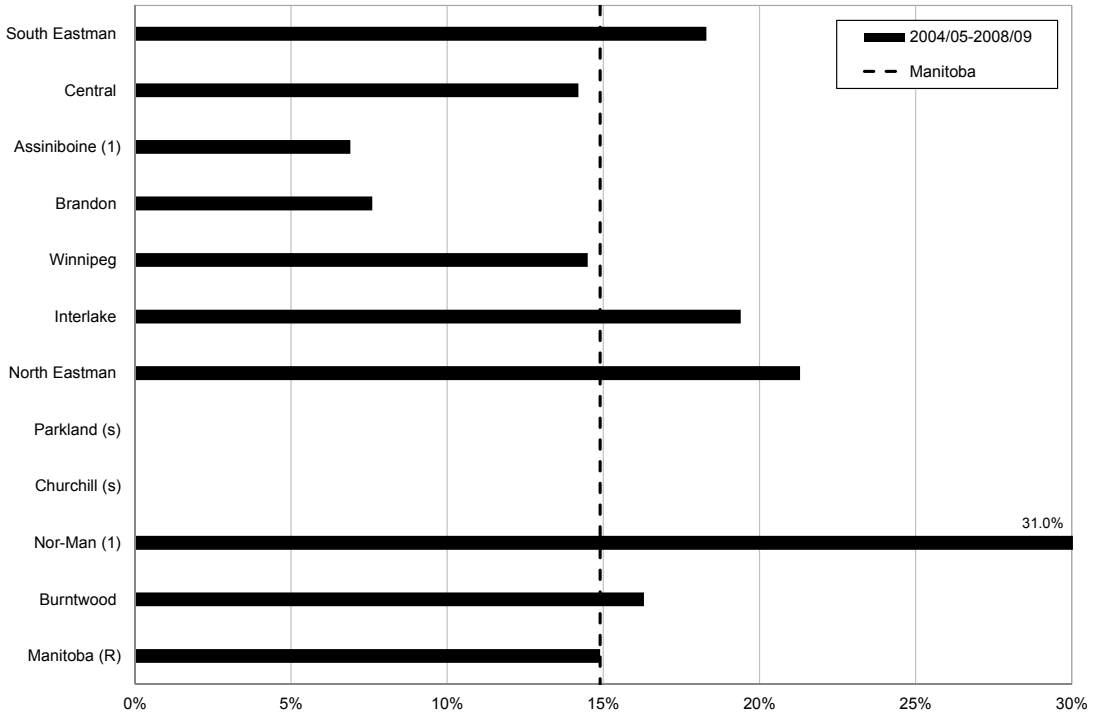
Figure 4.9.1: Proportion of Breech Births Delivered Vaginally by Region and Year, 2004/05-2008/09



* indicates that the linear trend over time is significant at p<0.05
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

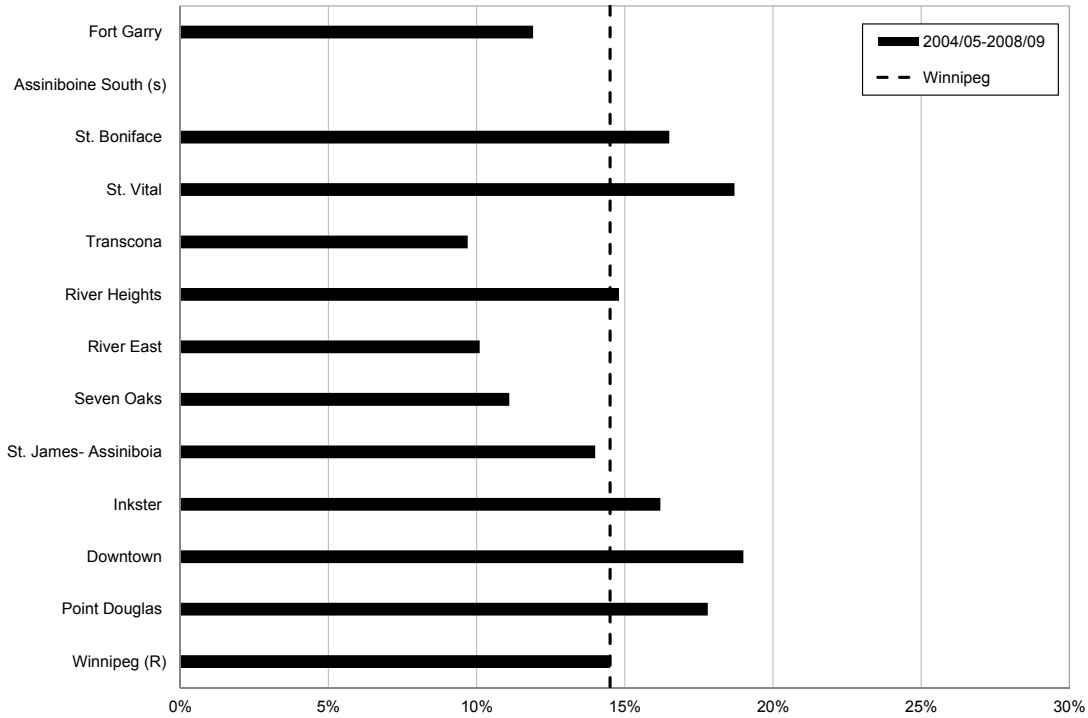
Figure 4.9.2: Proportion of Breech Births Delivered Vaginally by RHA, 2004/05–2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

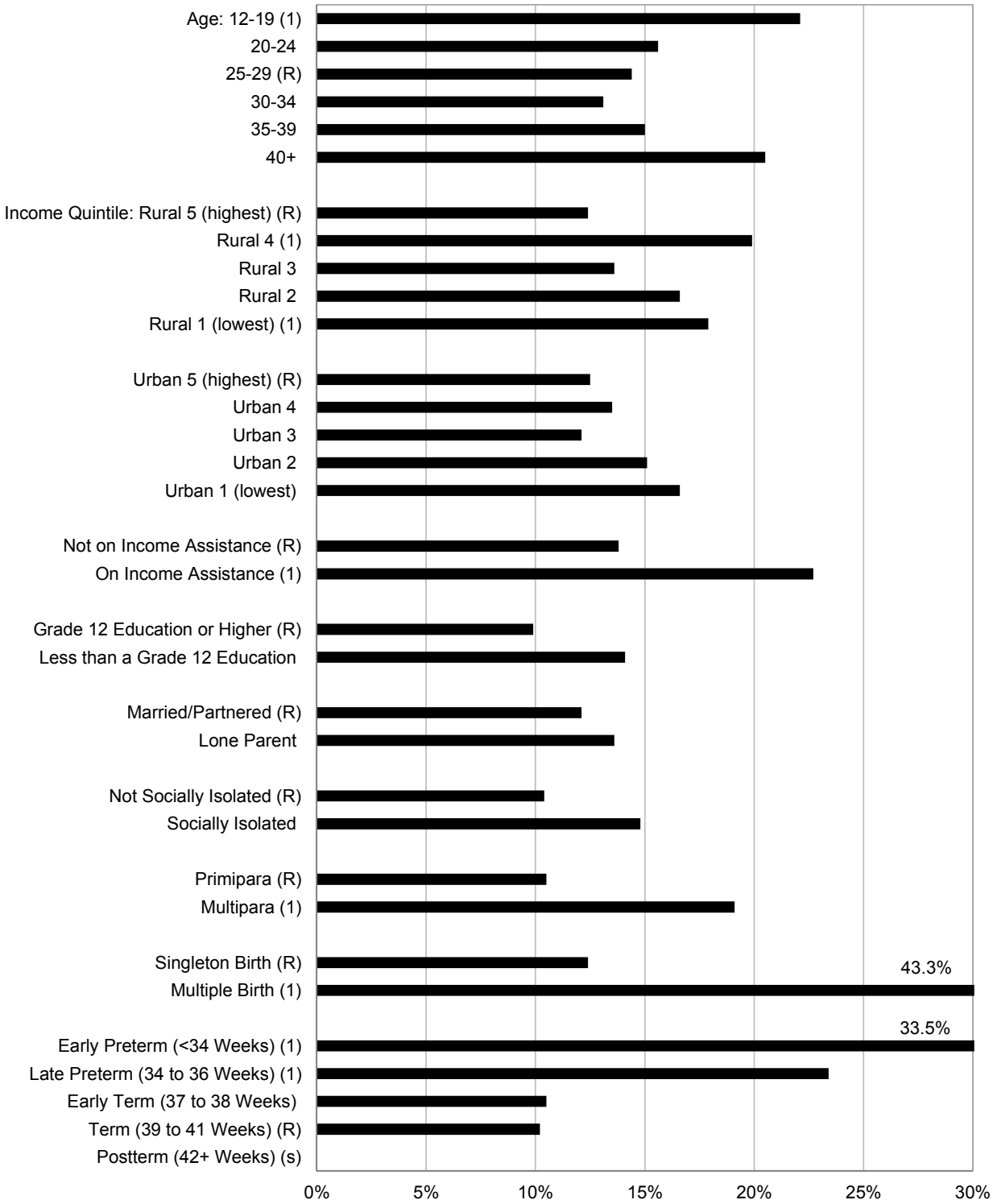
Figure 4.9.3: Proportion of Breech Births Delivered Vaginally by Winnipeg CA, 2004/05–2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 4.9.4: Proportion of Breech Births Delivered Vaginally by Sociodemographic and Other Characteristics, 2004/05-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

4.10 Severe Maternal Morbidities

Background

Maternal deaths have become a rare complication of childbirth in high income countries (Roberts, Cameron, Bell, Algert, & Morris, 2008). The maternal mortality rate in Canada, based on hospitalization data, was 9.2 per 100,000 deliveries in 1996 to 1999 and 9.0 per 100,000 deliveries in 2005 to 2007 (Lisonkova, Liu, Bartholomew, Liston, & Joseph, 2011). The rates of maternal mortality in Manitoba are too low to report and would have to be suppressed according to the guidelines governing presentation of data at MCHP.

Surveillance of severe maternal morbidity has assumed increasing importance with declines in maternal mortality and has been suggested as a better indicator for monitoring the quality of maternity care (Allen et al., 2010; Roberts et al., 2008; Wen et al., 2005). "The short and long–term consequences of adverse maternal outcomes can be profound including surgery, emergency care, infertility, psychological effects, disability and even death" and "the number of days in hospital represent the 'tip of the iceberg' for costs to women and the health system" (Roberts et al., 2009, p. 8).

Calculation of the Indicator

The rate and length of stay (LOS) of specific severe maternal morbidities was determined from the maternal delivery hospitalization record using the ICD codes reported by Joseph et al. (2010) and Liu et al. (2010). If a woman experienced more than one condition during a delivery, all conditions were counted separately. Due to coding changes, these analyses are limited to 2004/05–2008/09. There were 71,162 deliveries during this period. Thirteen morbidities were included in this analysis: **eclampsia**; rupture of uterus during labour; puerperal sepsis; HIV disease; cardiac arrest; cardiac failure or myocardial infarction; assisted ventilation; hysterectomy, open approach; blood transfusion; repair of bladder, urethra, or intestine; embolization/ligation/suture uterus for postpartum hemorrhage; placenta previa with hemorrhage and blood transfusion; postpartum hemorrhage and blood transfusion; and postpartum hemorrhage and hysterectomy. Refer to Appendix Table A.4 for a complete list of the codes used for each morbidity.

Key Observations

- The most frequent procedure indicating severe maternal morbidity was blood transfusion (72.5 per 10,000 deliveries).
- The most frequent severe maternal morbidity condition was postpartum hemorrhage requiring blood transfusion (46.7 per 10,000 deliveries) followed by cardiac arrest, cardiac failure, or myocardial infarction (14.1 per 10,000 deliveries) and puerperal sepsis (10.8 per 10,000 deliveries).
- The majority of the morbidities studied were associated with a prolonged LOS. The longest mean LOS was associated with placenta previa with hemorrhage and blood transfusion (a mean of 29.3 days), assisted ventilation (a mean of 16.2 days), and postpartum hemorrhage requiring hysterectomy (a mean of 11.6 days).

Comparison to Other Findings

Compared to Joseph et al. (2010), the rates of cardiac arrest, HIV disease, blood transfusion, and postpartum hemorrhage and blood transfusion were higher in Manitoba than those reported for Canada. The rates of hysterectomy (open approach) and postpartum hemorrhage and hysterectomy were lower in Manitoba than those reported for Canada. The rates of HIV disease were higher in Manitoba, but the mean LOS was lower for this diagnosis. The rates of placenta previa with hemorrhage and blood transfusion were similar in Manitoba to those reported for Canada, but the mean length of stay was longer in Manitoba.

Limitations

Data are presented for Manitoba as a whole, not by RHA or Winnipeg CA, because of the rarity of these morbidities. Calculation of severe maternal morbidities was limited to the birth admission and does not include postpartum admissions. The maternal LOS may also include antenatal stays that are contiguous with the birth event and not just the LOS following occurrence of the morbidity episode.

Summary

Hemorrhage is consistently reported as the largest and most important cause of maternal morbidity (Roberts et al., 2009). Our data indicate that postpartum hemorrhage and/or blood transfusion are significant causes of severe maternal morbidity.

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Table 4.10.1: Severe Maternal Morbidity, 2004/05-2008/09

Morbidity	Number of Cases	Rate per 10,000 Deliveries (95% CI)	Mean Maternal Length of Stay (LOS)	Proportion with a LOS over 7 days
Eclampsia	53	7.4 (5.4, 9.5)	7.4	26.4%
Rupture of uterus during labour	51	7.2 (5.2, 9.1)	3.8	5.9%
Puerperal Sepsis	77	10.8 (8.4, 13.2)	7.6	29.9%
HIV disease	60	8.4 (6.3, 10.6)	2.9	1.7%
Cardiac arrest, cardiac failure, or myocardial infarction	100	14.1 (11.3, 16.8)	6.8	37.0%
Assisted Ventilation	30	4.2 (2.7, 5.7)	16.2	63.3%
Hysterectomy, open approach	33	4.6 (3.1, 6.2)	8.4	33.3%
Blood Transfusion	516	72.5 (66.3, 78.7)	6.5	20.0%
Repair of bladder, urethra, or intestine	37	5.2 (3.5, 6.9)	4.2	10.8%
Embolization/ligation/suture uterus for postpartum hemorrhage	57	8.0 (5.9, 10.1)	5.1	12.3%
Placenta previa with hemorrhage and blood transfusion	21	3.0 (1.7, 4.2)	29.3	76.2%
Postpartum hemorrhage and blood transfusion	332	46.7 (41.6, 51.7)	6	16.9%
Postpartum hemorrhage and hysterectomy	18	2.5 (1.4, 3.7)	11.6	44.4%

Source: Manitoba Centre for Health Policy, 2012

Chapter 5: Maternal Postpartum Health

5.1 Breastfeeding Initiation

Background

Exclusive breastfeeding for at least six months has been recommended by the Canadian Paediatric Society, the Public Health Agency of Canada (Boland, 2005), and well–conducted systematic reviews (Kramer & Kakuma, 2002). Based on data from the Canadian Maternity Experiences Survey (2006–07), 90.3% of women in Canada initiated breastfeeding, but only 53.9% reported any breastfeeding at six months; even fewer (14.4%) were exclusively breastfeeding their baby at six months of age (Chalmers et al., 2009). Breastfeeding has been associated with improved infant and child outcomes, including reduction of risk of obesity in school–aged children (McCrory & Layte, 2012), gastrointestinal infections (Ip et al., 2007; Kramer & Kakuma, 2002), respiratory tract infections and asthma, dermatitis, type 1 and 2 diabetes, childhood leukemia, sudden infant death syndrome (SIDS) (Ip et al., 2007), and behaviour problems (Heikkila, Sacker, Kelly, Renfrew, & Quigley, 2011), as well as improved cognitive development (Quigley et al., 2012). Breastfeeding has also been related to improved maternal and family–based outcomes, such as increased maternal sensitivity and healthy mother–infant attachment patterns (Tharner et al., 2012) and reduced risk of type 2 diabetes, postpartum depression, and specific forms of cancer (breast, ovarian) (Cramer, 2012; Kobayashi et al., 2012; Taylor, Kacmar, Nothnagle, & Lawrence, 2005; Ystrom, 2012). Because the benefits of breastfeeding for infants and their mothers are so well documented, the U.S. Surgeon General has issued a call to action to support breastfeeding (U.S. Department of Health and Human Services, 2011). In Canada, maternity hospitals substantially improved their adherence to the WHO/UNICEF Ten Steps to Successful Breastfeeding from 1993 to 2007 (Levitt et al., 2011). However, as of 2010, only six Canadian hospitals, three birthing centers, and 13 community centres had completed Baby–Friendly assessments (Breastfeeding Committee for Canada, 2010).

Calculation of Indicator

The breastfeeding initiation at hospital discharge rate was calculated by taking the ratio of live born babies who were exclusively or partially breastfed at discharge from hospital or following a home birth under midwifery care to the total number of live born babies in a given time and place. Newborn feeding type is recorded on the hospital abstract as "breast", "artificial", or "both breast and artificial". On the midwifery form breastfeeding at discharge from care is recorded as a yes or no. The time trends were calculated across 2001/02–2007/08. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08—2008/09. Cases with missing breastfeeding initiation and stillborn babies were excluded. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 5.1.1
    - The Manitoba rate ranged from 80.9% (2001/02) to 79.2% (2008/09); the linear trend was significant; the rate decreased over time from a high of 81.7% in 2003/04 to a low of 78.9% in 2007/08.
    - The Winnipeg rate ranged from 83.8% (2001/02) to 82.8% (2008/09); the linear trend was significant; the rate decreased over time from a high of 84.6% in 2002/03 to a low of 82.3% in 2007/08.
    - The rate for the North ranged from 64.4% (2001/02) to 55.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 65.5% in 2002/03 to a low of 55.1% in 2007/08.

- RHA (2007/08–2008/09), Figure 5.1.2
  - The Manitoba rate was 79.0%.
  - South Eastman (90.7%), Central (86.0%), Assiniboine (83.4%), Brandon (83.8%), and Winnipeg (82.5%) were significantly higher than the Manitoba rate; while North Eastman (68.9%), Parkland (64.8%), NOR–MAN (63.9%), and Burntwood (52.2%) were significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 5.1.3
  - The Winnipeg rate was 82.5%.
  - Fort Garry (91.1%), Assiniboine South (89.3%), St. Boniface (87.9%), St. Vital (89.0%), River Heights (92.3%), and St. James–Assiniboia (88.0%) were significantly higher than Winnipeg rate; while Inkster (74.4%), Downtown (73.6%), and Point Douglas (65.8%) were significantly lower.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 5.1.4
  There was a statistically significant difference in the proportion of women giving birth who had initiated breastfeeding at hospital discharge for the following characteristics:
  - Maternal Age – More babies born to older women (aged 30 to 34, 84.6%; aged 35 to 39, 83.5%) were breastfed at hospital discharge compared to the reference group (aged 25 to 29, 81.6%), while fewer babies born to younger women (aged 12 to 19, 63.6%; aged 20 to 24, 73.9%) were breastfed at hospital discharge.
  - Income Quintile – There was a significant relationship with area–level income in both rural and urban areas of Manitoba. With each successive decrease in area–level income, fewer babies were being breastfed at hospital discharge.
  - Income Assistance – 59.9% of babies born to women on income assistance were breastfed at hospital discharge compared to 82.5% to women not on income assistance.
  - Maternal Education – 75.4% of babies born to women who had less than a Grade 12 education were breastfed at hospital discharge compared to 88.9% to women who had a Grade 12 education.
  - Marital Status – 69.2% of babies born to women who were a lone parent were breastfed at hospital discharge compared to 87.1% born to women who were married/partnered.
  - Social Isolation – 83.7% of babies born to women who were socially isolated were breastfed at hospital discharge compared to 86.6% of babies born to women who were not socially isolated.
  - Parity – 85.4% of babies born to primiparous women were breastfed at hospital discharge compared to 75.6% of babies born to multiparous women.
  - Prenatal Care – 55.1% of babies born to women who received inadequate prenatal care were breastfed at hospital discharge compared to 82.3% of babies born to women who received adequate prenatal care.
  - Maternal Psychological Distress – 78.2% of babies born to women who had psychological distress in the two years prior to giving birth were breastfed at hospital discharge compared to 79.7% of babies born to women who did not have psychological distress.
  - Vaginal Births with an Epidural – 82.3% of babies born to mothers who had a vaginal birth with an epidural were breastfed at hospital discharge compared to 77.8% of babies born to mothers who had a vaginal birth without an epidural.
  - Multiple Births – 61.1% of multiple births were breastfed at hospital discharge compared to 79.5% of singletons.
  - Maternal Length of Stay – 80.0% of babies born to women who had a length of stay of three or more days were breastfed at hospital discharge compared to 78.8% of babies born to women who had a length of stay of less than three days.

Comparison to Other Findings

The rate of breastfeeding initiation in Manitoba was 79.0% in 2007/08–2008/09. The rate of breastfeeding initiation reported by the Canadian Perinatal Health Report was 87.0% in 2005 (Public Health Agency of Canada, 2008); this rate was based on the Canadian Community Health Survey, which

asks a sample of mothers who have given birth in the previous five years whether they had breastfed or tried to breastfeed their baby. The Canadian Maternity Experiences Survey (Public Health Agency of Canada, 2009) described a self–reported breastfeeding initiation rate of 90.3% in 2006– 2007. Both of these reports are based on self–reported survey data and excluded First Nations women living on reserve; whereas the Manitoba rate was based on hospital discharge data and included all women in the population, so caution needs to be used in comparing rates. Although national data based on maternal self–report suggests that breastfeeding initiation rates are increasing over time in Canada, the population–based data in this report based on hospital discharge records revealed a small but significant declining trend.

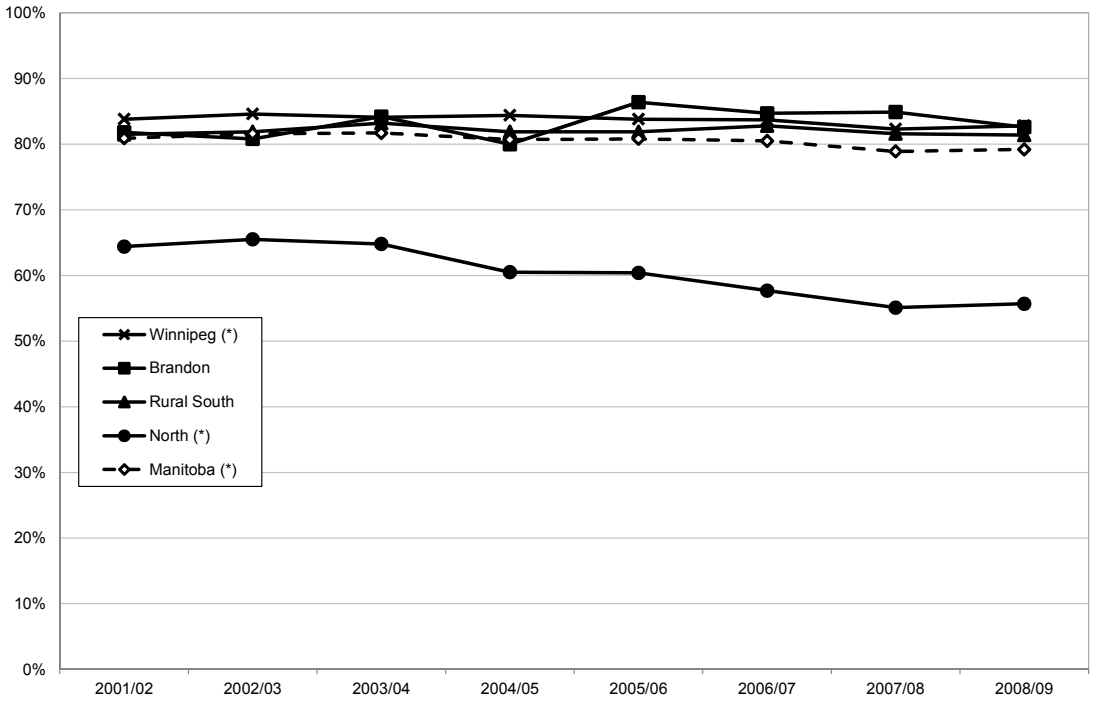
Limitations

Administrative data does not include information on duration of breastfeeding, only whether breastfeeding was initiated in the hospital following birth.

Summary

The rate of breastfeeding initiation at hospital discharge in Manitoba was 79.0% in 2007/08–2008/09. The lowest rates were noted in North Eastman (68.9%), Parkland (64.8%), NOR–MAN (63.9%), and Burntwood (52.2%). Within Winnipeg, the lowest breastfeeding initiation rates included Inkster (74.4%), Downtown (73.6%), and Point Douglas (65.8%). During the period 2001/02–2008/09, significant declines of 1% to 2% in the rates of breastfeeding initiation were found in Winnipeg and overall in Manitoba, with a decrease of over 10% observed in the North. The lowest rates of breastfeeding initiation were found among women who were aged 29 and younger, lone parents, socially isolated, on income assistance, or multiparous; lived in areas with lower incomes; had less than Grade 12 education; experienced psychological distress in the two years prior to giving birth; or had inadequate prenatal care, multiple birth, a vaginal birth without an epidural, or a length of stay less than three days.

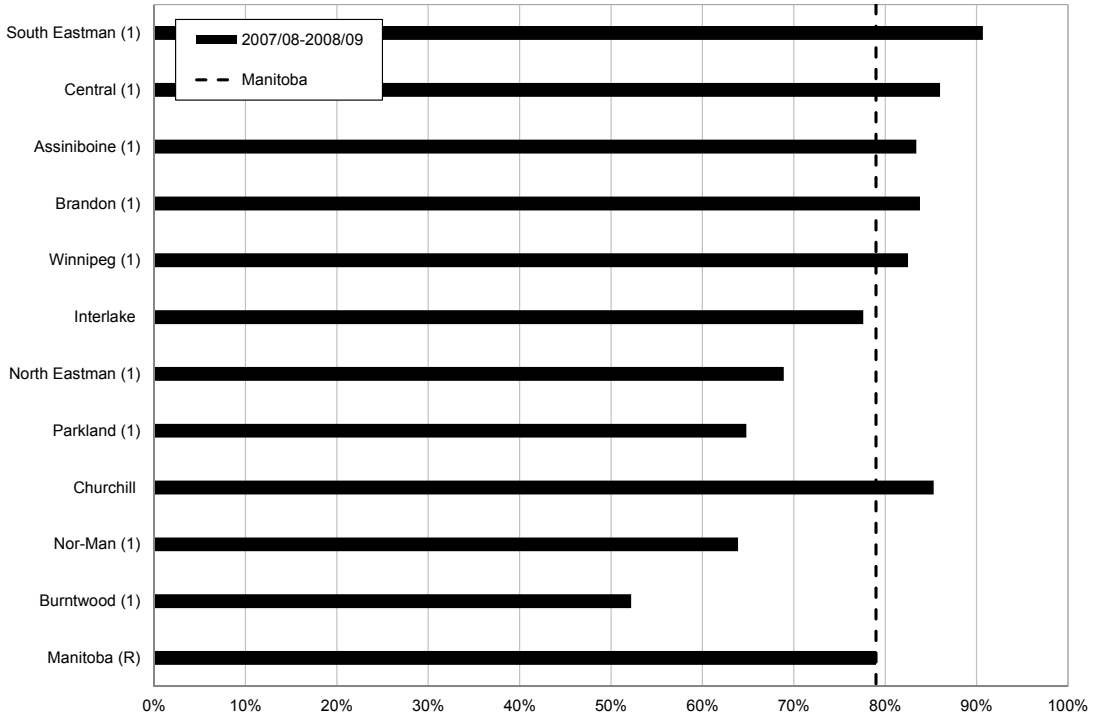
Figure 5.1.1: Breastfeeding Initiation at Hospital Discharge by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

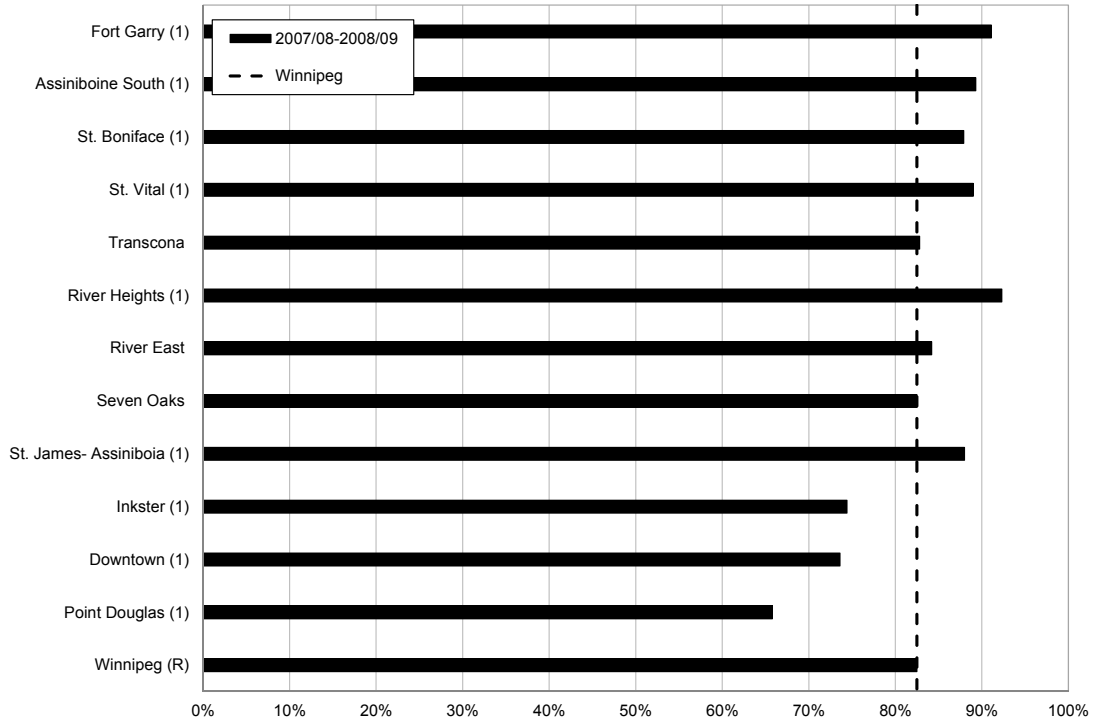
Figure 5.1.2: Breastfeeding Initiation at Hospital Discharge by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

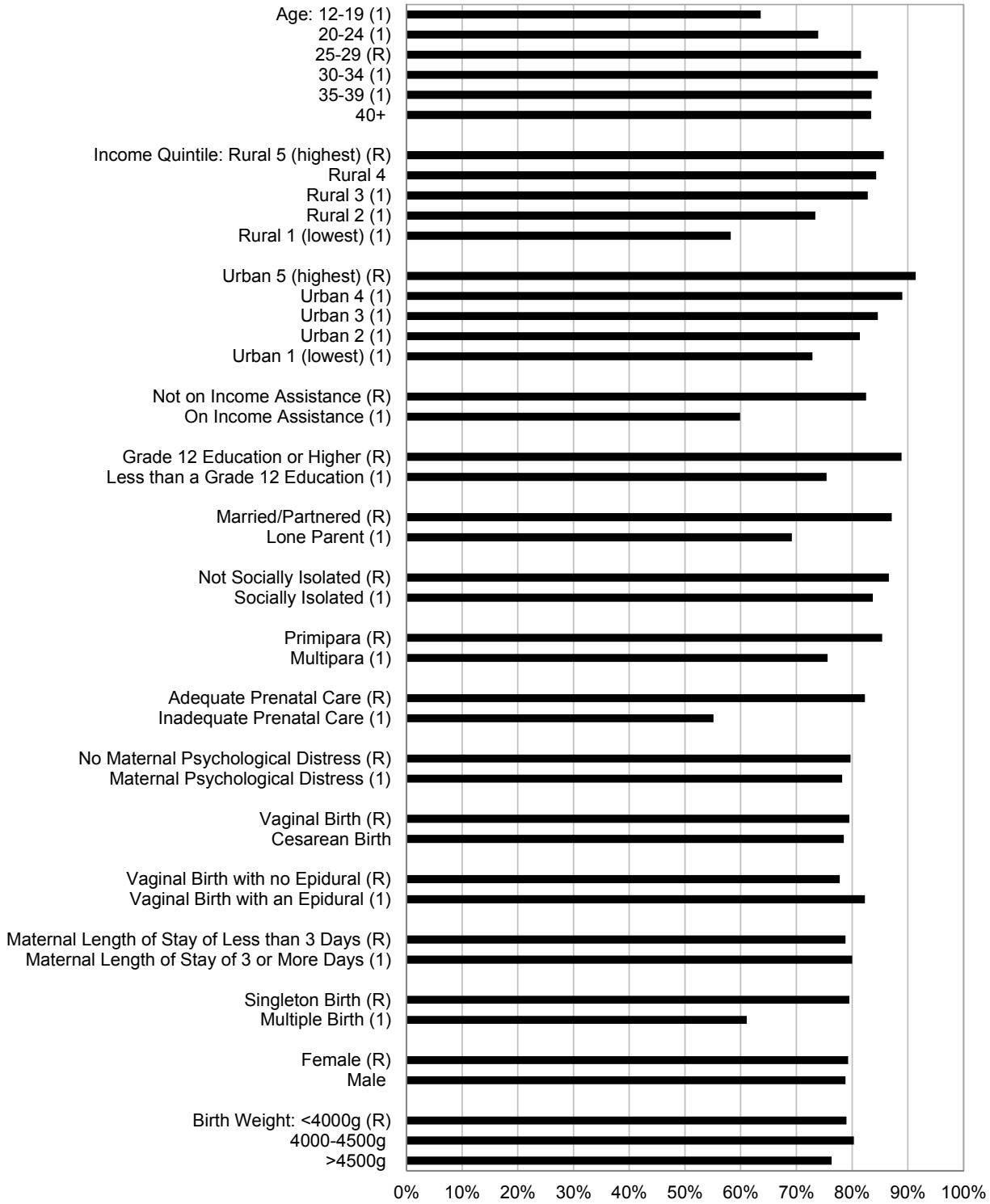
Figure 5.1.3: Breastfeeding Initiation at Hospital Discharge by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 5.1.4: Breastfeeding Initiation at Hospital Discharge by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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5.2 Maternal Postpartum Readmission

Background

Maternal readmission during the postpartum period refers to hospital admissions which occur in a defined period following childbirth (e.g., six weeks, 90 days) and may involve either complications related to pregnancy and/or delivery or unrelated medical conditions (Belfort et al., 2010; Clark et al., 2010; Liu et al., 2005). Maternal postpartum readmission is an important indicator of maternal morbidity as well as having significant implications for maternal/infant bonding, breastfeeding, and family function (Liu et al., 2005). Method of delivery has been found to have an impact on rates of postpartum readmission. Women who deliver by cesarean or by assisted vaginal delivery have higher rates of hospital readmissions in the postpartum period than women who deliver vaginally (Belfort et al., 2010; Clark et al., 2010; Liu et al., 2002; Liu et al., 2005). Mode of delivery also impacts the admission diagnosis. Women with cesarean births have higher rates of admission for pelvic injury, wound infection, necrotizing fasciitis, and cellulitis (Belfort et al., 2010; Liu et al., 2005). Postpartum hemorrhage is the most common cause of readmission for women who deliver by spontaneous or assisted vaginal birth (Liu et al., 2005). Non–obstetric complications may also necessitate readmission. Gallbladder disease, appendicitis, and pneumonia all contribute to postpartum readmission (Belfort et al., 2010; Clark et al., 2010; Liu et al., 2005). Hospital readmission following childbirth represents a serious disruption in the lives of new families. Further investigation is required to gain an understanding of the multitude of causes and the development of improved care practices.

Calculation of the Indicator

The number of women giving birth who were readmitted to hospital within 90 days of the initial hospitalization was divided by the total number of women giving birth in a given time and place. Only **inpatient** hospitalizations were counted as readmissions. Inter–hospital transfers occurring within the birth hospitalization were not counted as readmissions. Cases with maternal hospitalization for delivery with a length of stay greater than 20 days were excluded from analysis. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. To find all possible readmissions, data from 2009/10 were also used. The reason for hospital readmission was reported by cause and aggregated into 17 groups, using a slightly modified version of the groupings presented in the Canadian Perinatal Health Report (Public Health Agency of Canada, 2008). The groupings used are: postpartum hemorrhage; major puerperal infection; cholelithiasis; complications of pregnancy not elsewhere classified; other unspecified complication of puerperium, not elsewhere classified; person seeking consultation without complaint of sickness; postpartum care and examination; other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium; depression disorder and mood/affective psychoses; infection of the breast/nipple associated with childbirth; acute appendicitis; hypertension complicating pregnancy, childbirth, puerperium; symptoms involving abdomen and pelvis; acute pancreatitis; retained placenta; complications of procedures, not elsewhere classified; calculus of kidney and ureter; and other diagnoses. These were further separated by delivery type (cesarean and vaginal). Refer to the Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 5.2.1
    - The Manitoba rate ranged from 3.2% (2003/04) to 2.8% (2006/07) and was relatively stable
    - The Winnipeg rate ranged from 2.4% (2001/02) to 3.1% (2008/09); the linear trend was significant; the rate increased over time from a low of 2.4% in 2001/02 to a high of 3.1% in 2008/09.

    - The Brandon rate ranged from 4.0% (2001/02) to 2.0% (2008/09); the linear trend was significant; the rate decreased over time from a high of 4.0% in 2001/02 to a low of 1.4% in 2006/07.
    - The rate for the Rural South ranged from 3.5% (2001/02) to 2.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 3.5% in 2001/02 to a low of 2.6% in 2007/08.
- RHA (2007/08–2008/09), Figure 5.2.2
    - The Manitoba rate was 3.0%.
    - South Eastman (2.0%) and Assiniboine (1.8%) were significantly lower than the Manitoba rate (3.0%), while Burntwood (4.9%) was significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 5.2.3
    - The Winnipeg rate was 2.9%.
    - Downtown (4.0%) and Point Douglas (4.4%) were significantly higher than the Winnipeg rate (2.9%)
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 5.2.4
  There was a statistically significant difference in the proportion of women giving birth who were readmitted to hospital within 90 days of birth hospitalization discharge for the following characteristics
    - Maternal Age – More women aged 12 to 19 (4.5%) were readmitted to hospital within 90 days of birth hospitalization discharge than the reference group (aged 25 to 29, 2.9%), while fewer women aged 30 to 34 (2.3%) were readmitted.
    - Income Quintile – In both rural and urban income quintiles, more women living in the lowest income quintiles (Rural 2, 3.7%; Rural 1, 4.0%; Urban 3, 2.6%, Urban 2, 2.8%; and Urban 1, 4.1%) were readmitted to hospital within 90 days of birth hospitalization discharge than the reference group.
    - Income Assistance – 4.6% of the women giving birth who were on income assistance were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.7% of the women who were not on income assistance.
    - Maternal Education – 3.7% of the women giving birth who had less than a Grade 12 education were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.3% of those with a Grade 12 education.
    - Marital Status – 4.5% of the women giving birth who were lone parents were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.5% of those who were married/partnered.
    - Prenatal Care – 4.0% of women who had inadequate prenatal care were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.8% of those who had adequate prenatal care.
    - Maternal Hypertension – 4.8% of women with a hypertension diagnosis during pregnancy were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.8% of women without a hypertension diagnosis.
    - Maternal Diabetes – 5.3% of women with a diabetes diagnosis during pregnancy were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.8% of women without a diabetes diagnosis.
    - Delivery Method – 4.9% of women who had a cesarean birth were readmitted to hospital within 90 days of birth hospitalization discharge compared to 2.5% of the women who had a vaginal birth.
    - Initial Hospital Length of Stay (LOS) – 2.2% of women who had a birth hospitalization LOS of three or more days were readmitted to hospital within 90 days of birth hospitalization discharge compared to 4% of women who had a birth hospitalization LOS of less than three days.

- Primary Diagnosis, Figure 5.2.5
    - The top five causes for hospital readmission for women within 90 days of birth hospitalization discharge are:
        - Other diagnoses (23.6%)
        - Complications of pregnancy, not elsewhere classified (15.5%)
        - Postpartum hemorrhage (13.2%)
        - Major puerperal infection (10.1%)
        - Cholelithiasis (7.1%)
- Primary Diagnosis by Delivery Type, Table 5.2.1
    - The primary diagnosis for readmission differed by delivery method. The top five causes for hospital readmission for women who had cesarean births were other diagnoses (27.9%), postpartum hemorrhage (16.7%), major puerperal infection (11.6%), cholelithiasis (8.5%), and the diagnostic code "other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium" (7.0%). The top five causes for hospital readmission for women who had vaginal births were complications of pregnancy, not elsewhere classified (39.6%), other diagnoses (14.7%), other unspecified complications of puerperium (7.4%), major puerperal infection (7.0%), and postpartum hemorrhage (5.6%).

Comparison to Other Findings

Rates of maternal postpartum readmission to hospital are fairly consistent. Studies have reported rates of 1.2% to 1.8% in the U.S. and Canada respectively (Belfort et al., 2010; Liu et al., 2005). The rate of re–admission for women who delivered via cesarean ranges from 1.8% to 2.7%; while women who deliver vaginally have lower rates, 0.8% to 1.5% (Belfort et al., 2010; Liu et al., 2005). The maternal readmission rates for Manitoba of 4.9% of women who had a cesarean birth and 2.5% of women who had a vaginal birth in 2007/08 to 2008/09 are considerably higher than the Canadian rates of 3.1% for cesarean birth and 1.8% for vaginal birth in 2004/05 (Public Health Agency of Canada, 2008).

Summary

The overall rate of maternal postpartum readmission in Manitoba was 3.0%; Burntwood had a higher rate than the provincial rate. The overall rate in Winnipeg was 2.9%; Downtown and Point Douglas had higher rates than the Winnipeg rate. Postpartum readmission was more likely in women who were a young age (aged 12 to 19), a lone parent, or on income assistance; lived in low income quintile areas; had less than Grade 12 education, inadequate prenatal care, conditions such as hypertension or diabetes, a cesarean birth, or a hospital length of stay of less than three days.

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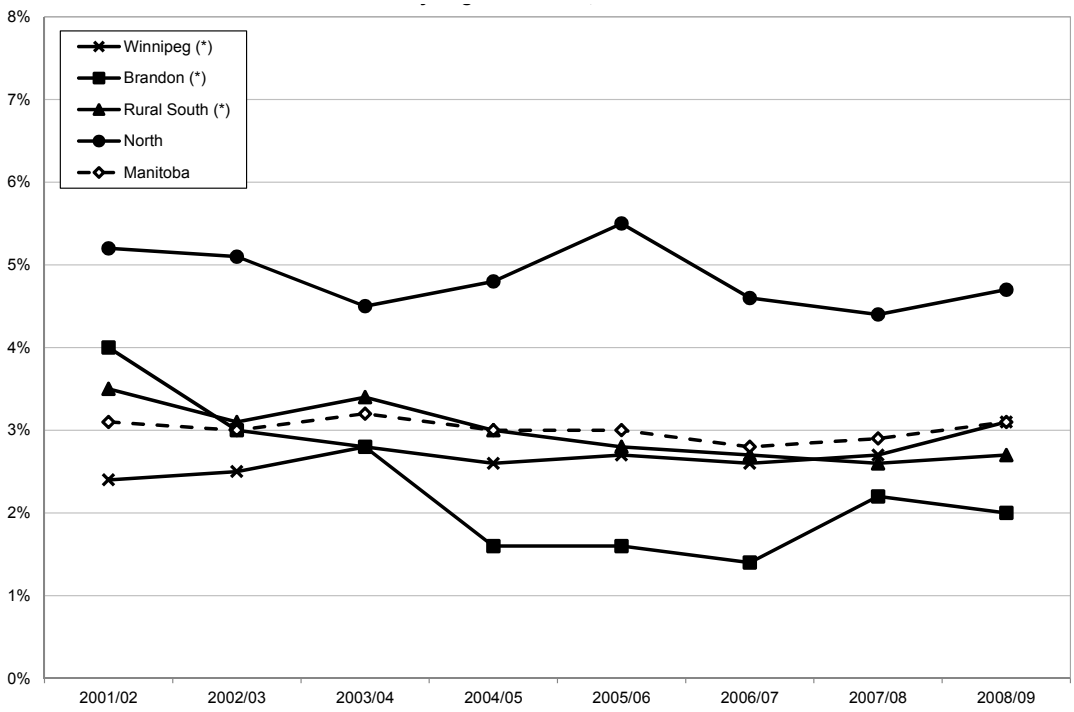
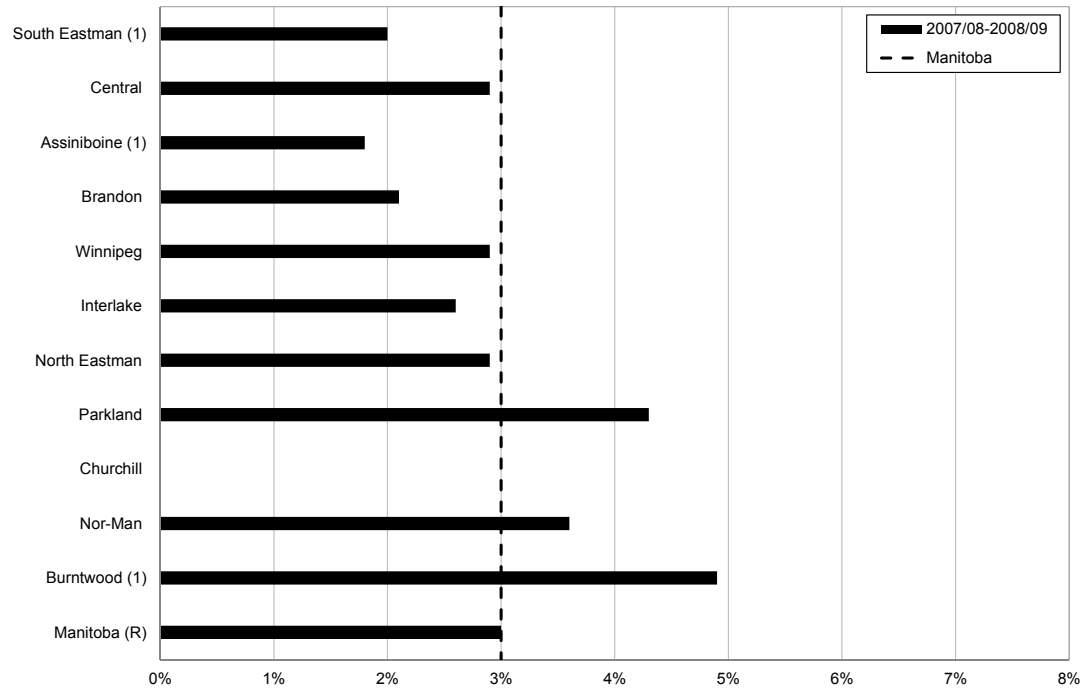
Figure 5.2.1: Proportion of Women Readmitted to the Hospital Within 90 Days of Discharge from Hospital Following Childbirth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

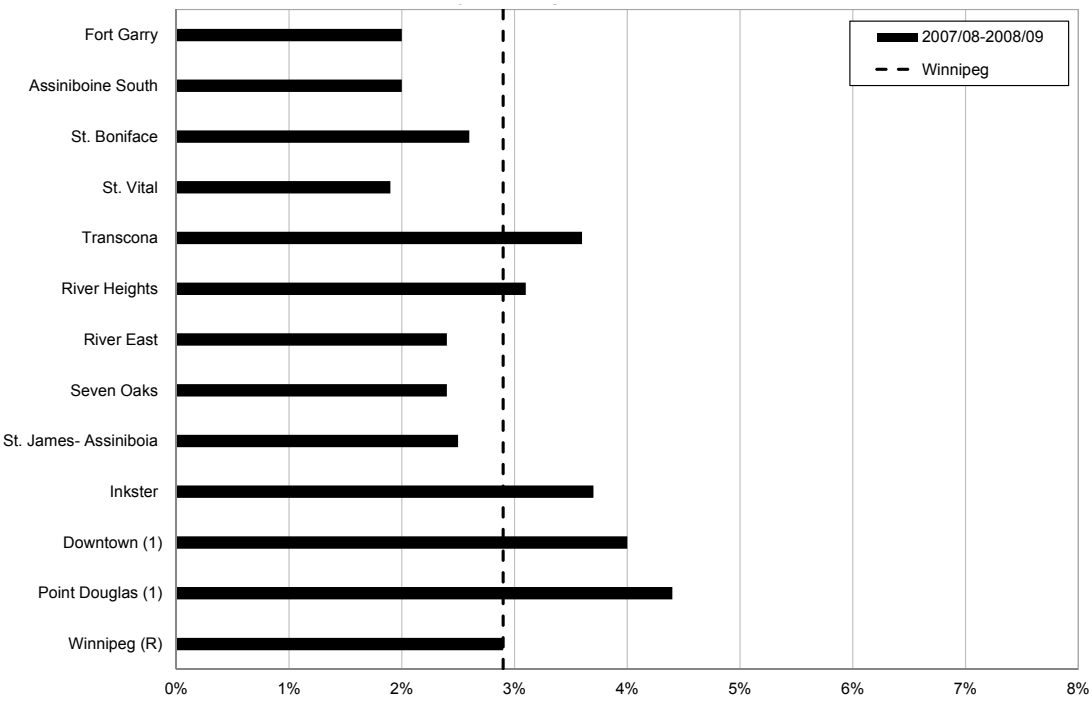
Figure 5.2.2: Proportion of Women Readmitted to the Hospital Within 90 Days of Discharge from Hospital Following Childbirth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

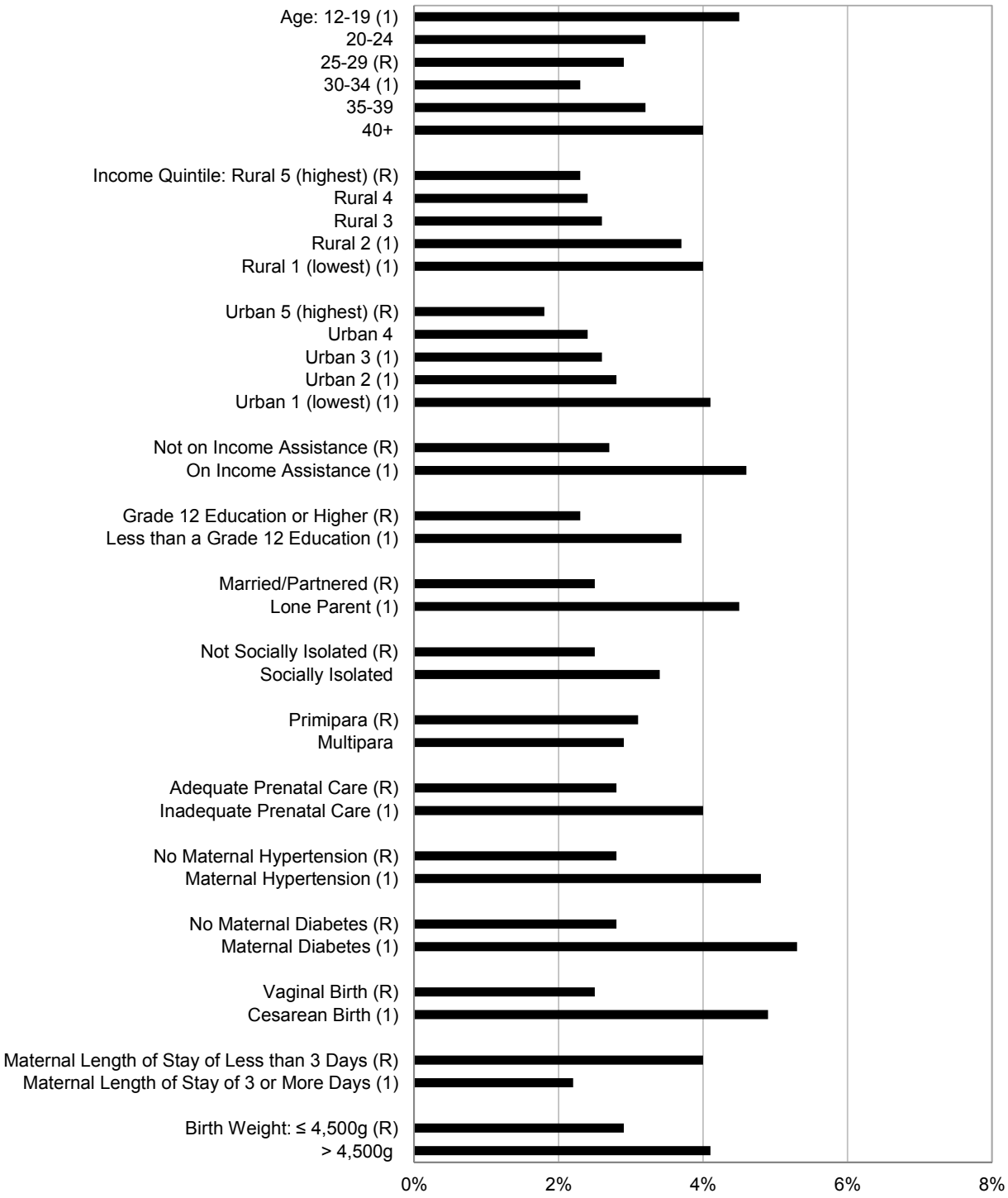
Figure 5.2.3: Proportion of Women Readmitted to the Hospital Within 90 Days of Discharge from Hospital Following Childbirth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

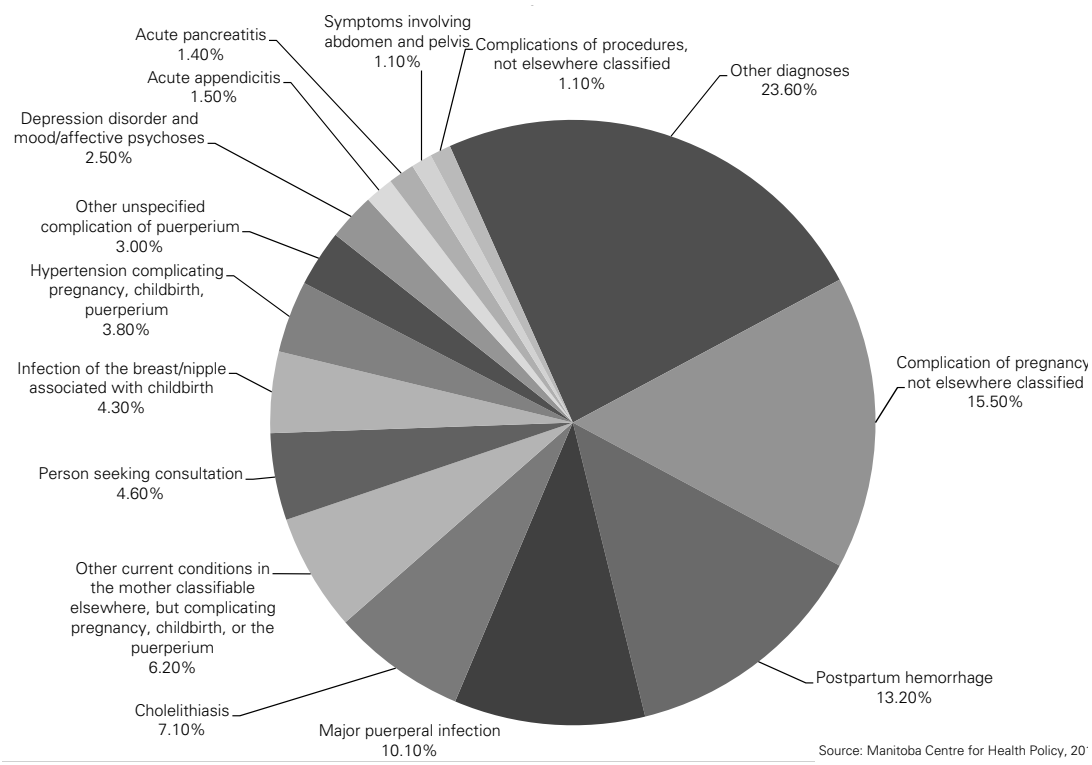
Figure 5.2.4: Proportion of Women Readmitted to the Hospital Within 90 Days of Discharge from Hospital Following Childbirth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 5.2.5: Primary Diagnosis for Maternal Readmission within 90 Days of Discharge from Hospital Following Childbirth, 2007/08-2008/09



Source: Manitoba Centre for Health Policy, 20

Table 5.2.1: Primary Diagnosis for Maternal Readmission Within 90 Days of Discharge from Hospital Following Childbirth by Delivery Method, 2007/08-2008/09

Primary Diagnosis at Readmission	Method of Delivery					
	Total		Cesarean		Vaginal	
	%	Rank	%	Rank	%	Rank
Other diagnoses	23.6	1	27.9	1	14.7	2
Complication of pregnancy, not elsewhere classified	15.5	2	4.1	8	39.6	1
Postpartum hemorrhage	13.2	3	16.7	2	5.6	5
Major puerperal infection	10.1	4	11.6	3	7.0	4
Cholelithiasis	7.1	5	8.5	4	4.2	8
Other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium	6.2	6	7.0	5	4.6	7
Person seeking consultation	4.6	7	5.5	6	2.8	9
Infection of the breast/nipple associated with childbirth	4.3	8	5.1	7	2.5	10
Hypertension complicating pregnancy, childbirth, puerperium	3.8	9	3.3	9	4.9	6
Other unspecified complication of puerperium	3.0	10	1.0	14	7.4	3
Depression disorder and mood/affective psychoses	2.5	11	2.7	10	2.1	11
Acute appendicitis	1.5	12	1.7	11	s	
Acute pancreatitis	1.4	13	1.3	13	s	
Symptoms involving abdomen and pelvis	1.1	14	1.7	11	s	
Complications of procedures, not elsewhere classified	1.1	14	s		s	
Retained placenta	s		s		0.0	
Calculus of kidney and ureter	s		s		s	

Excludes maternal length of stay of more than 20 days

's' indicates suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

5.3 Postpartum Psychological Distress

Background

Postpartum psychological distress is defined as any form of psychological distress (e.g., anxiety, depression) occurring between birth and one–year postpartum. It is common, with rates ranging from 13% to 21% in the literature (Andersson, Sundstrom–Poromaa, Wulff, Astrom, & Bixo, 2006; Priest, Austin, Barnett, & Buist, 2008). Recent epidemiologic evidence suggests that postpartum psychological distress is not always self–remitting and, if untreated, can continue beyond the postpartum period (Beeghly et al., 2002). It has been associated with adverse maternal, child, and family outcomes, including maternal substance abuse (Bowen, Bowen, Butt, Rahman, & Muhajarine, 2012), family dysfunction, child developmental delay, and poor school performance (Kingston, Tough, & Whitfield, 2012). In addition, maternal psychiatric illness has been identified as one of the leading causes of maternal deaths in Australia (Austin, Kildea, & Sullivan, 2007). A small, emerging body of research has demonstrated that early interventions aimed at improving maternal mental health in pregnancy and postpartum can ameliorate the risk of poor neonatal, child, maternal, and family outcomes (Poobalan et al., 2007) and are economically viable approaches (Doyle, Harmon, Heckman, & Tremblay, 2009).

Calculation of Indicator

The number of women diagnosed with postpartum psychological distress was divided by the total number of women giving birth. A woman was considered to have postpartum psychological distress if in the 12 months after giving birth (or after hospital discharge in case of a stillbirth) if she had:

- one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression or adjustment reaction OR
- one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction OR
- one or more hospitalizations with a diagnosis for **anxiety disorders** OR
- one or more prescriptions for an **antidepressant** or mood stabilizer OR
- one or more physician visits with a diagnosis for anxiety disorders and one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders OR
- two or more physician visits with a diagnosis for anxiety disorders

Refer to the Appendix Table A.4 for more details. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics associated were calculated for 2007/08–2008/09. To find all possible diagnoses, data from 2009/10 were used to allow a 12 month "look forward" period.

Key Observations

- Time Trend (2001/02–2008/09), Figure 5.3.1
    - The Manitoba rate ranged from 13.4% (2001/02) to 14.3% (2005/06) and was relatively stable.
    - The rate for the Rural South ranged from 13.2% (2001/02) to 14.7% (2008/09); the linear trend was significant; the rate increased over time from a low of 12.8% in 2004/05 to a high of 14.7% in 2008/09.
    - The rate for the North ranged from 10.4% (2001/02) to 7.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 10.4% in 2001/02 to a low of 7.7% in 2008/09.

- RHA (2007/08–2008/09), Figure 5.3.2
  - The Manitoba rate was 13.8%.
  - Brandon (19.4%) and Parkland (23.2%) were significantly higher than the Manitoba rate (13.8%), while Burntwood (7.1%) was significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 5.3.3
  - The Winnipeg rate was 14.3%
  - Transcona (17.9%) and Point Douglas (18.5%) were significantly higher than the Winnipeg rate (14.3%), while Seven Oaks (10.7%) was significantly lower.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 5.3.4
  There was a statistically significant difference in the proportion of women with postpartum psychological distress for the following characteristics:
  - Maternal Age – Fewer women aged 12 to 19 (11.3%) had postpartum psychological distress compared to women aged 25 to 29 (14.0%).
  - Income Quintile – More (16.3%) of women living in Rural 3 had postpartum psychological distress and fewer women (10.2%) of women living in Rural 2 compared to 12.3% of women living in Rural 5. More women living in Urban 1 (17.9%) had postpartum psychological distress compared to 13.0% of women living in Urban 5.
  - Income Assistance – 24.8% of the women giving birth who were on income assistance had postpartum psychological distress compared to 12.0% of the women who were not on income assistance.
  - Maternal Education – 17.0% of the women giving birth who had less than a Grade 12 education had postpartum psychological distress compared to 12.8% of those with a Grade 12 education.
  - Marital Status – 21.0% of the women giving birth who were lone parents had postpartum psychological distress compared to 12.7% of those who were married/partnered.
  - Social Isolation – 19.7% of the women giving birth who were socially isolated had postpartum psychological distress compared to 13.4% who were not socially isolated.
  - Parity – 12.3% of the primiparous women also had postpartum psychological distress compared to 14.7% of multiparous women.
  - Maternal Hypertension – 15.5% of women with a hypertension diagnosis during pregnancy also had postpartum psychological distress compared to 13.6% of women without a hypertension diagnosis.
  - Antepartum Hemorrhage – 18.3% of women who had an antepartum hemorrhage also had postpartum psychological distress compared 13.5% of women who did not have an antepartum hemorrhage.

Comparison to Other Findings

Definitions of psychological distress vary widely in population–based studies. We did not find other rates that were based on a definition similar to ours. However, the Canadian Maternity Experiences Survey reported a rate of postpartum depression of 7.5% based on a score of 13 or higher on the Edinburgh Postnatal Depression Scale (Public Health Agency of Canada, 2009). In the United States, self–reported rates of postpartum depression across various states using Pregnancy Risk Assessment Monitoring System (PRAMS) data for 2005–2004 were 11.7% to 20.4% (Centers for Disease Control and Prevention (CDC), 2008); while the national Listening to Mothers survey reported rates of PPD of 20% during the first six months postpartum and 24% during the last six months postpartum (Mayberry, Horowitz, & Declercq, 2007).

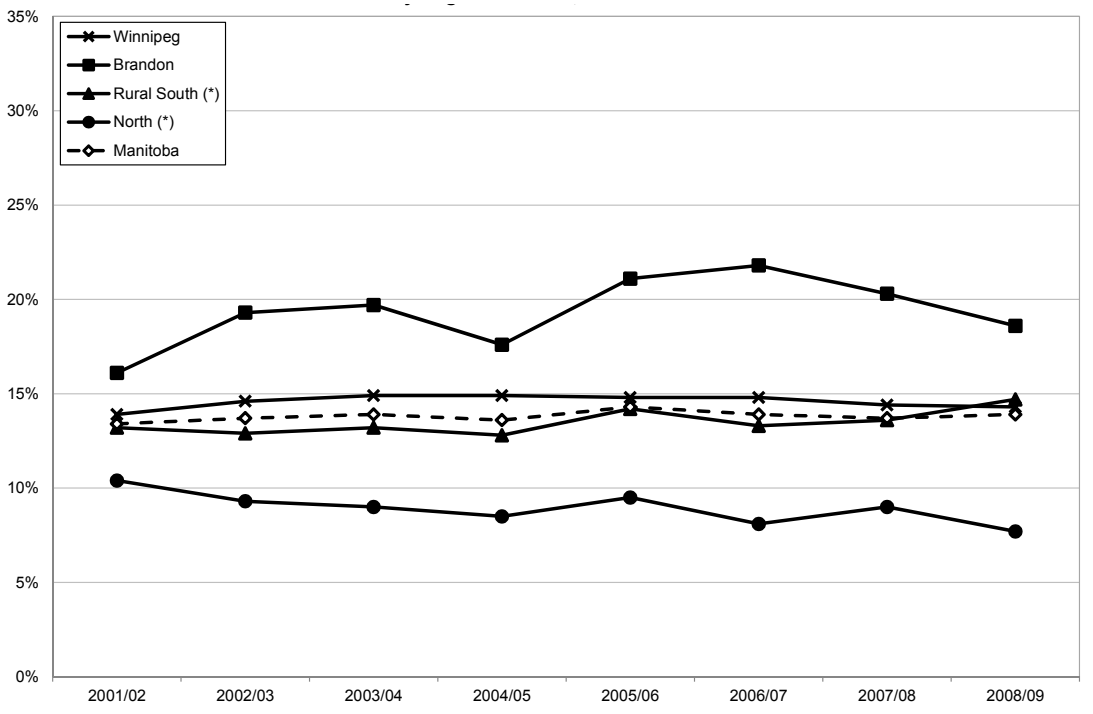
Limitations

Most studies assess postpartum psychological distress by maternal self–report or clinical interviews. Although a strength of the data in this report is that they are based on medical diagnosis and treatment, a limitation is that women who do not access care (e.g., either by choice or lack of available services) but who experience postpartum distress are not captured. Others may seek non–pharmacological care (e.g., psychologist; support groups) and these data are not available from administrative data. As such, the proportion of women with postpartum psychological distress may be under–reported.

Summary

The rate of postpartum psychological distress in Manitoba was relatively stable at 13.4% to 14.3% between 2001/02–2008/09, with the exception of the Rural South where significant increases in rates were observed. Although rates in the North appeared to decline during this period, this may be a reflection of reduced access to healthcare. While the rate of psychological distress in Winnipeg was 14.3% during 2007/08–2008/09, higher rates were reported in Transcona (17.9%) and Point Douglas (18.5%), but Seven Oaks had a lower rate (10.7%). The rates of postpartum psychological distress differed little by maternal age except that younger women aged 12 to 19 had significantly lower rates than the referent group (aged 25 to 29). The highest rates of psychological distress were found among women who had less than Grade 12 education; were lone parents, on income assistance, socially isolated, or multiparous; or had pregnancy–related complications (e.g., hypertension, antepartum hemorrhage).

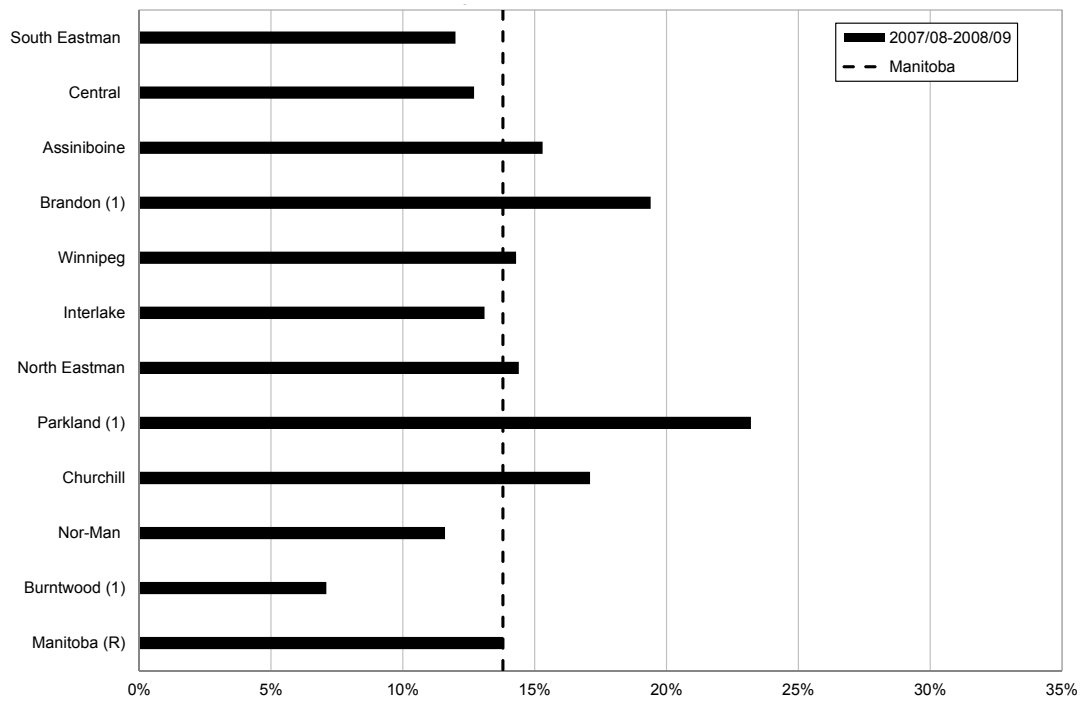
Figure 5.3.1: Proportion of Women who were Diagnosed with Psychological Distress in the 12 Months After Giving Birth by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

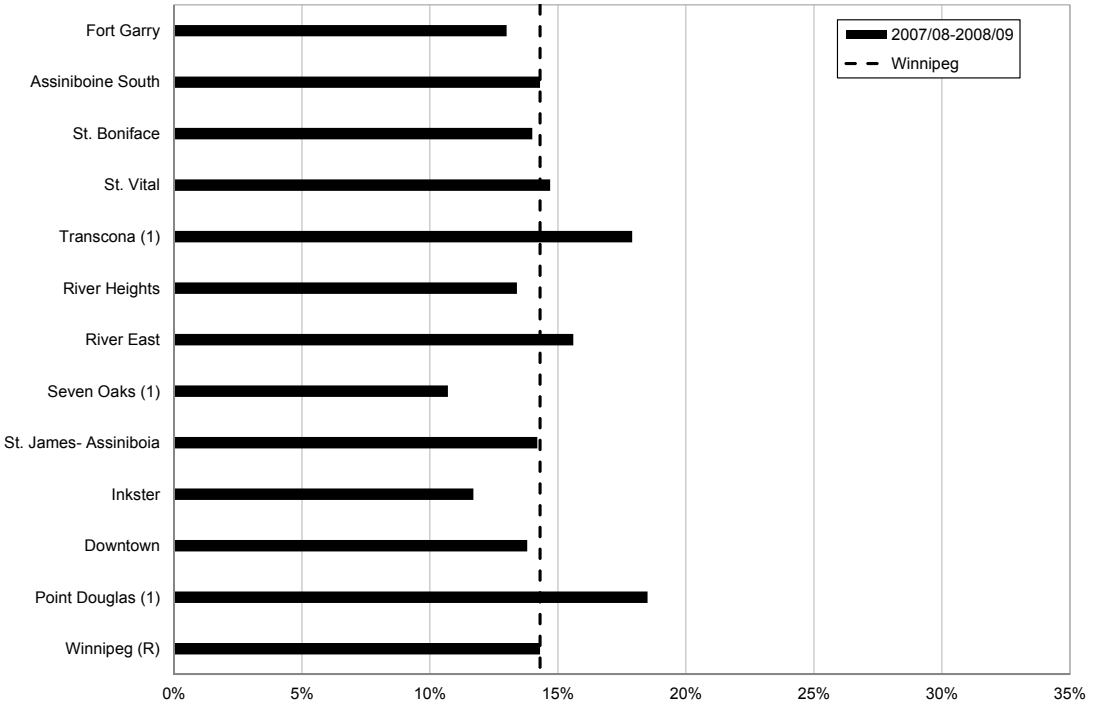
Figure 5.3.2: Proportion of Women who were Diagnosed with Psychological Distress in the 12 Months After Giving Birth by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

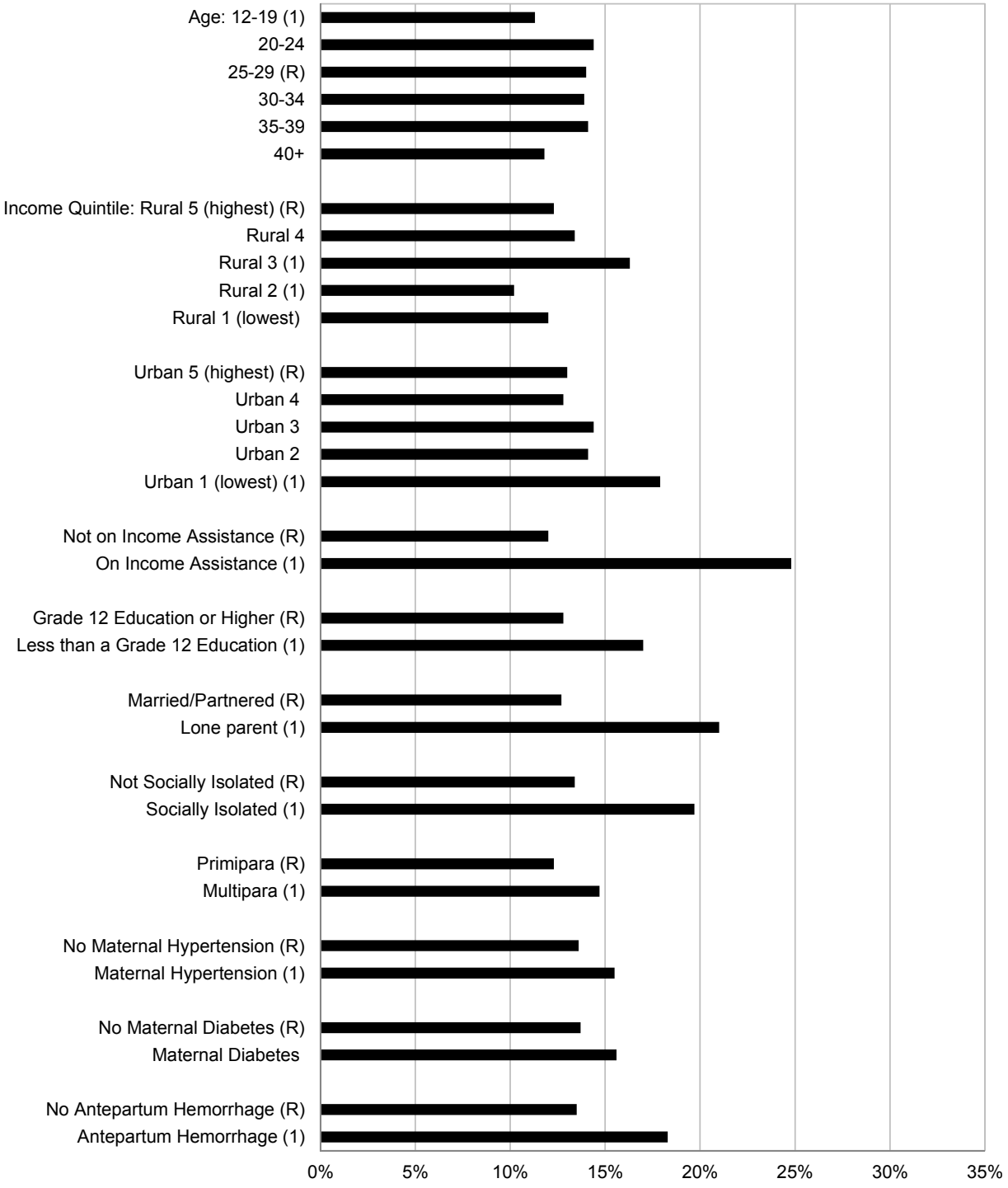
Figure 5.3.3: Proportion of Women who were Diagnosed with Psychological Distress in the 12 Months After Giving Birth by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 5.3.4: Proportion of Women who were Diagnosed with Psychological Distress in the 12 Months After Giving Birth by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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Chapter 6: Fetal and Newborn Health

6.1 Stillbirths

Background

Stillbirths, also referred to as fetal deaths, account for almost half of U.S. deaths from 20 weeks to one year of life (Stillbirth Collaborative Research Network Writing Group, 2011). The risk of having a stillborn infant has been associated with being Aboriginal (Shah, Zao, Al–Wassia, & Shah, 2011) or non–Hispanic Black (Rowland Hogue & Silver, 2011; Stillbirth Collaborative Research Network Writing Group, 2011), having a previous stillbirth, nulliparity (with and without previous losses less than 20 weeks), diabetes, older maternal age (aged 39 and younger), maternal AB blood type, having a history of drug use, smoking during the three months prior to pregnancy, obesity/overweight, having a multiple pregnancy, and not living with a partner (Balayla, Azoulay, & Abenhaim, 2011; Stillbirth Collaborative Research Network Writing Group, 2011) Some have demonstrated socioeconomic disparity in stillbirth prevalence, whereby disadvantaged women have higher rates of stillbirth than their advantaged counterparts (Goy, Dodds, Rosenberg, & King, 2008).

Calculation of Indicator

The stillbirth rate is defined as the number of stillbirths (fetal deaths) with a gestation of 20 weeks or greater or a birth weight of at least 500 grams per 1,000 total births (live births and stillbirths) in a given place and time. Time trends were across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2004/05–2008/09. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.1.1
  - The Manitoba rate ranged from 7.0% (2003/04) to 5.0% (2007/08) and was relatively stable.
- RHA (2004/08–2008/09), Figure 6.1.2
  - The Manitoba rate was 6.0 per 1,000 total births.
  - Central (8.3 per 1,000 total births) and Burntwood (9.3 per 1,000 total births) were significantly higher than the Manitoba rate.
- Winnipeg CA (2004/05–2008/09), Figure 6.1.3
  - The Winnipeg rate was 5.4 per 1,000 total births.
- Sociodemographic and Other Characteristics (2004/05–2008/09, Figure 6.1.4
  There was a statistically significant difference in the proportion of stillbirths for the following characteristics
  - Maternal Age – Mothers aged 40 and older had a significantly higher rate (13.2 per 1,000 total births) of stillbirths compared to mothers aged 25 to 29 (5.1 per 1,000 total births).
  - Income Quintile – The relationship with area–level income differs in rural and urban areas. With each successive decrease in rural area–level income, there was an increase in the stillbirth rate; however, no pattern was apparent in urban areas.
  - Marital Status – 2.7 stillbirths per 1,000 total births to women who were married/ partnered compared to 0.0 per 1,000 total births to women who were lone parents.
  - Maternal Diabetes – 10.7 stillbirths per 1,000 total births to women who had diabetes compared to 5.4 stillbirths per 1,000 total births to women who did not have diabetes.

- Multiple Births – 11.6 stillbirths per 1,000 total births that were multiples compared to 5.6 stillbirths per 1,000 total births that were singletons.
- Gestation – 147.5 early preterm stillbirths per 1,000 total births, 11.3 late preterm stillbirths, and 3.4 early term stillbirths per 1,000 total births compared to 1.5 term stillbirths per 1,000 total births.

Comparison to Other Findings

The Canadian rate of stillbirths (fetal mortality) for greater than or equal to 500 grams fluctuated between 4.7 in 1995 to 4.3 per 1,000 total births in 2004 (Public Health Agency of Canada, 2008). The rate of stillbirths was 4.1 per 1,000 among singleton births and 9.5 per 1,000 among multiples (Public Health Agency of Canada, 2008). The Manitoba stillbirth rate of 6.0 per 1,000 total births (2004/08–2008/09) was higher than the Canadian rate of 4.6 in 2008 (Public Health Agency of Canada, 2012).

Limitations

The definition of stillbirth varies slightly across countries and across provinces, making comparisons difficult. Some differences in stillbirth rates may occur due to differences in birth registration at the borderline of viability (Joseph et al., 1999). The low numbers of stillbirths create fluctuations in rates in the time trend graph (Figure 6.1.1). The use of three–year moving averages would be more appropriate to depict time trends for this indicator, but we chose to be consistent in our approach with that of other indicators in this report.

Summary

During 2004/05–2008/09, the provincial rate of stillbirths in Manitoba was 6.0 per 1,000 total births. Some regional variations were apparent with higher rates observed in Central (8.3 per 1,000 total births) and Burntwood (9.3 per 1,000 total births). The provincial rate was fairly stable from 2001/02 to 2008/09, ranging between 5.0 and 7.0 per 1,000 total births. Stillborn infants were more likely to have been delivered by women who were older (aged 40 and older), married/partnered, living in lower income rural areas or who had diabetes or a multiple pregnancy. Higher rates of stillbirths were observed among early preterm, late preterm, and early term infants compared to term infants; rates were highest among early preterm infants.

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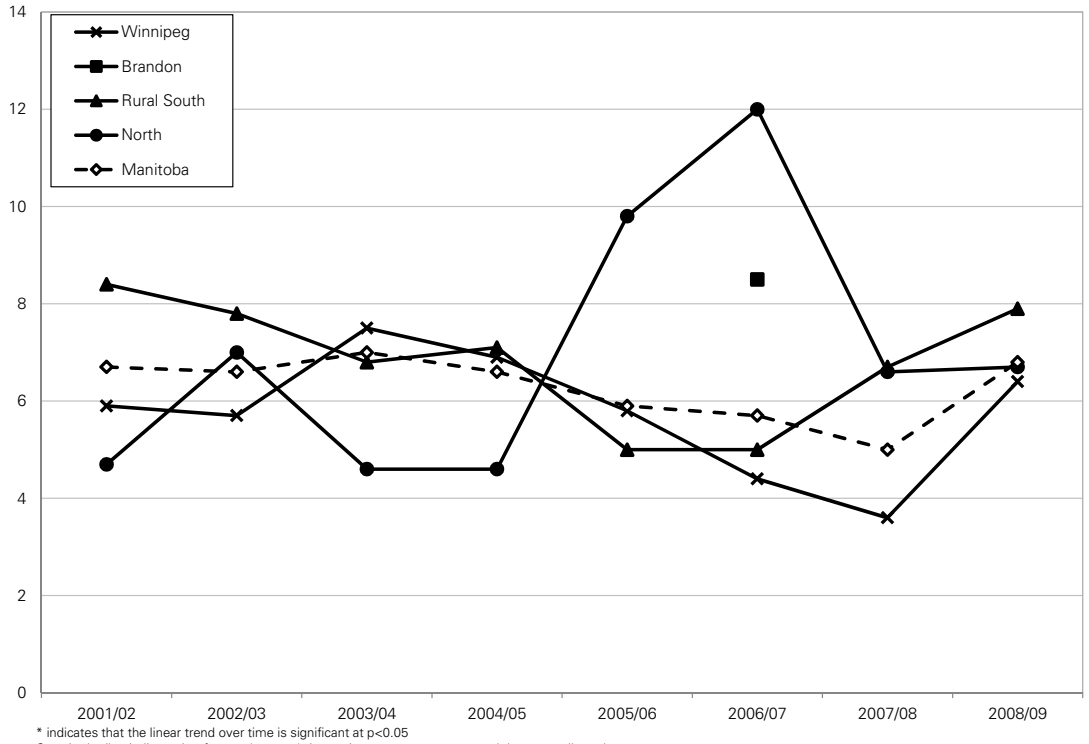
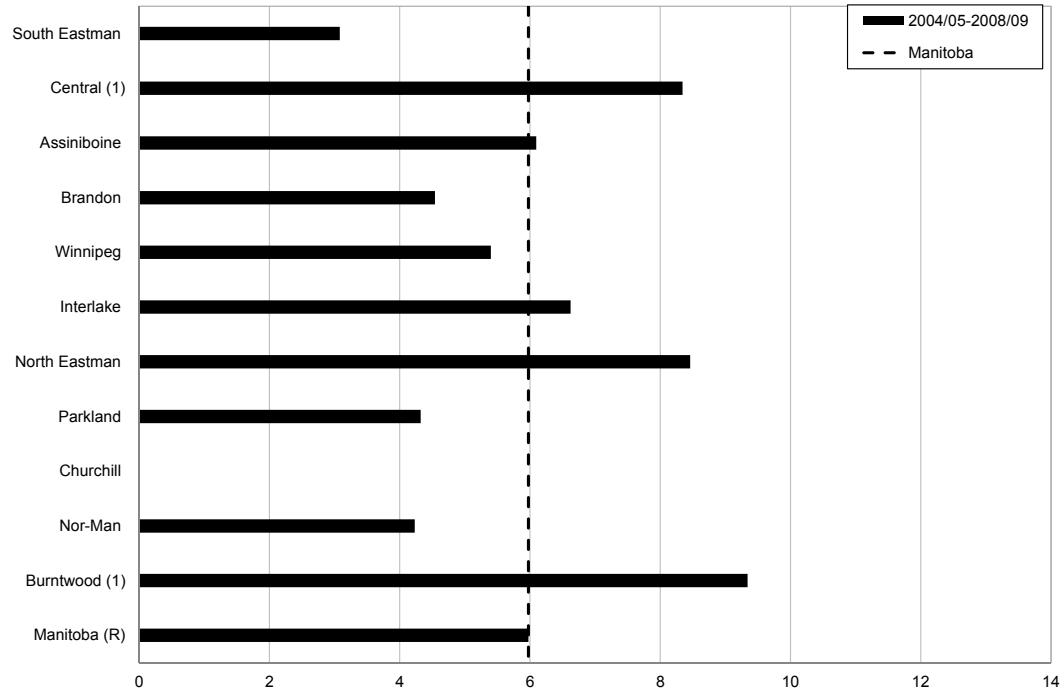
Figure 6.1.1: Stillbirth Rates by Region and Year, 2001/02-2008/09
Deaths per 1,000 total births



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

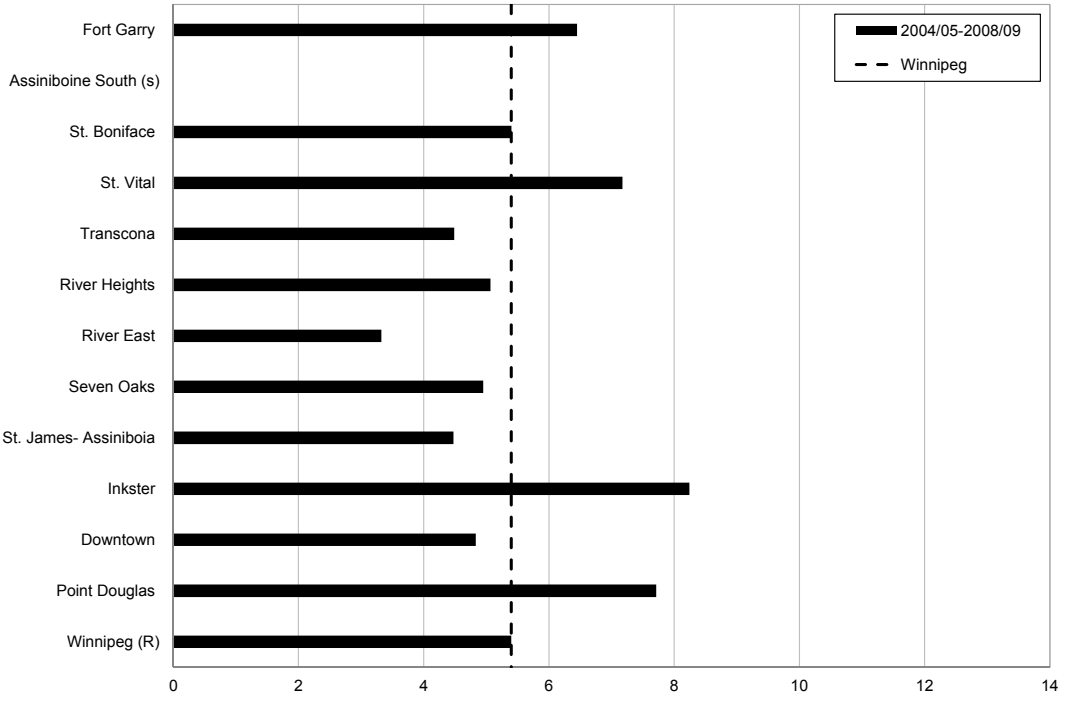
Figure 6.1.2: Stillbirth Rates by RHA, 2004/05-2008/09
Deaths per 1,000 total births



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

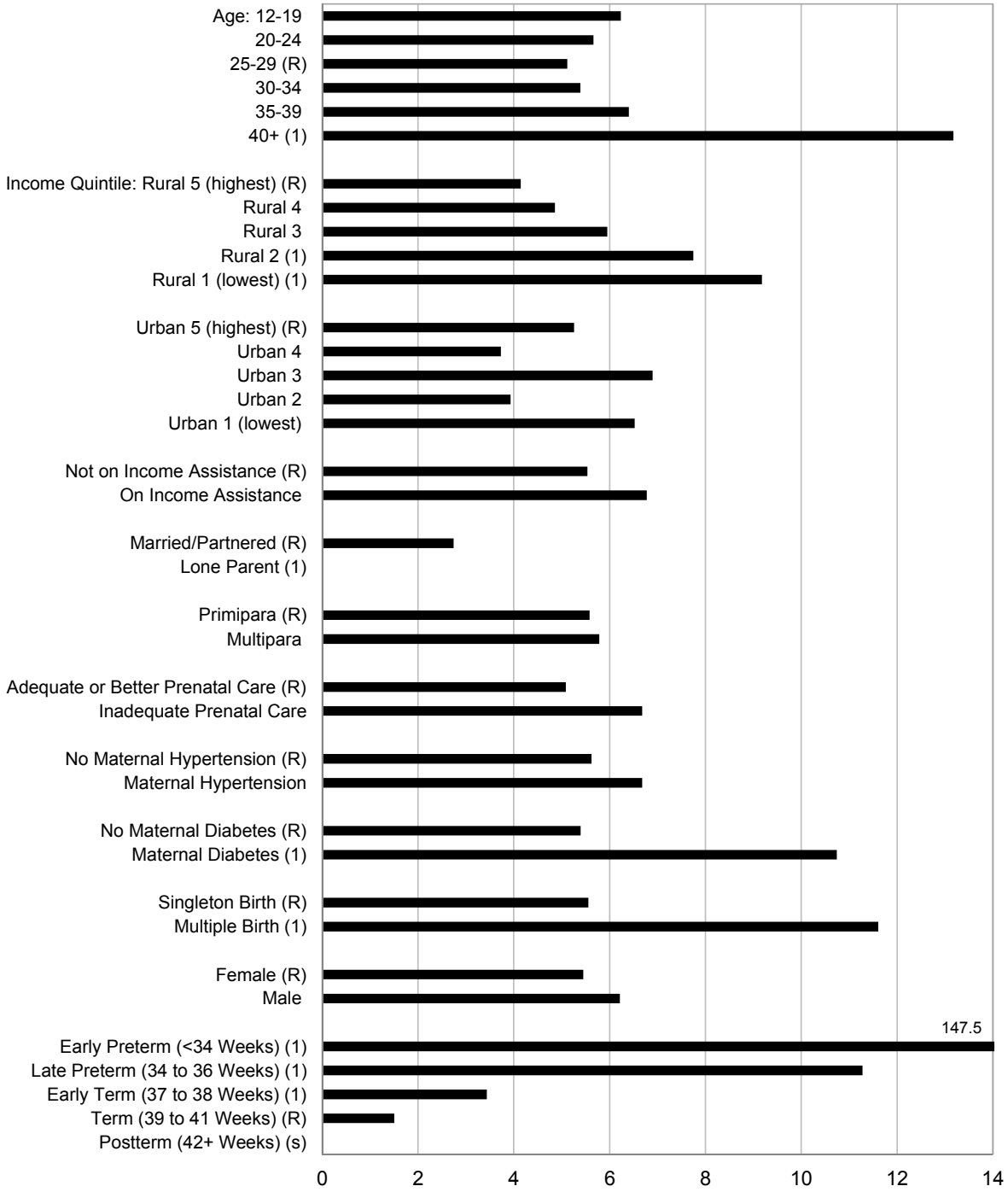
Figure 6.1.3: Stillbirth Rates by Winnipeg CA, 2004/05-2008/09
Deaths per 1,000 total births



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.1.4: Stillbirth Rates by Sociodemographic and Other Characteristics, 2004/05-2008/09
Deaths per 1,000 total births



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

6.2 Preterm Birth

Background

"Preterm birth is the leading cause of neonatal and infant mortality in industrialized countries and accounts for a substantial portion of all neonatal morbidity" (Public Health Agency of Canada, 2008, p. 123). Preterm birth remains a high priority public health concern with substantial costs incurred by the health, social, and educational systems (Mangham, Petrou, Doyle, Draper, & Marlow, 2009). The Canadian Institute of Health Information (CIHI) reported that the average in–hospital cost for a preterm baby was nine times higher than for full–term baby for singletons ($9,233 versus $1,050) and seven times higher for multiples ($12,479 versus $1,871) (Canadian Institute for Health Information, 2009). Factors contributing to the increasing preterm birth rates in industrialized countries include a higher proportion of older mothers giving birth, an increase in the number of multiple births, and increased rates of obstetric intervention (cesarean births; elective inductions) (Public Health Agency of Canada, 2008; Vanderweele, Lantos, & Lauderdale, 2011). Although the etiology of preterm birth is multifactorial and remains ill–defined, a number of psychosocial, biological, and medical factors have been implicated, including infection and inflammation, decidual hemorrhage, psychological stress (Wadhwa et al., 2001), lack of support (Rauchfuss & Maier, 2011), vaginal bleeding after 12 weeks gestation, gestational hypertension, low weight gain during pregnancy, inadequate prenatal care (Heaman, Blanchard, Gupton, Moffatt, & Currie, 2005; Heaman & Chalmers, 2005), uterine overdistention, cervical insufficiency, smoking (Gravett, Rubens, & Nunes, 2010), and having a previous preterm birth (Heaman et al., 2005; Wadhwa et al., 2001). In the 2009 CIHI report, biological factors such as multiple birth, maternal comorbidities (diabetes and hypertension), and previous preterm deliveries were most strongly associated with preterm births after adjusting for the simultaneous effect of other influences (Canadian Institute for Health Information, 2009). A recent secondary analysis of data from the Canadian Maternity Experiences Survey built on the findings of the CIHI report by studying a more comprehensive range of psychosocial, behavioural, anthropometric, and demographic risk factors than were available in CIHI's Discharge Abstract Database. These investigators found that risk factors for preterm birth included education less than high school, low weight gain during pregnancy (less than 9.1 kg), short stature (less than 155 cm), reporting life as "very stressful" in the year prior to birth of the baby, having a previous medical condition, developing a new medical condition or health problem during pregnancy, and being a **primigravida** or being a **multigravida** with a previous preterm birth or a previous **miscarriage** or abortion (Heaman et al., in press). The adverse sequelae associated with preterm birth include mortality (both early and late) (Kramer et al., 2000), as well as long–term motor, cognitive, sensory, behavioural, and socio–emotional problems (Institute of Medicine (US), 2007).

Calculation of Indicator

The preterm birth rate is defined as the number of live births with a gestational age of less than 37 completed weeks (less than 259 days) expressed as a proportion of all live births (in a given place and time) (Public Health Agency of Canada, 2008). Preterm births are frequently categorized as early preterm (less than 34 weeks) and late preterm (34 to 36 weeks). We examined the proportion of live births with a gestational age at birth of less than 37 weeks, the proportion of live births with a gestational age at birth of 34 to 36 weeks, and the proportion of live births with a gestational age at birth of less than 34 weeks. These divisions are reported only at the RHA and Winnipeg CA levels. Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2005/06–2008/09. Stillbirths were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.2.1
  - The Manitoba rate ranged from 7.2% (2002/03) to 8.2 (2004/05) and was relatively stable.
- RHA (2005/06–2008/09), Figure 6.2.2
  - All preterm
    - The Manitoba rate was 7.8%.
    - South Eastman (6.0%) and Central (6.3%) were significantly lower than the Manitoba rate, while North Eastman (9.8%) and Burntwood (9.1%) were significantly higher.
  - Early Preterm (33 weeks or less)
    - The Manitoba rate was 1.9%.
    - South Eastman (1.1%) was significantly lower than Manitoba rate.
  - Late Preterm (34 to 36 weeks)
    - The Manitoba rate was 5.9%.
    - South Eastman (4.8%) and Central (4.8%) were significantly lower than the Manitoba rate, while North Eastman (7.7%) and Burntwood (7.0%) were significantly higher.
- Winnipeg CA (2005/06–2008/09), Figure 6.2.3
  - All preterm
    - The Winnipeg rate was 8.1%.
    - Fort Garry (6.7%) was significantly lower than the Winnipeg rate, while Downtown (10.4%) and Point Douglas (10.1%) were significantly higher.
  - Early preterm (33 weeks or less)
    - The Winnipeg rate was 2.1%.
  - Late Preterm (34 to 36 weeks)
    - The Winnipeg rate was 6.0%.
    - Downtown (8.0%) and Point Douglas (7.3%) were significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2005/06–2008/09), Figure 6.2.4
  There was a statistically significant difference in the preterm birth rate for the following characteristics:
  - Maternal Age – There was a significant relationship with maternal age. With each successive increase in maternal age (by age group) over age 29, there were more preterm births.
  - Income Quintile – 8.6% of births to women living in Rural 1 were preterm compared to 6.8% to women living in Rural 5. This difference was significant. Similarly, 9.4% of births to women living in Urban 1 were preterm compared to 7.5% to women living in Urban 5.
  - Income Assistance – 10.4% of the births to women on income assistance were preterm compared to 7.4% of births to women who were not on income assistance.
  - Maternal Education – 7.5% of the births that occurred to women who had less than a Grade 12 education were preterm compared to 6.7% to women who had a Grade 12 education.
  - Marital Status – 8.9% of the births to women who were lone parents were preterm compared to 7.0% to women who were married/partnered.
  - Maternal Hypertension – 16.0% of the births to women who had hypertension were preterm compared to 7.0% to women who did not have hypertension.
  - Maternal Diabetes – 20.0% of the births to women who had diabetes were preterm compared to 7.0% to women who did not have diabetes.
  - Maternal Smoking – 8.5% of the births to women who reported smoking during pregnancy were preterm compared to 6.5% to women who did not report smoking during pregnancy.
  - Maternal Psychological Distress – 9.5% of the births to women who had psychological distress were preterm compared to 7.6% to women who did not have psychological distress.
  - Multiple Births – 49.7% of multiple births were preterm, compared to 6.7% of singleton births.
  - Previous Preterm Birth – 24.9% of births to women who had a previous preterm birth were preterm compared to 7.1% to women who did not have a previous preterm birth.

- Sex of Newborn – 8.3% of male newborns were preterm compared to 7.3% of female newborns.
- Special Care Unit (SCU) Stay for Newborn – 47.8% of newborns who had an SCU stay were preterm compared to 3.5% of those who did not have an SCU stay.

Comparison to Other Findings

The rate of preterm birth in Canada increased between 1981 and 2004 from 6.4% to 8.2% (Public Health Agency of Canada, 2008). From 2004 to 2008, the preterm birth rate in Canada remained stable, fluctuating between 7.7% and 8.2% with an average of 7.9% (Public Health Agency of Canada, 2012). In this report, the Manitoba rate of preterm birth was 7.8% (2005/06–2008/09) and was similar to the Canadian rate (Canadian Institute for Health Information, 2009; Canadian Institute for Health Information, 2011).

Limitations

Errors in reporting gestational age may affect the accuracy of preterm birth rates, especially when gestational age is based on menstrual dates alone rather than in conjunction with ultrasound confirmation (Public Health Agency of Canada, 2008). The rates of preterm birth presented here do not differentiate between spontaneous and indicated preterm birth.

Summary

The rate of preterm birth in Manitoba (2005/06–2008/09) was 7.8%, with rates of early and late preterm birth reported as 1.9% and 5.9%, respectively. Higher rates of overall preterm birth and late preterm birth were found in North Eastman and Burntwood. Within Winnipeg, the preterm birth rate was 8.1%, with higher rates observed in the inner–city areas of Downtown (10.4%) and Point Douglas (10.1%). During the period of 2001/02–2008/09, the provincial rate increased from 7.2% to 8.2%, but this trend was not statistically significant. Higher rates of preterm birth were found among women who were older (aged 30 and older), lived in rural and urban areas with the lowest income quintiles, were on income assistance, had less than a Grade 12 education, were lone parents, smoked, had a previous preterm birth, had a multiple pregnancy, and had medical conditions (e.g., hypertension, diabetes, maternal psychological distress). A significantly higher proportion of preterm infants were male.

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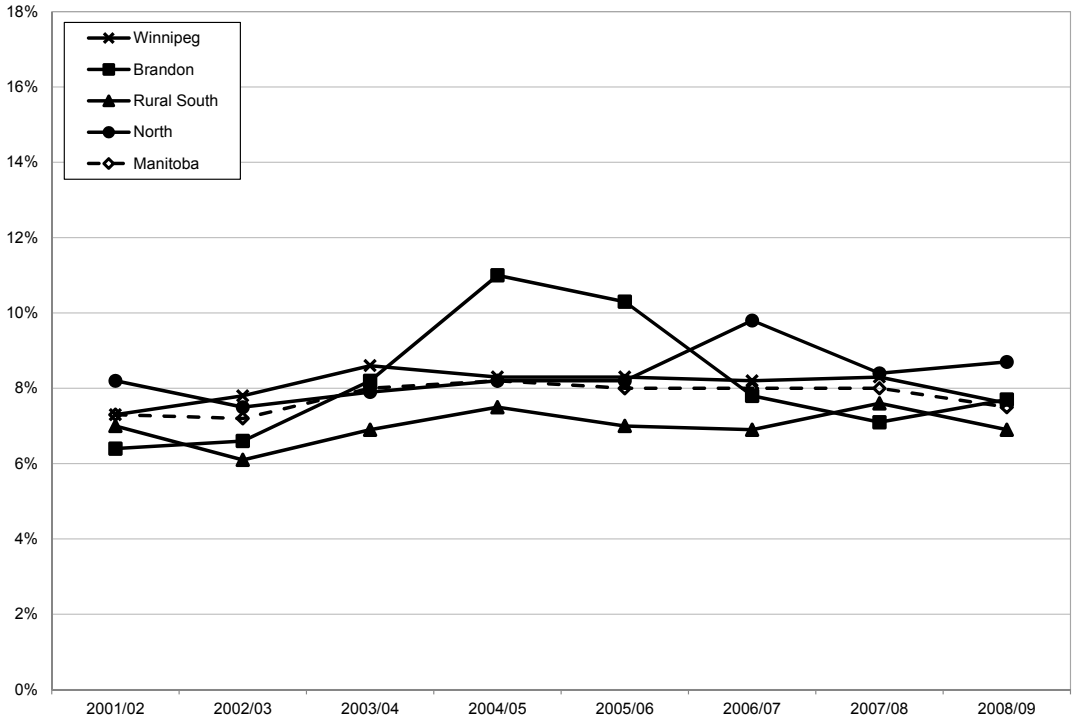
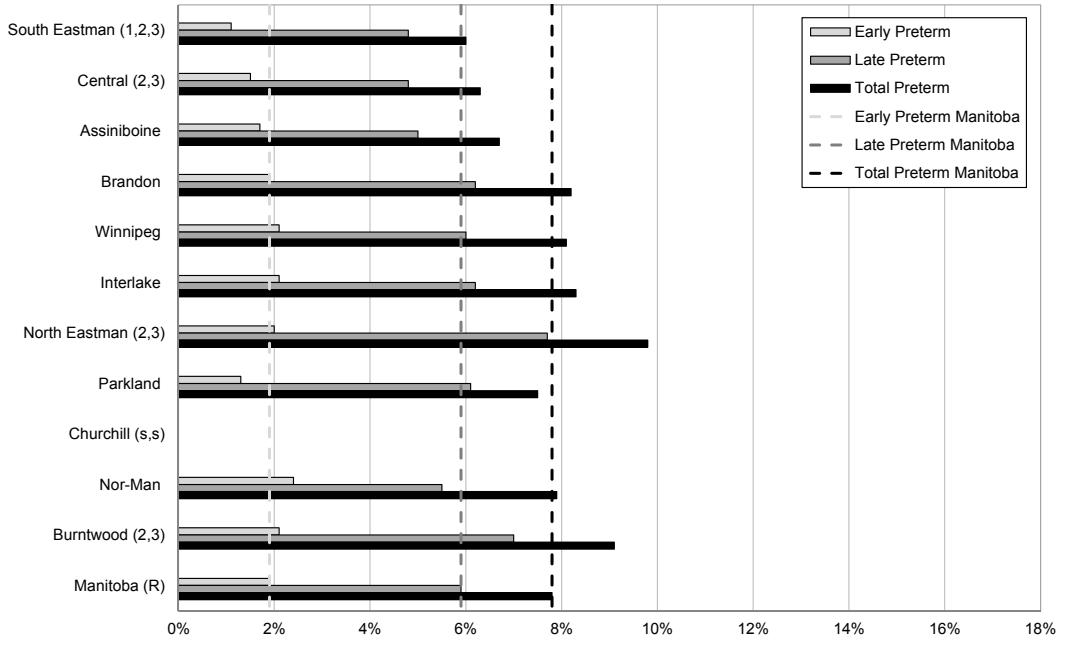
Figure 6.2.1: Proportion of Preterm Births (Less than 37 Weeks) by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

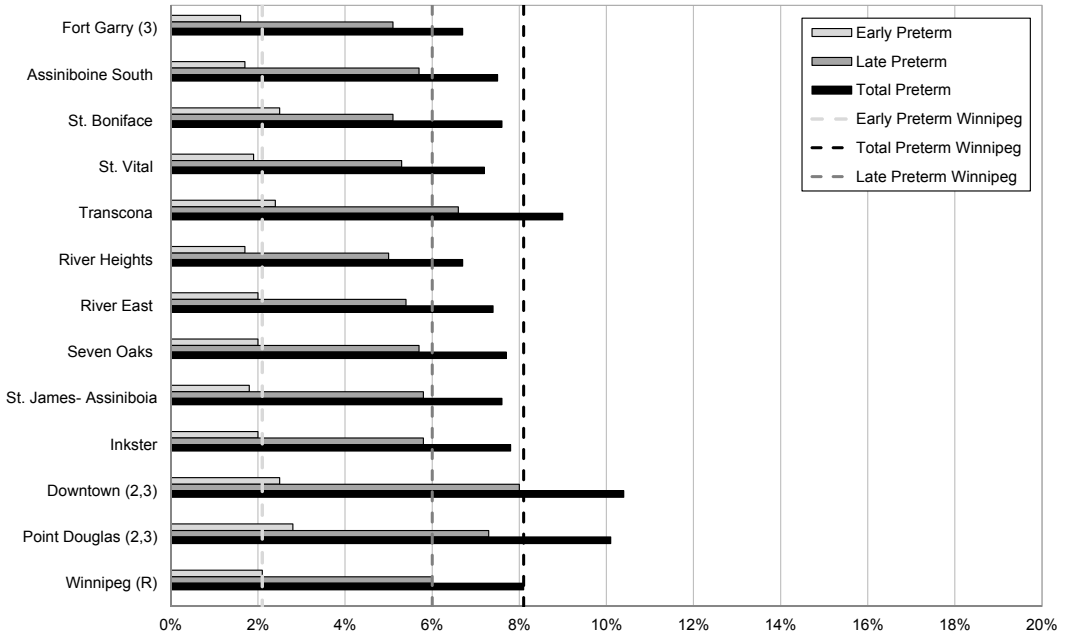
Figure 6.2.2: Proportion of Early (33 Weeks or Less), Late (34-36 Weeks), and Total (Less than 37 Weeks) Preterm Births by RHA, 2005/06-2008/09



'1' indicates the area's Early Preterm rate was statistically different from the Manitoba Early Preterm rate (p<0.01)
'2' indicates the area's Late Preterm rate was statistically different from the Manitoba Late Preterm rate (p<0.01)
'3' indicates the area's Total Preterm rate was statistically different from the Manitoba Total Preterm rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.2.3: Proportion of Early (33 Weeks or Less), Late (34-36 Weeks), and Total (Less than 37 Weeks) Preterm Births by Winnipeg CA, 2005/06-2008/09



'1' indicates the area's Early Preterm rate was statistically different from the Winnipeg Early Preterm rate (p<0.01)
'2' indicates the area's Late Preterm rate was statistically different from the Winnipeg Late Preterm rate (p<0.01)
'3' indicates the area's Total Preterm rate was statistically different from the Winnipeg Total Preterm rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.2.4: Proportion of Preterm Births (Less than 37 Weeks) by Sociodemographic and Other Characteristics, 2005/06-2008/09

'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

6.3 Postterm Birth

Background

Postterm births are associated with increased perinatal morbidity and mortality, as well as more maternal complications (e.g., shoulder dystocia, obstetric trauma, postpartum hemorrhage) (Olesen, Westergaard, & Olsen, 2003). Studies have demonstrated associations between postterm birth and adverse pregnancy outcomes, such as increased risk of meconium aspiration (Joseph, 2011), cerebral palsy (Moster, Wilcox, Vollset, Markestad, & Lie, 2010), macrosomia, fetal distress, cesarean delivery, stillbirth, low **Apgar scores**, and admission to a neonatal **intensive care unit** (De Los Santos–Garate A.M., Villa–Guillen, Villanueva–Garcia, Vallejos–Ruiz, & Murguia–Peniche, 2011). The main contributing factor to the neonatal morbidity related to postterm birth is thought to be uteroplacental insufficiency (Sanchez–Ramos, Olivier, Delke, & Kaunitz, 2003). Rates of postterm birth are highly influenced by policy and provider practice with respect to active or expectant management of pregnancy greater than 41 weeks. For example, rising rates of elective induction of labour at greater than 41 weeks have been linked to reductions in rates of macrosomia, morbidity due to meconium aspiration (Hussain, Yakoob, Imdad, & Bhutta, 2011), as well as stillbirth and cesarean birth rates (Sue–A–Quan, Hannah, Cohen, Foster, & Liston, 1999). In Canada, rates of postterm birth declined after a study by Hannah and colleagues showed elective induction at 41 weeks or more was associated with fewer perinatal deaths with no increase in use of cesarean compared to expectant management (Hannah et al., 1992).

Calculation of the Indicator

"The postterm birth rate is defined as the number of live births that occur at a gestational age of 42 or more completed weeks of pregnancy, expressed as a proportion of all live births" (Public Health Agency of Canada, 2008). Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2005/06–2008/09. Stillbirths, newborns with a gestation of less than 20 weeks, and newborns with a birth weight of less than 500 grams were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.3.1
    - The Manitoba rate ranged from 1.1% (2001/02) to 1.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.1% in 2001/02 to a high of 1.9% in 2007/08.
    - The Winnipeg rate ranged from 0.9% (2001/02) to 1.9% (2008/09); the linear trend was significant; the rate increased over time from a low of 0.9% in 2001/02 to a high of 2.2% in 2007/08.
    - The rate for the Rural South ranged from 1.3% (2001/02) to 1.6% (2008/09); the linear trend was significant; the rate increased over time from a low of 1.3% in 2001/02 to a high of 2.0% in 2007/08.
    - The rate for the North ranged from 1.5% (2001/02) to 0.8% (2008/09); the linear trend was significant; the rate decreased over time from a high of 1.5% in 2001/02 to a low of 0.6% in 2006/07.
- RHA (2005/06–2008/09), Figure 6.3.2
    - The Manitoba rate was 1.6%.
    - Central (2.6%) and Winnipeg (1.9%) were significantly higher than the Manitoba rate; while Assiniboine (0.7%), Brandon (0.5%), and Burntwood (0.5%) were significantly lower.
- Winnipeg CA (2005/06–2008/09), Figure 6.3.3
    - The Winnipeg rate was 1.9%.
    - Downtown (2.6%) was significantly higher than the Winnipeg rate.

- Sociodemographic and Other Characteristics (2005/06–2008/09), Figure 6.3.4
  There was a statistically significant difference in the postterm birth rate for the following characteristics:
  - Maternal Age – 2.4% of the births to women aged 12 to 19 were postterm and 1.3% of the births to women aged 30 to 34 were postterm compared to 1.7% of the births to women who aged 25 to 29.
  - Income Quintile – 1.8% of births to women living in Rural 4 and 1.7% of the births in Rural 3 were postterm compared to 1.2% to women living in Rural 5; 2.1% of births to women living in Urban 1 were postterm compared to 1.5% to women living in Urban 5.
  - Maternal Education – 2.0% of births to women with less than a Grade 12 education were postterm compared to 1.5% to women with a Grade 12 education.
  - Marital Status – 2.2% of births to women who were lone parents were postterm compared to 1.6% to women who were married/partnered.
  - Prenatal Care – 2.7% of the births to women who had inadequate prenatal care were postterm compared to 1.5% to women who had adequate prenatal care.
  - Maternal Diabetes – 0.3% of the births to women who had diabetes were postterm compared to 1.7% to women who did not have diabetes.
  - Delivery Method – 1.9% of cesarean births and 2.5% of the assisted vaginal births were postterm compared to 1.5% of **spontaneous vaginal births**.
  - Sex of Newborn – 1.7% of male newborns were postterm compared to 1.5% of females.

Comparison to Other Findings

In Canada, the rate of postterm birth decreased from 2.5% in 1995 to 0.8% in 2004 (Public Health Agency of Canada, 2008). The Manitoba rate of 1.6% (2005/06–2008/09) is higher than the Canadian rate of 0.8% in 2004 (Public Health Agency of Canada, 2008) and 0.6% in 2008 (Public Health Agency of Canada, 2012). In the most recent report by Public Health Agency of Canada, Manitoba had the highest rate of postterm birth of all 10 provinces for 2004–2008; only Yukon and the Northwest Territories had higher rates (Public Health Agency of Canada, 2012). Using data from U.S. vital statistics, Zhang et al. reported that rates of labour induction nearly doubled over 12 years, from 14.3% in 1992 to 27.0% in 2003; and this increase was accompanied by a decrease in postterm birth rates from 3.8% in 1992 to 0.9% in 2003 (2010). In contrast with Canadian and U.S. trends, the rates of postterm birth have been increasing in Manitoba.

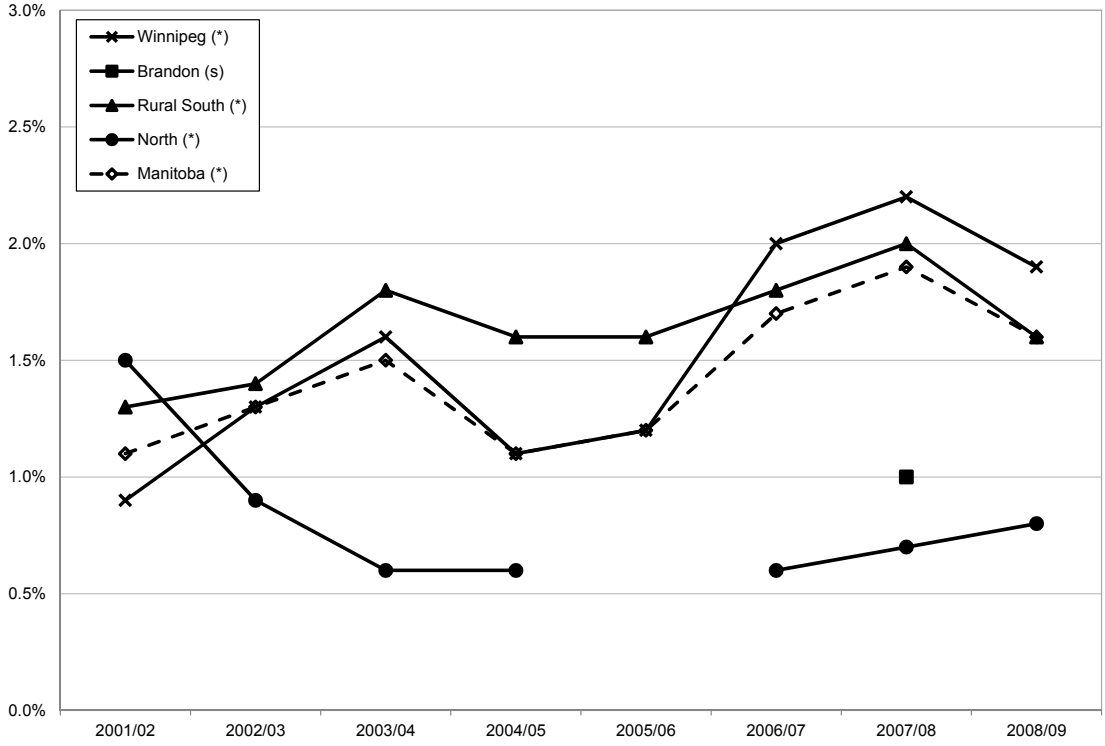
Limitations

Errors in reporting postterm birth rates may occur when estimates of gestational age are based on menstrual dates. These errors have diminished in recent decades as ultrasound confirmation of gestational age becomes more widely used (Public Health Agency of Canada, 2012).

Summary

The rate of postterm birth in Manitoba (2005/06–2008/09) was 1.6% with higher rates observed in Central (2.6%) and Winnipeg (1.9%). Within Winnipeg, the Downtown area had a significantly higher rate (2.6%) than the Winnipeg rate (1.9%). During 2001/02–2008/09, the provincial rate increased significantly from 1.1 % to 1.9%. Regional variation in the rates during this period were evident. Increasing linear trends were found in the regions of Winnipeg and Rural South, but the North had a declining trend. The rate of postterm delivery was highest among women who were younger or lone parents, had less than Grade 12 education, lived in the lowest urban income quintile or mid–income rural quintiles (i.e., Rural 3 and Rural 4), had cesarean or assisted vaginal deliveries, received inadequate prenatal care, or delivered male infants. Fewer women with postterm deliveries had diabetes.

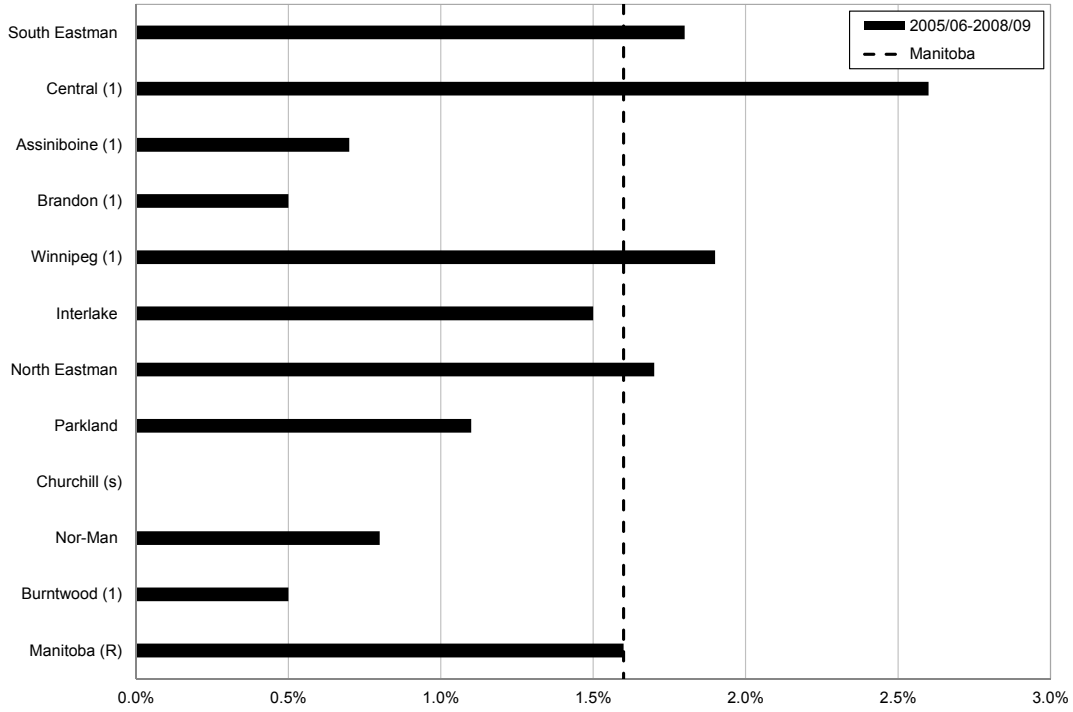
Figure 6.3.1: Proportion of Postterm (42+ Weeks) Births by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05
Gaps in the line indicate that for one (or more) time points, rates are suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

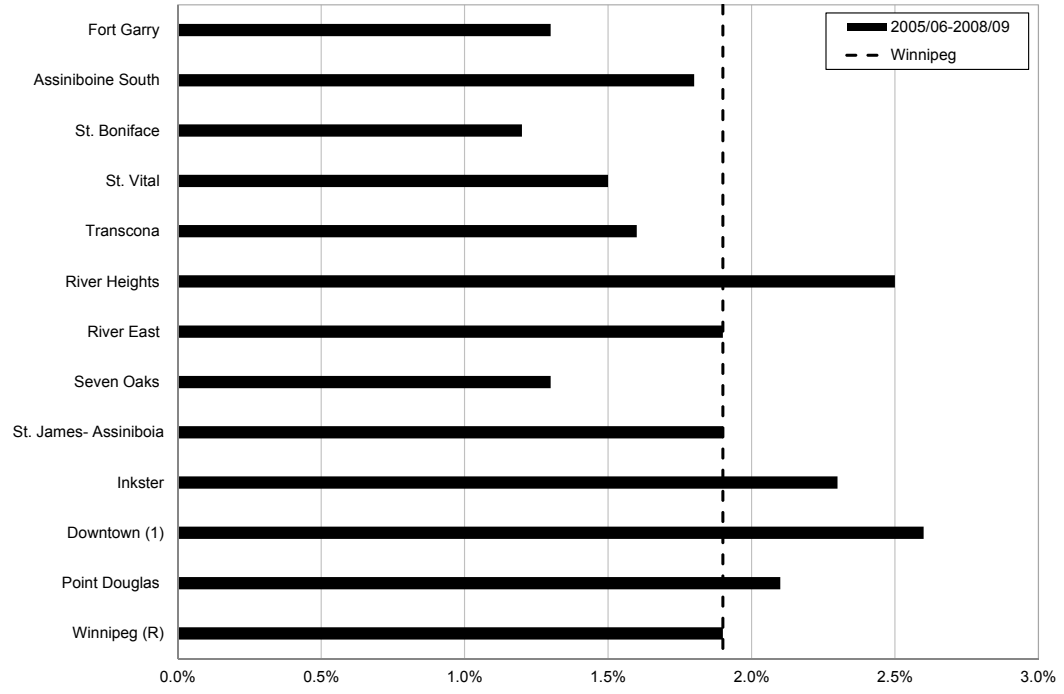
Figure 6.3.2: Proportion of Postterm (42+ Weeks) Births by RHA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate(p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

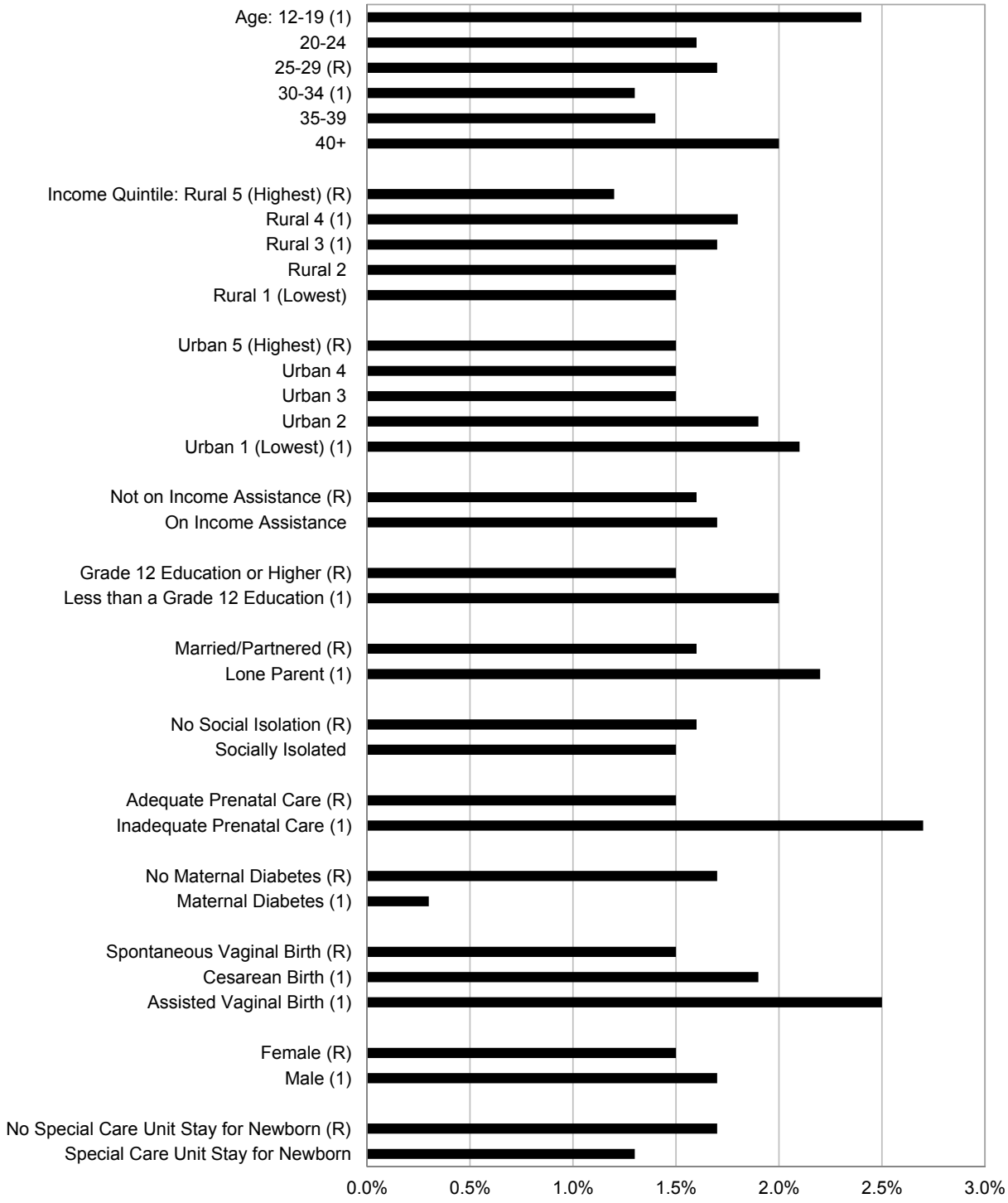
Figure 6.3.3: Proportion of Postterm (42+ Weeks) Births by Winnipeg CA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.3.4: Proportion of Postterm (42+ Weeks) Births by Sociodemographic and Other Characteristics, 2005/06-2008/09



'1' indicates the group's rate was statistically different from the reference (R) group ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

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6.4 Small–for–Gestational–Age

Background

"The small–for–gestational–age (SGA) rate is defined as the number of live births whose birth weight is below the standard 10th percentile of the sex–specific birth weight for a given gestational age, expressed as a proportion of all live births (in a given place and time). The term SGA is often used interchangeably with intrauterine growth restriction (IUGR), although there are distinctions between the two—IUGR refers to the occurrence of poor fetal growth which may happen through a number of mechanisms, while SGA describes an infant's position on growth charts after birth" (Public Health Agency of Canada, 2008). The risk of SGA is increased among women who experience inadequate weight gain during pregnancy (Moore Simas et al., 2011), pregnancy complications (e.g., maternal hypertension, hyperemesis gravidarum, asthma) (Canadian Institute for Health Information, 2009; Firoozi et al., 2010; Liu et al., 2011; Veenendaal, van Abeelen, Painter, van der Post, & Roseboom, 2011), heavy alcohol consumption (Patra et al., 2011), and smoking (Watanabe et al., 2010), as well as primiparity (first–time mothers) (Canadian Institute for Health Information, 2009). There is also some evidence that birth weight is influenced by neighbourhood characteristics (Canadian Institute for Health Information, 2009; Metcalfe, Lail, Ghali, & Sauve, 2011). In a recent secondary analysis of data from the Canadian Maternity Experiences Survey, risk factors for SGA births included low pre–pregnancy body mass index (less than 8 kg/m^2), smoking during pregnancy, low weight gain during pregnancy (less than 9.1 kg), short stature (less than 155 cm), reporting life as "very stressful" in the year prior to birth of the baby, and being a recent immigrant (less than five years in Canada) (Heaman et al., in press). Infants who are born SGA are at greater risk for neonatal mortality and morbidity (Grisaru–Granovsky et al., 2012; Qiu et al., 2012) and adverse long–term outcomes, such as reduced neurocognitive abilities and school performance (Pyhälä et al., 2011), autism (Guinchat et al., 2012), depression as young adults (Raikkonen et al., 2008), and adult cardiovascular disease (Rogers & Velten, 2011).

Calculation of the Indicator

A birth was considered to be SGA if the birth weight was at less than the 10th percentile for its gestational age and sex using a Canadian standard (Kramer et al., 2001).The SGA was calculated by dividing the number of births categorized as SGA by the total number of live births. The time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths, multiple births, newborns with a gestation of less than 20 weeks, and newborns with missing birth weights were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.4.1
    - The Manitoba rate ranged from 6.7% (2003/04) to 7.6% (2006/07) and was relatively stable.
- RHA (2007/08–2008/09), Figure 6.4.2
    - The Manitoba rate was 7.3%.
    - Winnipeg (8.2%) was significantly higher than the Manitoba rate, while NOR–MAN (5.0%) was significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 6.4.3
    - The Winnipeg rate was 8.2%.
    - Seven Oaks (10.7%) and Downtown (9.7%) were significantly higher than the Winnipeg rate.

- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 6.4.4
  There was a statistically significant difference in the SGA rate for the following characteristics:
  - Income Quintile – More babies born to women living in lower urban income quintiles (Urban 4, 8.2%; Urban 3, 8.6%; Urban 2, 8.6%; and Urban 1, 8.5%) were SGA compared to babies born to women living in the highest urban income quintile (Urban 5, 5.9%)
  - Parity – 9.4% of babies born to primiparous women were SGA compared to 5.9% of babies born to multiparous women.
  - Maternal Hypertension – 10.8% of babies born to women who had hypertension were SGA compared to 6.9% to women who did not have hypertension.
  - Maternal Diabetes – 4.7% of the babies born to mother with diabetes were SGA compared to 7.4% to women who did not have diabetes.
  - Maternal Smoking During Pregnancy – 10.8% of babies born to women who smoked during pregnancy were SGA compared to 6.6% to women who did not smoke during pregnancy.
  - Sex of Newborn – 7.7% of male babies born were SGA compared to 6.9% of female babies.

Comparison to Other Findings

In 2004, the rate of SGA births in Canada was 7.8 per 100 singleton live births (Public Health Agency of Canada, 2008) and 7.8% in 2009 (Public Health Agency of Canada, 2012). In the CIHI report, *Too Early, Too Small*, 8.3% of singleton births in Canada were born SGA in 2006–2007 (Canadian Institute for Health Information, 2009). The Manitoba SGA rate of 7.3% for 2007/08–2008/09 is lower than these nationally reported rates for Canada.

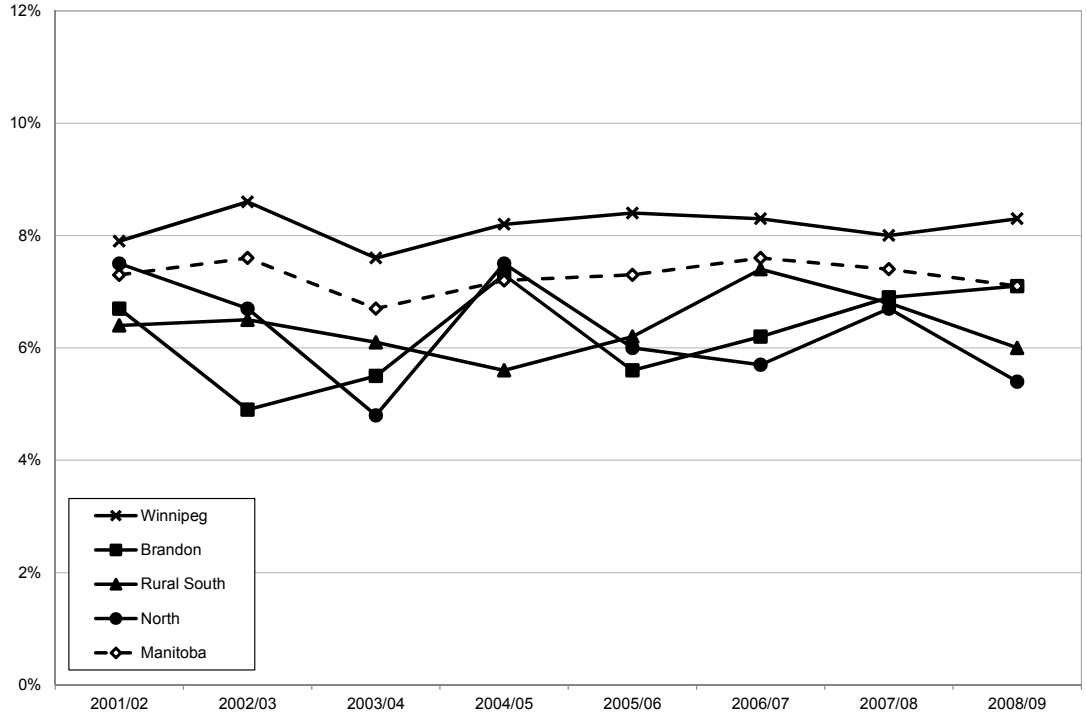
Limitations

We used traditional "one size fits all" newborn weight percentile curves to determine SGA, but these curves do not take into account the differences in newborn weight between some ethnic groups (Kierans, Joseph, Platt, Wilkins, & Kramer, 2008; Ray et al., 2009). Birth weight curves tailored to maternal world region of birth have recently been developed using data from Ontario and could be considered for use in future research (Ray et al., 2012). We also did not have access to data on maternal pre–pregnancy height and weight nor maternal weight gain during pregnancy; so we could not examine the association between low pre–pregnancy BMI and low maternal weight gain during pregnancy, which are known risk factors for SGA.

Summary

The rate of SGA was stable over time. In 2007/08–2008/09, the Manitoba rate of SGA was 7.3%. NOR–MAN (5.0%) had a significantly lower SGA rate, while Winnipeg (8.2%) had a significantly higher SGA rate compared to the provincial rate. Within Winnipeg, Seven Oaks (10.7%) and Downtown (9.7%) had significantly higher rates than the Winnipeg rate (8.2%). The highest rates of SGA were found among women who lived in lower income quintile urban areas, were primiparous, smoked, had hypertension, and who did not have diabetes. Higher rates of SGA were also apparent in male infants.

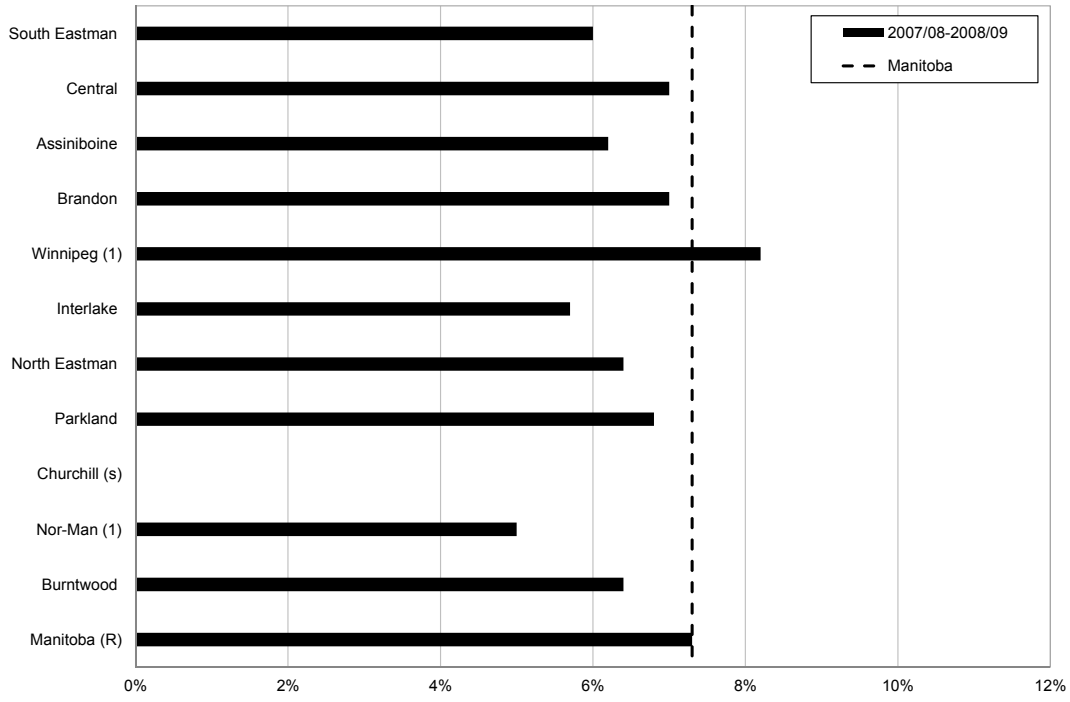
Figure 6.4.1: Proportion of Small-for-Gestational-Age (SGA) Infants by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

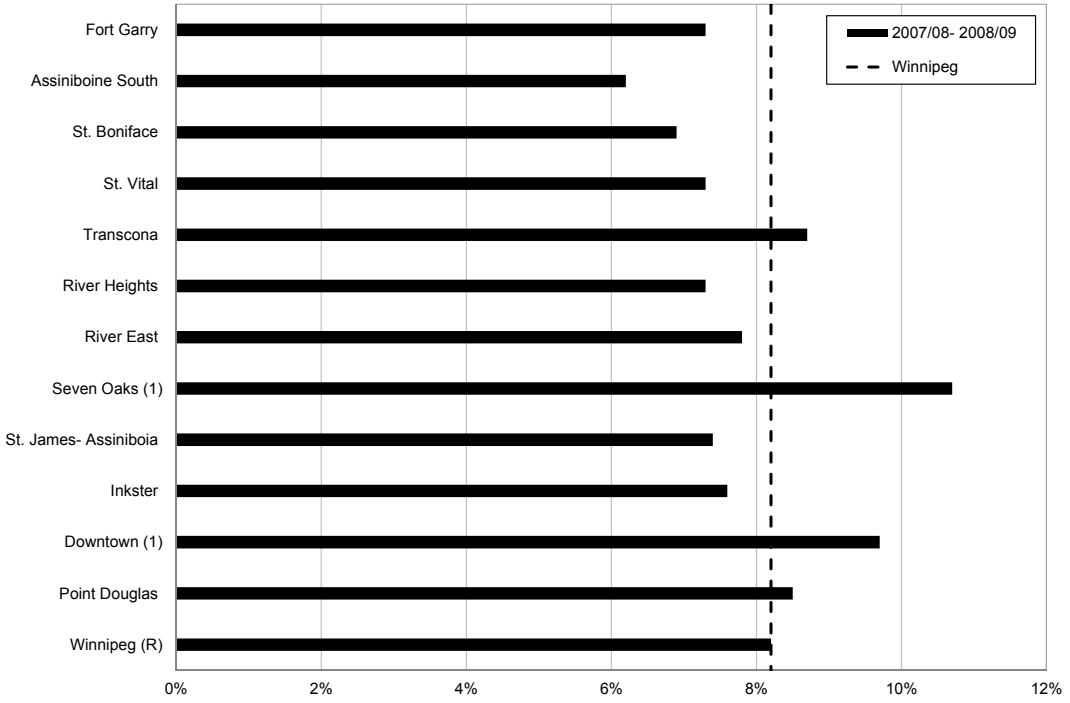
Figure 6.4.2: Proportion of Small-for-Gestational-Age (SGA) Infants by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

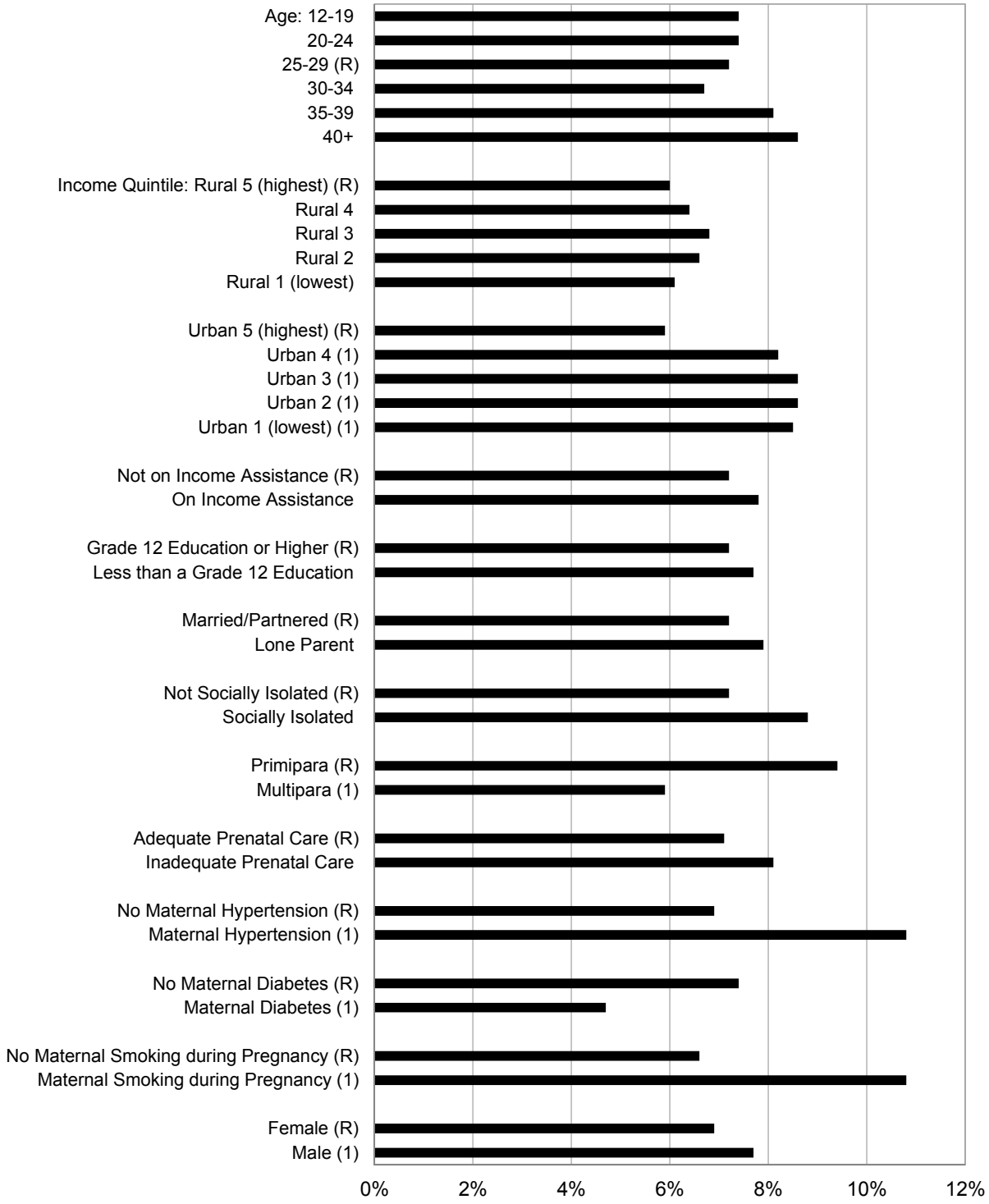
Figure 6.4.3: Proportion of Small-for-Gestational-Age (SGA) Infants by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.4.4: Proportion of Small-for-Gestational-Age (SGA) Infants by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
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Source: Manitoba Centre for Health Policy, 2012

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6.5 Large–for–Gestational–Age

Background

Traditionally, the main concern related to neonatal birth weight has been infants who are born small for their gestational age (SGA); however, increasing attention is now being paid to the rising rates of infants born large for their gestational age (LGA) (Cnattingius, 2004), factors contributing to LGA, and the long–term health consequences of LGA. As a perinatal indicator, LGA is reflective of maternal health in that it is related to high pre–pregnancy weight (Olmos et al., 2012), maternal diabetes (Persson, Norman, & Hanson, 2009), and excessive weight gain during pregnancy (Ferraro et al., 2011; Savitz, Stein, Siega–Riz, & Herring, 2011). Infants born LGA are more likely to require greater intervention at delivery, including cesarean delivery, resuscitation, and special care nursery admission (Ng et al., 2010). LGA birth has also been associated with long–term sequelae, such as an increased risk of metabolic syndrome in childhood (obesity, hypertension, dyslipidemia, glucose intolerance) (Boney, Verma, Tucker, & Vohr, 2005), childhood obesity (de Hoog, van, Stronks, Gemke, & Vrijkotte, 2011), and adult obesity (Cnattingius, 2004). Given the modifiable nature of the risk factors that contribute to LGA birth, monitoring rates and trends of LGA births can aid in understanding patterns of maternal health and the effectiveness of public health interventions.

Calculation of the Indicator

A birth was considered to be LGA if the birth weight was above the standard 90th percentile for their gestational age and sex using a Canadian standard (Kramer et al., 2001). The LGA rate was calculated by dividing the number of births categorized as LGA by the total number of live births. The time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths, multiple births, babies with a gestation of less than 20 weeks, and babies with missing birth weights were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.5.1
  - The Manitoba rate ranged from 14.4% (2007/08) to 15.5% (2003/04) and was relatively stable.
- RHA (2007/08–2008/09), Figure 6.5.2
  - The Manitoba rate was 15.0%.
  - Winnipeg (13.2%) was significantly lower than the Manitoba rate; while Interlake (19.4%), Parkland (18.3%), NOR–MAN (19.7%), and Burntwood (19.8%) were significantly higher.
- Winnipeg CA (2007/08–2008/09), Figure 6.5.3
  - The Winnipeg rate was 13.2%.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 6.5.4
  There was a statistically significant difference in the LGA rate for the following characteristics:
  - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age over age 29, there were more LGA babies.
  - Income Quintile – 20.7% of the babies born in the lowest rural income quintile (Rural 1) were LGA. This is significantly higher than the reference group (Rural 5), in which 15.2% of the babies born were LGA.
  - Social Isolation – 10.0% of the babies born to women who were socially isolated were LGA compared to 13.8% of the babies born to women who were not socially isolated.
  - Parity – 17.6% of babies born to multiparous women were LGA compared to 10.7% of babies born to primiparous women.
  - Maternal Hypertension – 16.7% of babies born to women who had hypertension were LGA compared to 14.8% to women who did not have hypertension.

- Maternal Diabetes – 34.8% of the babies born to mother with diabetes were LGA compared to 13.6% to women who did not have diabetes.
- Maternal Smoking During Pregnancy – 14.3% of babies born to women who did not smoke during pregnancy were LGA compared to 10.9% to women who smoked during pregnancy.

Comparison to Other Findings

The rate of LGA births among singleton live births in Canada was 11.6% in 2004 (Public Health Agency of Canada, 2008) and 11.1% in 2008 (Public Health Agency of Canada, 2012). The rate in Manitoba was considerably higher (15.0% for 2007/08–2008/09) than the Canadian rate, probably related to the high prevalence of maternal diabetes in Manitoba.

Limitations

We used traditional "one size fits all" newborn weight percentile curves to determine LGA, but these curves do not take into account the differences in newborn weight between some ethnic groups (Kierans, Joseph, Latt, Wilkins, & Kramer, 2008; Ray et al., 2009). Birth weight curves tailored to maternal world region of birth have recently been developed in Ontario and could be considered for use in future research (Ray et al., 2012). We also did not have access to data on maternal pre–pregnancy height and weight nor maternal weight gain during pregnancy; so we could not examine the association between overweight or obese pre–pregnancy BMI and high maternal weight gain during pregnancy, which are known risk factors for LGA.

Summary

The Manitoba rate of large–for–gestational age births in 2007/08–2008/09 was 15.0%, with higher than provincial rates observed in Interlake (19.4%), Parkland (18.3%), NOR–MAN (19.7%), and Burntwood (19.8%). Overall, the Manitoba rate remained stable during the period 2001/02–2008/09. The rate of LGA births was highest among women who were aged 30 and older, lived in the lowest rural income quintile, were not socially isolated, were multiparous, did not smoke, and who had hypertension or diabetes. Among women with diabetes, 34.8% of their infants were LGA.

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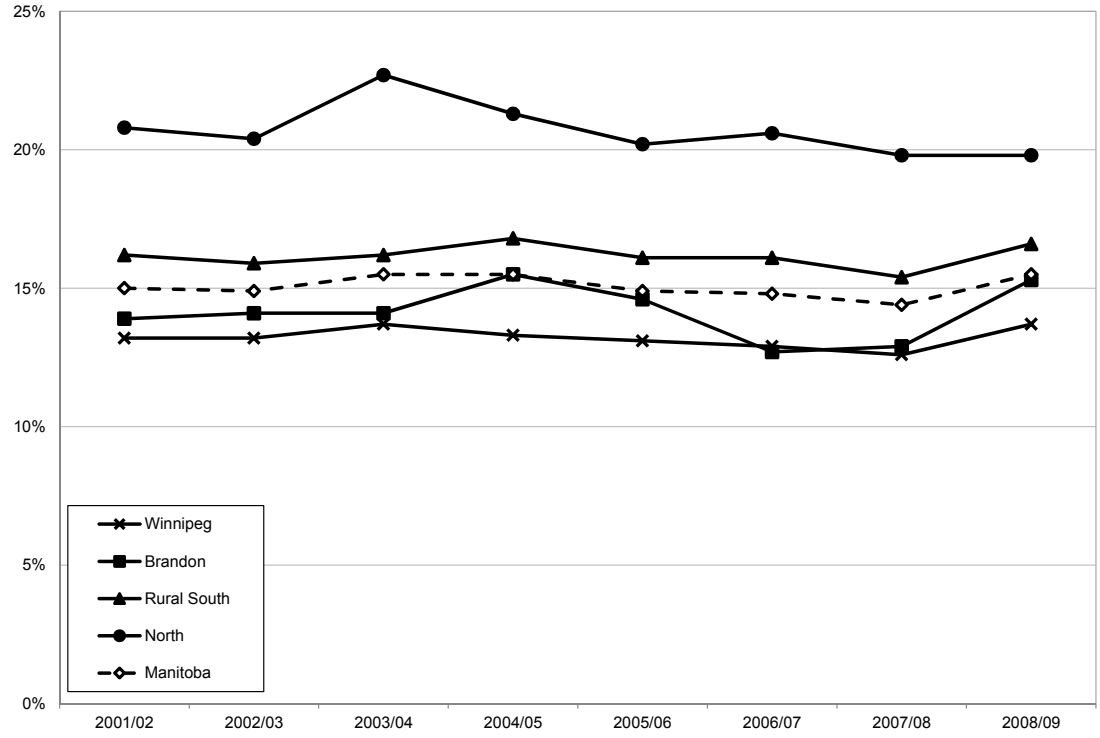
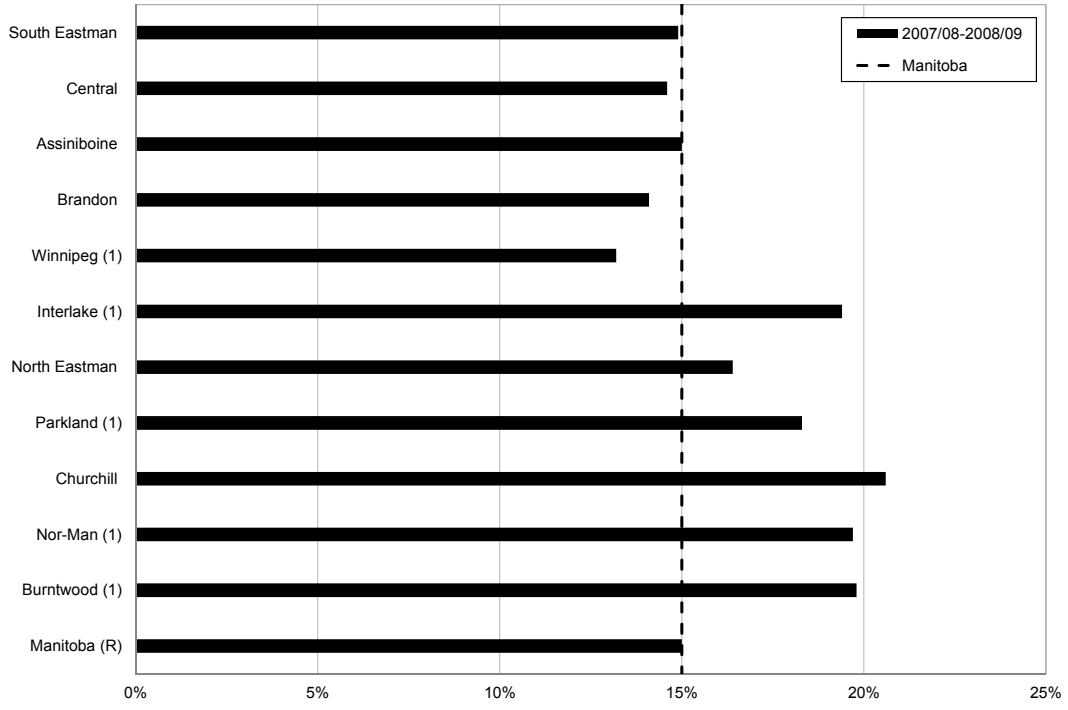
Figure 6.5.1: Proportion of Large-for-Gestational-Age (LGA) Infants by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

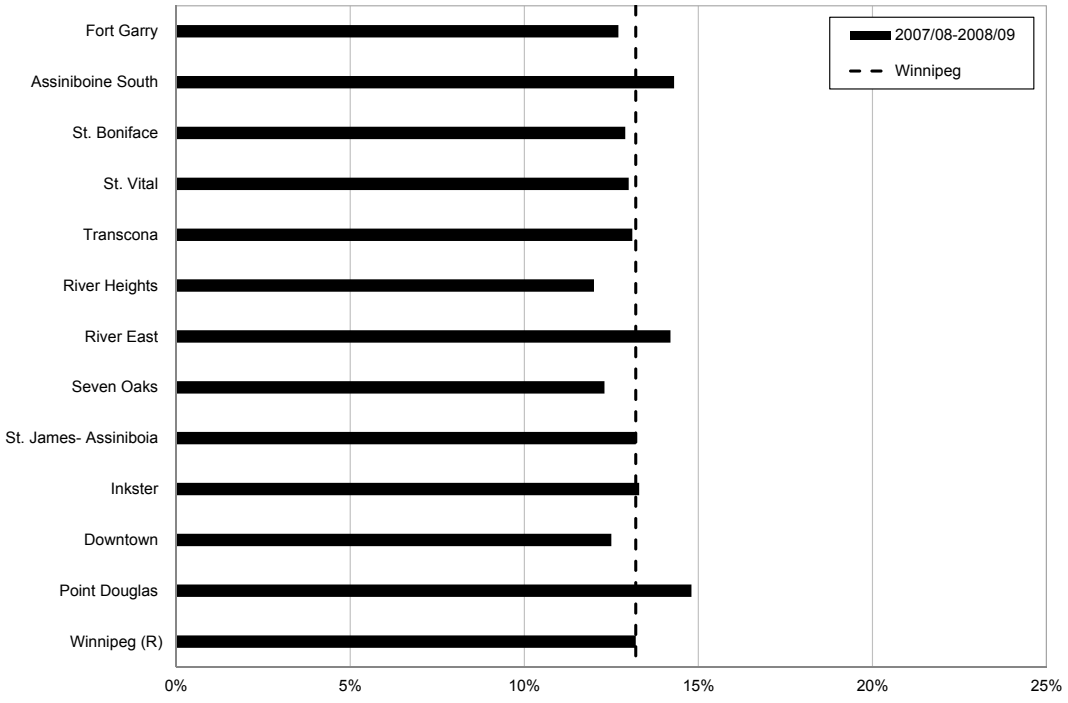
Figure 6.5.2: Proportion of Large-for-Gestational-Age (LGA) Infants by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

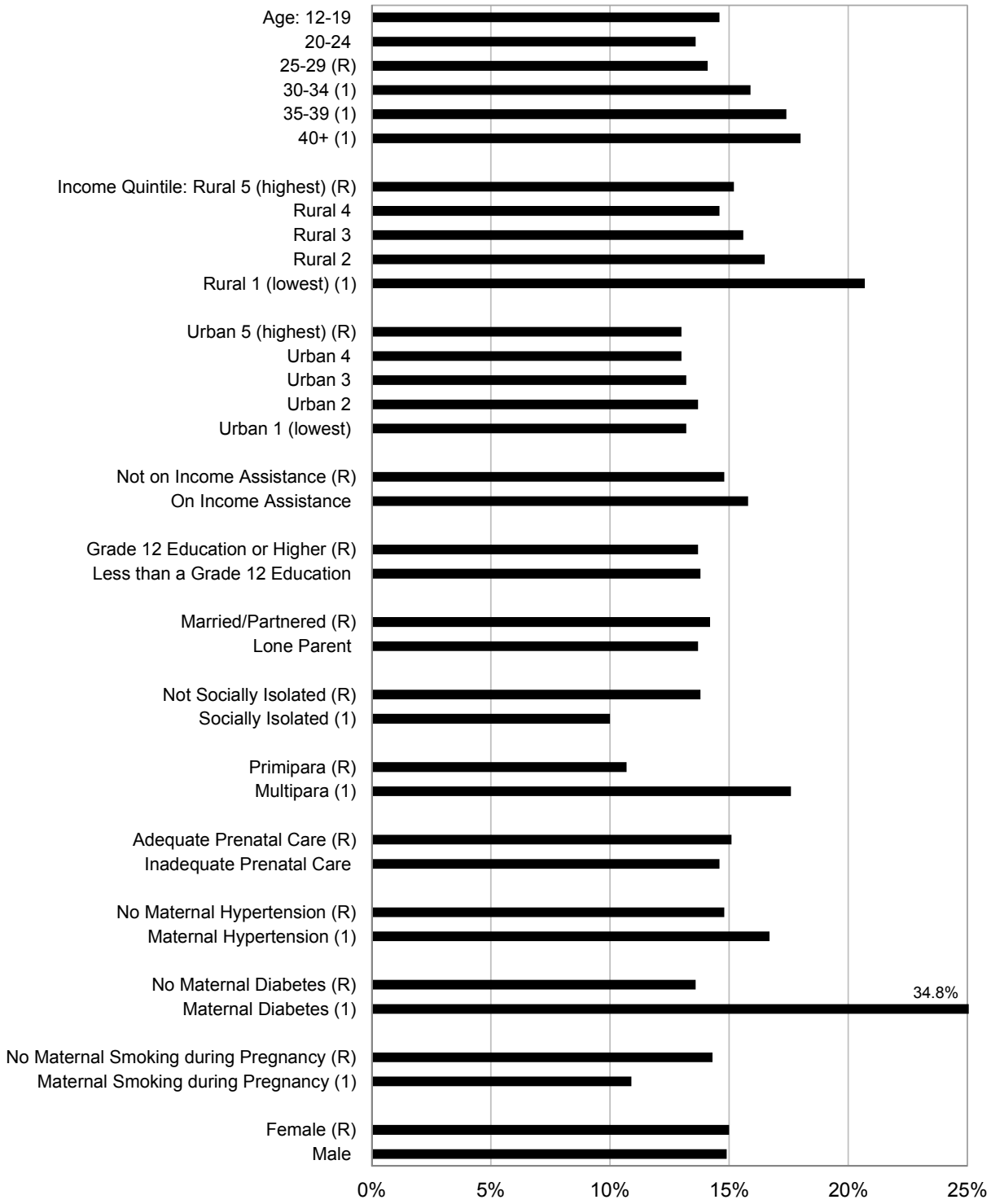
Figure 6.5.3: Proportion of Large-for-Gestational-Age (LGA) Infants by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.5.4: Proportion of Large-for-Gestational-Age (LGA) Infants by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

6.6 Multiple Births

Background

Infants of multiple pregnancies, especially higher order multiples, are more commonly preterm (Bromer, Ata, Seli, Lockwood, & Seli, 2011), small–for–gestational–age (Cleary–Goldman et al., 2005), and have a higher risk of neurodevelopmental impairment (Vohr et al., 2009). In addition, societal costs related to multiple births in the form of maternal complications, neonatal healthcare, and maternal productivity losses are substantial (Kjellberg, Carlsson, & Bergh, 2006).

In 2002, a study of rates of multiple births in Canada and other western countries demonstrated a steady increase over the previous 30 years that was attributed to greater use of infertility treatments (Blondel & Kaminski, 2002). Similarly, a recent study in Canada found that the main contribution to higher order pregnancies was infertility treatment (e.g., ovulation induction, *in vitro* fertilization) (Cook, Geran, & Rotermann, 2011). As a result, limiting the number of embryos that are transferred during fertility procedures to a single embryo has been recommended (Min, Claman, & Hughes, 2008). The Joint Society of Obstetricians and Gynaecologists of Canada and the Canadian Fertility and Andrology Society (SOGC – CFAS) Clinical Practice Guideline recommends selective application of elective single embryo transfer in a small group of good prognosis patients (Min, Hughes, & Young, 2010).

Calculation of the Indicator

The multiple birth rate was defined as the number of live births and stillbirths following a multiple gestation pregnancy, expressed as a proportion of all live births and stillbirths. The time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Others Characteristics were calculated for 2005/06–2008/09. Births with a gestation of less than 20 weeks and those with a birth weight of less than 500 grams were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.6.1
  - The Manitoba rate ranged from 3.0% (2003/04) to 2.4% (2004/05) and was relatively stable.
- RHA (2005/06–2008/09), Figure 6.6.2
  - The Manitoba rate was 2.6%.
  - North Eastman (1.5%) was significantly lower than the Manitoba rate.
- Winnipeg CA (2005/06–2008/09), Figure 6.6.3
  - The Winnipeg rate was 2.7%.
  - St. James–Assiniboia (3.7%) was significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2005/06–2008/09), Figure 6.6.4
  There was a statistically significant difference in the multiple births for the following characteristics:
  - Maternal Age – There is a significant relationship with maternal age. With each successive increase in maternal age, there were more multiple births.
  - Income Quintile – 1.9% and 1.8% of babies born to mothers living in Rural 3 and Rural 1 were multiple births compared to 2.8% to mothers living in Rural 5.
  - Marital Status – 2.1% of babies born to women who were lone parents were multiples compared to 2.7% of babies born to mothers who were married/partnered.
  - Parity – 1.2% of babies born to primiparous women were multiples compared to 1.4% of babies born to multiparous women.
  - Delivery Method – 1.6% of babies delivered vaginally were multiples compared to 6.5% of those delivered by a cesarean.

- Ovulation Induction – 7.9% of babies born to women who had used drugs for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth were multiples compared to 1.2% to women who did not use such drugs.
- Gestation – 10.5% of early preterm, 8.2% of late preterm, and 2.5% of early term babies were multiples compared to 0.2% of term babies.
- **Special Care Unit** Admission – 10.8% of babies who had a special care unit admission were multiples compared to 1.7% of those who did not have a special care unit admission

Comparison to Other Findings

The rate of multiple births estimated in Manitoba for 2005/06–2008/09 (2.6%) was slightly lower than the national rate reported by the Canadian Perinatal Health Report (3.0%) for 2004 (Public Health Agency of Canada, 2008). The Canadian multiple birth rate remained stable between 2.9% and 3.1% between 2004 and 2008 (Public Health Agency of Canada, 2012).

Limitations

In examining the predictors of multiple births, we did not distinguish between twins and higher order multiples; some studies have found that the factors associated with these groups differ (Cook et al., 2011). Although we studied the association between use of drugs for ovulation induction or controlled ovarian hyperstimulation with multiple births, we were unable to study the association between multiple births and **assisted reproductive technology** (such as *in vitro* fertilization) because it is an uninsured service and not recorded in physician claims data.

Summary

The prevalence of multiple births in Manitoba during 2005/06–2008/09 was 2.6%. Within Winnipeg, the rate of multiple births was 2.7%, with a significantly higher rate observed in St. James–Assiniboia (3.7%). The Manitoba rate remained stable for the period 2001/02–2008/09 (2.4% to 3.0%). The prevalence of multiple births was greater among women who were older, married, and multiparous; lived in higher income rural areas; used fertility medications (e.g., for ovulation induction/hyperstimulation); and delivered preterm infants.

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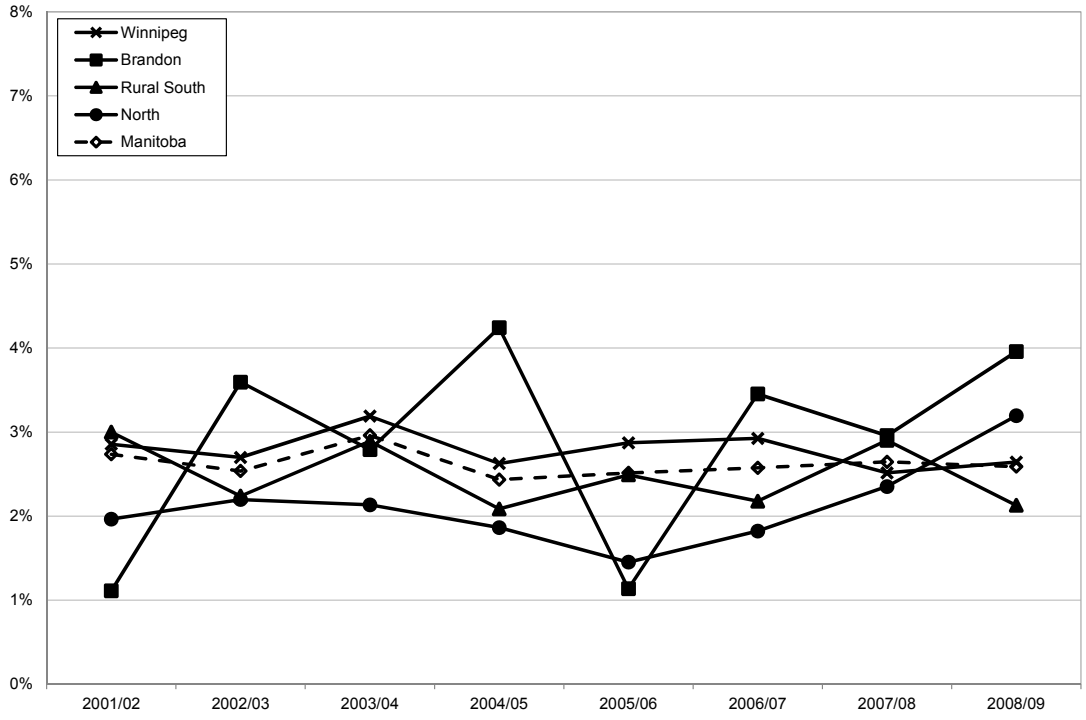
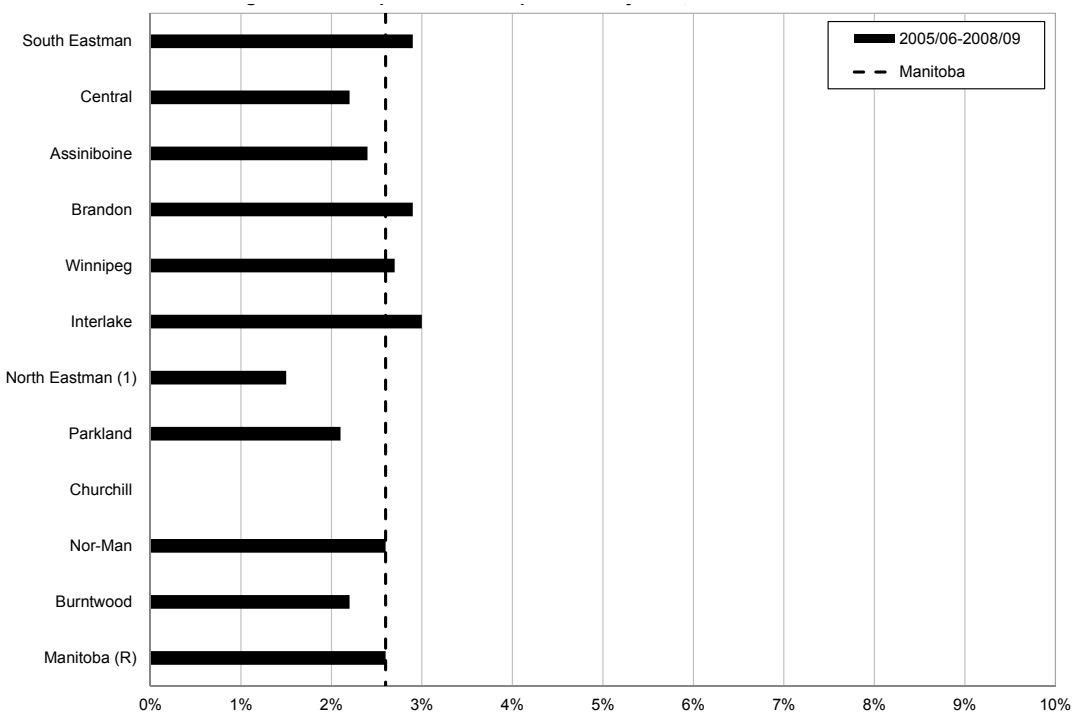
Figure 6.6.1: Proportion of Multiple Births by Region and Year, 2000/01-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

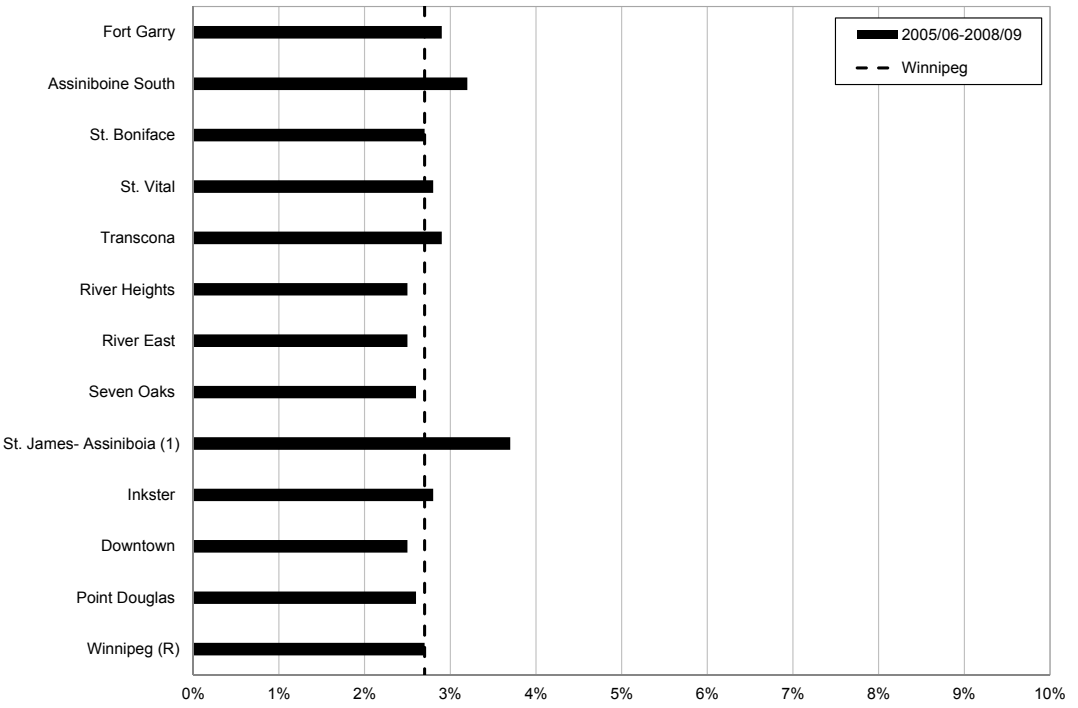
Figure 6.6.2: Proportion of Multiple Births by RHA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

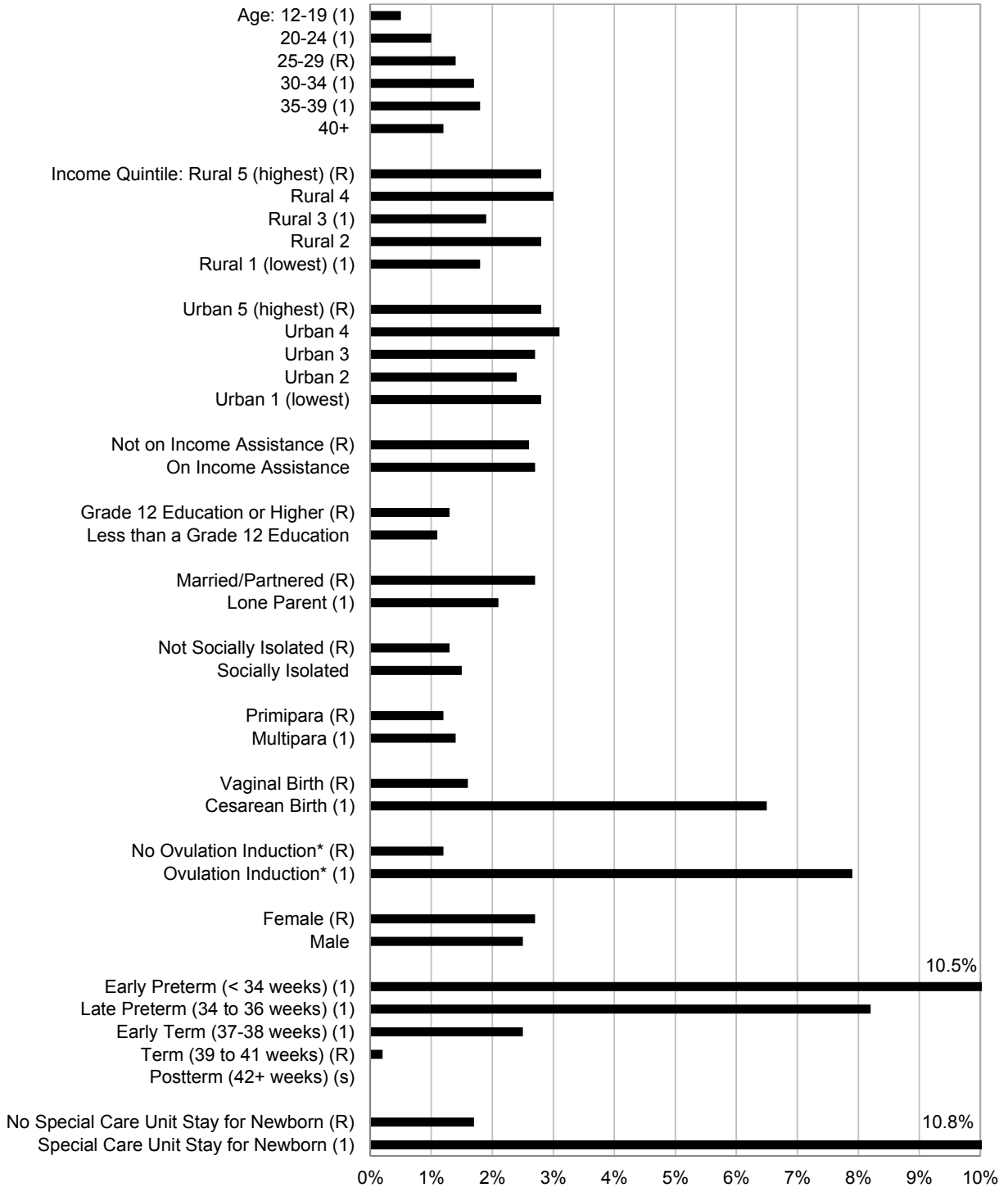
Figure 6.6.3: Proportion of Multiple Births by Winnipeg CA, 2005/06-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.6.4: Proportion of Multiple Births by Sociodemographic and Other Characteristics, 2005/06-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers
'*' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

Source: Manitoba Centre for Health Policy, 2012

6.7 Five–Minute Apgar Score of 7 or Less

Background

Apgar scores measure the physiological well–being of newborns as they adjust to life outside the womb, and are recorded for virtually all births in hospital and home births attended by a midwife. A score of 0, 1, or 2 is given for each of five vital signs that is assessed at one and five minutes after birth, including appearance, pulse, reflex, muscle tone, and breathing pattern. These five scores are added up to give a total score between 0 and 10, with higher scores representing optimal extrauterine adjustment.
In addition to measuring physiological stability at birth and response to resuscitation, there is some evidence for a relationship between low five–minute Apgar scores and increased risk of cerebral palsy (Stoknes et al., 2012), autism (Gardener, Spiegelman, & Buka, 2011), low IQ (Odd, Rasmussen, Gunnell, Lewis, & Whitelaw, 2008), and impaired school performance during adolescence (Stuart, Olausson, & Käñllen, 2011). Although an important indicator of newborn well–being, little research has assessed the prevalence and time trends of Apgar scores of 7 or less.

Calculation of the Indicator

The number of newborns with a five–minute Apgar score of 7 or less was divided by the total number of live births. The time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths, births weighing less than 500 grams, and newborns with a gestation of less than 20 weeks were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.7.1
  - The Manitoba rate ranged from 3.1% (2006/07) to 4.0% (2008/09) and was relatively stable.
- RHA (2007/08–2008/09), Figure 6.7.2
  - The Manitoba rate was 3.5%.
  - Brandon (5.0%) was significantly higher than the Manitoba rate, while Burntwood (2.7%) was significantly lower.
- Winnipeg CA (2007/08–2008/09), Figure 6.7.3
  - The Winnipeg rate was 3.7%.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 6.7.4
  There was a statistically significant difference in the five–minute Apgar score of 7 or less for the following characteristics:
  - Income Assistance – 3.9% of the newborns born to women on income assistance had a five–Minute Apgar score of 7 or less compared to 3.4% of newborns born to women who were not on income assistance.
  - Delivery Method – 2.7% of the newborns who had a spontaneous vaginal birth had a five–minute Apgar score of 7 or less compared to 5.3% of cesarean births and 6.6% of assisted vaginal births.
  - Vaginal Birth with an Epidural – 4.0% of newborns born to women who had an vaginal birth with an epidural during delivery had a five–minute Apgar score of 7 or less compared to 2.4% of newborns born to women who did not have an epidural during vaginal delivery.
  - Sex of Newborn – 3.9% of male newborns had a five–minute Apgar score of 7 or less compared to 3.1% of female newborns.
  - Gestation – 3.01% of early preterm, 8.4% of late preterm, and 4.7% of postterm newborns had a five–minute Apgar score of 7 or less compared to 2.6% of term babies.
  - **Size for Gestational Age** – 5.1% of newborns who were small–for–gestational–age had a five–minute Apgar score of 7 or less compared to 3.3% of appropriate–for– gestational–age newborns.

- Special Care Unit – 17.8% of newborns who were admitted to a special care unit at birth had a five–minute Apgar score of 7 or less compared to 1.9% of newborns who were not admitted to a special care unit.

Summary

The proportion of infants born with a five–minute Apgar score of 7 or less was stable in Manitoba from 2001/02–2008/09. In 2007/08–2008/09, the Manitoba rate was 3.5%, with a significantly higher rate observed in Brandon (5.0%). The rate of infants born with a score 7 or less was significantly higher in boys, infants of mothers on income assistance, preterm infants, small–for–gestational–age infants, and infants admitted to a special care unit. Rates of Apgar scores 7 or less were also significantly higher among mothers who had cesarean deliveries or assisted vaginal deliveries and mothers who had epidurals.

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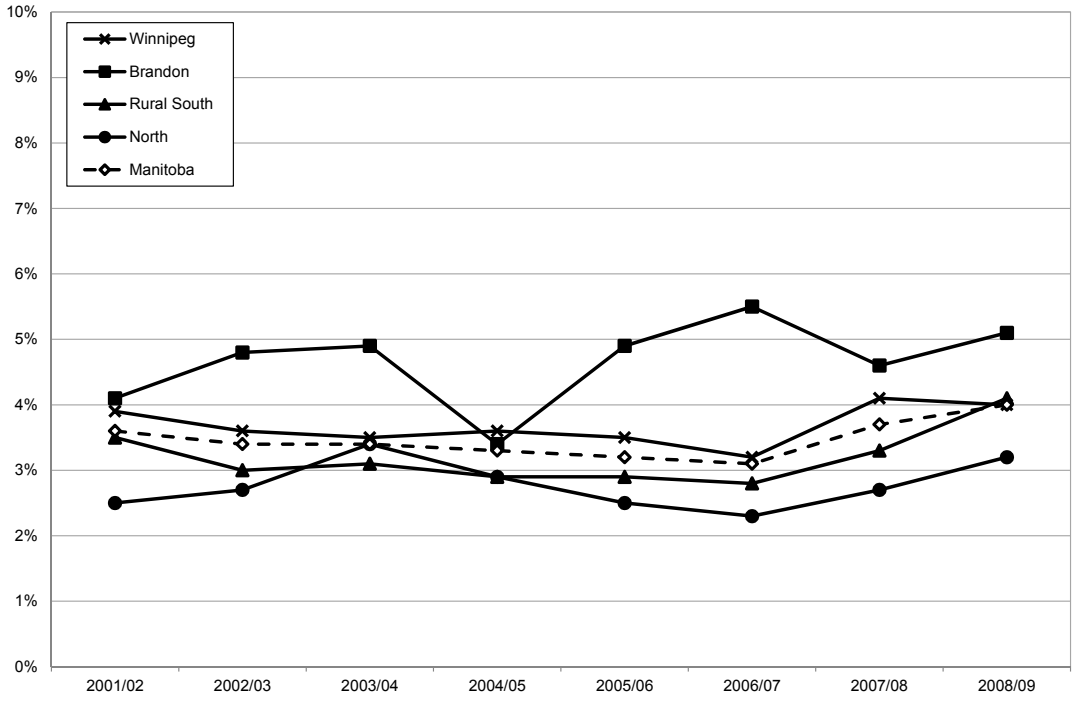
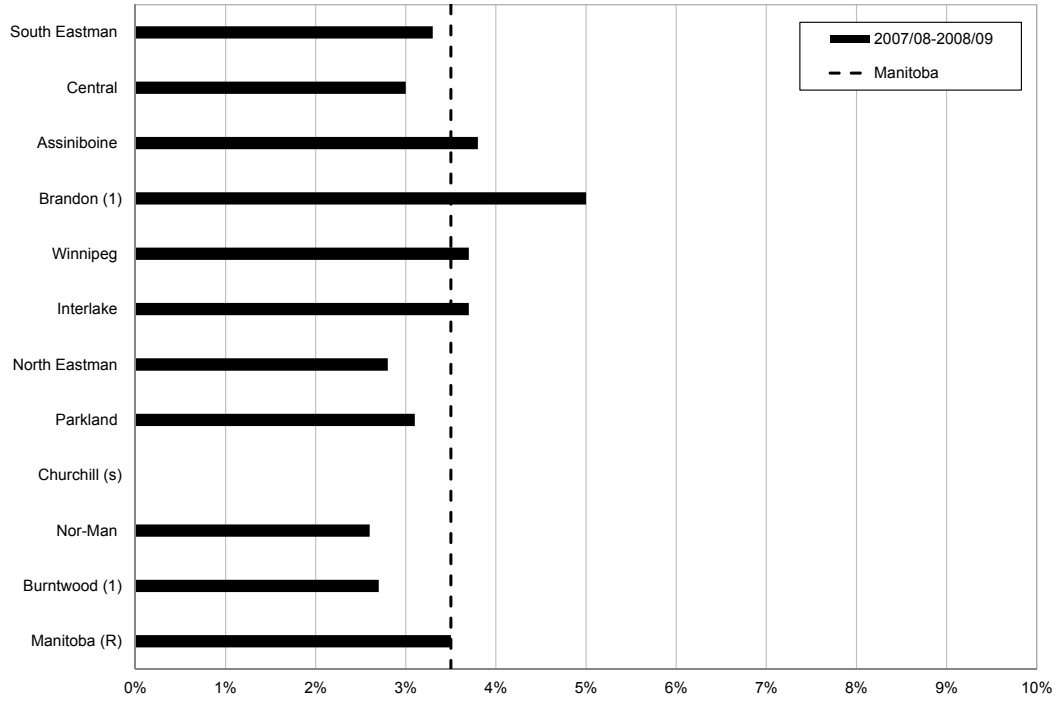
Figure 6.7.1: Proportion of Infants with a Five-Minute Apgar Score of 7 or Less by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

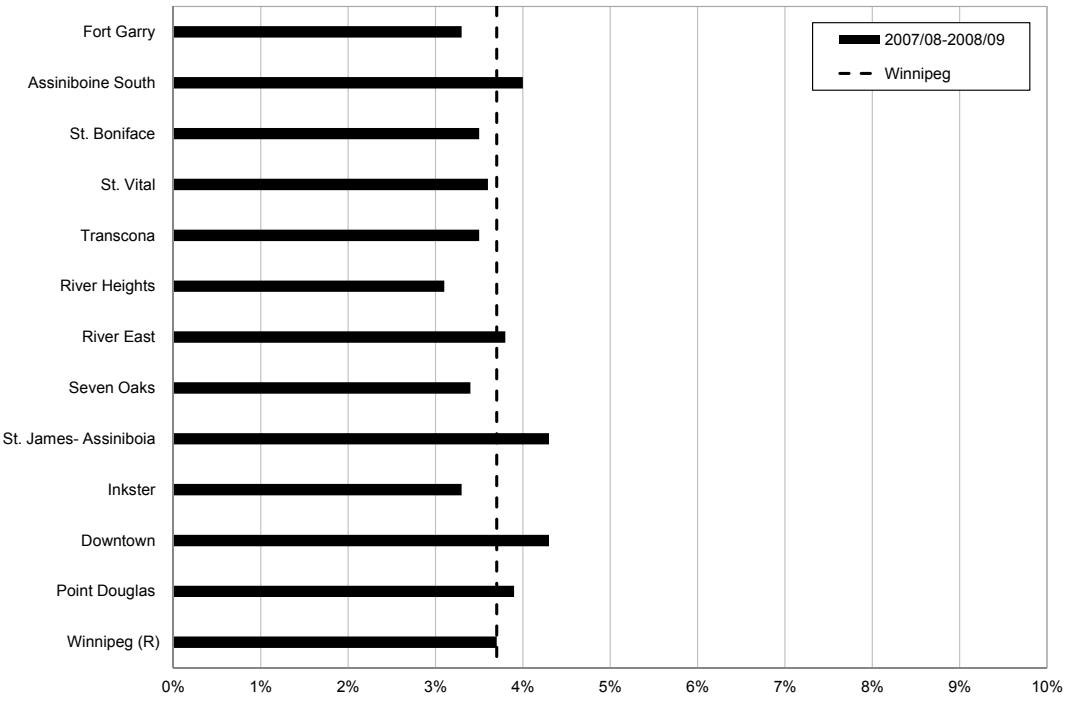
Figure 6.7.2: Proportion of Infants with a Five-Minute Apgar Score of 7 or Less by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

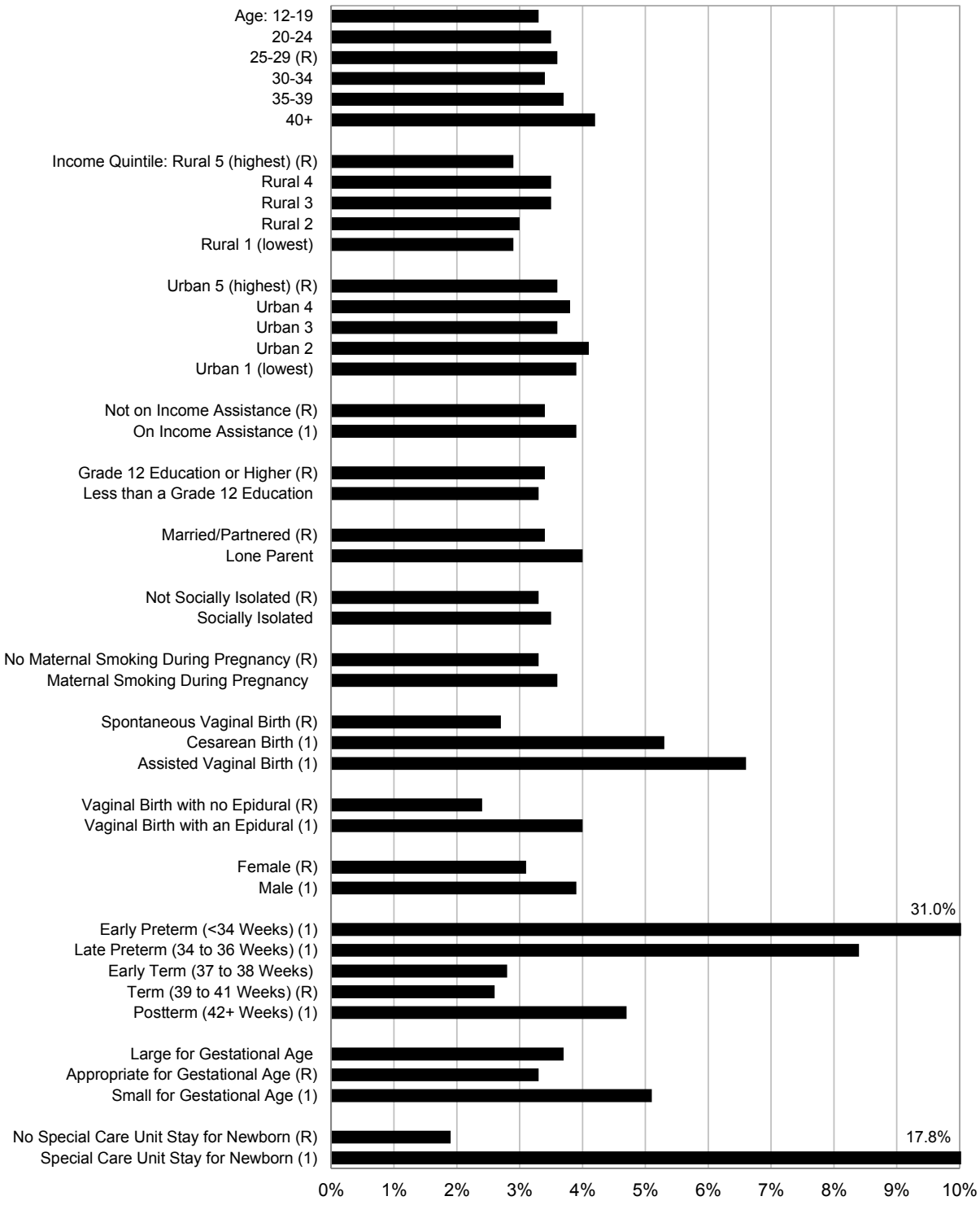
Figure 6.7.3: Proportion of Infants with a Five-Minute Apgar Score of 7 or Less by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.7.4: Proportion of Infants with a Five-Minute Apgar Score of 7 or Less by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

6.8 Severe Neonatal Morbidity

Background

The consequences of severe neonatal morbidity in the form of the future health of the infant/child and resource utilization are substantial (Qiu et al., 2012). Risk of severe neonatal morbidity is influenced by several factors, including male sex (Binet, Bujold, Lefebvre, Tremblay, & Piedboeuf, 2012; Kent, Wright, & bdel–Latif, 2012), both early and late preterm birth (Qiu et al., 2012; Zayek et al., 2011), small–for–gestational–age birth (Qiu et al., 2012), multiple births (Arlettaz Mieth, Ersfeld, Douchet, Wellmann, & Bucher, 2011), and maternal pregnancy complications (e.g., eclampsia) (Liu et al., 2011).

Calculation of the Indicator

After consultation with a member of our Advisory group, a list of severe neonatal morbidities was generated. This list included: Neonatal sepsis, Respiratory distress syndrome (RDS), Hypoxic ischemic encephalopathy (HIE), Convulsions of newborn, Brachial plexus injury/palsy, Persistent fetal circulation/ Neonatal hypertension, Grade III or IV Intraventricular hemorrhage (IVH)/ Periventricular Leukomalacia (PVL), Intubation, Gastroschisis, Omphalocele, Diaphragmatic hernia, and Congenital malformations of the circulatory system (refer to Appendix Table A.4 for more details). We looked at the overall rate and the mean length of stay (LOS) for each of these morbidities per 1,000 live births as well as the rates (per 1,000 live births) and LOS by gestational categories—early preterm (less than 34 weeks), preterm (34 to 36 weeks), early term (37 to 38 weeks), and term (39 or more weeks). Stillbirths were excluded from the analyses.

Key Observations

Refer to Table 6.8.1.

Comparison to Other Findings

The Canadian Perinatal Health Report presents rates of intubation and neonatal sepsis by birth weight categories rather than gestational age categories, so we are unable to directly compare our rates to the Canadian rates (Public Health Agency of Canada, 2008).

Limitations

Variations in case definitions and coding of neonatal conditions may affect reporting of cases. The information available does not distinguish degrees of severity for a particular condition (Public Health Agency of Canada, 2008).

Summary

Overall, the most prevalent severe neonatal morbidities were intubation (22.9 per 1,000 live births), respiratory distress syndrome (14.3 per 1,000 live births), congenital malformations of the circulatory system (8.4 per 1,000 live births), neonatal sepsis (7.2 per 1,000 live births), persistent fetal circulation/ neonatal hypertension (4.4 per 1,000 live births) and convulsions (2.6 per 1,000 live births). All other morbidities occurred one or less times per 1,000 live births. Apart from brachial plexus injury/palsy, all morbidities were associated with LOS greater than or equal to 10 days with the highest LOS occurring in infants with Grade III or IV intraventricular hemorrhage or periventricular leukomalacia (66.2 days) and gastroschisis (40.8 days). Rates of severe morbidities varied by gestational age, with the highest rates and LOS consistently observed in early preterm infants (less than 34 weeks gestation).

Table 6.8.1: Rate of Severe Neonatal Morbidity in the First 30 Days after Birth with Corresponding Mean Length of Stay (LOS) by Gestational Group Expressed as a Proportion of all Live Births, 2004/05-2008/09

Morbidity	Overall		Early Preterm (<34 weeks)		Preterm (34 to 36 weeks)		Early Term (37 to 38 weeks)		Term (39+ weeks)	
	Rate per 1,000 live births	Mean LOS	Rate per 1,000 live births	Mean LOS	Rate per 1,000 live births	Mean LOS	Rate per 1,000 live births	Mean LOS	Rate per 1,000 live births	Mean LOS
Neonatal sepsis	7.2	29.6	117.2	67.7	13.6	18.6	4.8	12.5	4.3	8.0
Respiratory distress syndrome (RDS)	14.3	35.0	443.5	49.2	48.5	12.8	4.2	5.4	2.0	8.0
Hypoxic ischemic encephalopathy (HIE)	0.9	13.4	s	s	1.7	9.1	0.8	17.3	0.7	12.5
Convulsions of newborn	2.6	10.4	6.1	52.4	4.8	9.9	2.5	9.9	2.3	7.0
Brachial plexus injury/palsy	1.2	5.8	s	s	2.1	9.4	1.7	6.2	1.0	3.2
Persistent fetal circulation/Neonatal hypertension	4.4	16.5	30.0	65.9	8.8	12.6	4.5	6.3	3.2	8.2
Grade III or IV Intraventricular haemorrhage (IVH)/ Periventricular Leukomalacia (PVL)	1.0	66.2	47.7	67.3	s	s	0.0	0.0	0.0	0.0
Intubation	22.9	28.5	502.7	48.2	80.2	15.4	13.2	12.9	7.1	9.5
Gastroschisis	0.6	40.8	s	s	4.3	37.0	1.2	41.7	s	s
Omphalocele	0.3	20.0	s	s	s	s	0.5	30.1	0.1	17.3
Diaphragmatic hernia	0.4	28.6	s	s	s	s	0.6	15.0	0.3	34.5
Congenital malformations of the circulatory system	8.4	15.1	68.8	48.2	24.3	12.5	8.6	7.4	5.2	7.5

's' indicates suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2011

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6.9 Neonatal Special Care Unit Admissions

Background

Neonatal admission to an intensive care unit or special care unit (SCU) represents a proxy for neonatal morbidity. Infants that are admitted to SCUs are frequently preterm or small–for–gestational–age (Carter, Xenakis, Holden, & Dudley, 2012; Vachharajani, Vachharajani, & Dawson, 2009), or are multiple births (Bassil et al., 2012; Burns, Mattick, & Wallace, 2008; Ross et al., 1999). Maternal factors that also place infants at risk for morbidity and SCU admission include cesarean delivery (Tracy, Tracy, & Sullivan, 2007), substance use during pregnancy (Burns et al., 2008), maternal pregnancy complications (e.g., diabetes, **gestational diabetes,** pregnancy induced hypertension, abruptio placentae) (Battin, Bevan, & Knight, 2007; Burns et al., 2008; Phung et al., 2005; Ross et al., 1999), preterm premature rupture of membranes (Ross et al., 1999), advanced maternal age (Battin et al., 2007), and high parity (Phung et al., 2005). Relatively little research has explored sociodemographic variations in neonatal SCU admissions, although some have observed that infants of women of low education and low occupation index have a greater risk of admission (Phung et al., 2005).

Normal nursery care, including care provided on combined care postpartum wards, is designated Level I. Level II and Level III nursery care, combined into Special Care Unit (SCU) admission in the discharge database, are for infants requiring monitoring or advanced nursing care (Level II) or respiratory support (Level III). There are three Level II/III nurseries in Manitoba, two in Winnipeg and one in Brandon, and a Level II nursery in Thompson. All other delivery centres in Manitoba provide only Level I care.

Calculation of the Indicator

The number of live births admitted to a SCU, prior to birth hospitalization episode discharge, was divided by the total number of live births. An episode was defined as a single, continuous stay in the hospital system, irrespective of transfers between hospitals. Due to coding changes, these analyses are limited to 2004/05–2008/09. Time trends were calculated across 2004/05–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2004/05–2008/09), Figure 6.9.1
    - The Manitoba rate ranged from 10.9% (2004/05) to 8.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 10.9% in 2004/05 to a low of 8.6% in 2008/09.
    - The Winnipeg rate ranged from 12.3% (2004/05) to 9.9% (2008/09); the linear trend was significant; the rate decreased over time from a high of 12.3% in 2004/05 to a low of 9.7% in 2006/07.
    - The Brandon rate ranged from 24.7% (2004/05) to 15.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 24.7% in 2004/05 to a low of 15.6% in 2008/09.
    - The rate for the Rural South ranged from 8.8% (2004/05) to 7.3% (2008/09); the linear trend was significant; the rate decreased over time from a high of 8.9% in 2005/06 to a low of 7.3% in 2008/09.
- RHA (2007/08–2008/09), Figure 6.9.2
    - The Manitoba rate was 9.1%.
    - South Eastman (5.5%), Central (5.4%), Parkland (5.6%), NOR–MAN (5.4%), and Burntwood (5.0%) were significantly lower than the Manitoba rate; while Assiniboine (13.6%), Brandon (17.9%), and Winnipeg (10.2%) were significantly higher.

- Winnipeg CA (2007/08–2008/09), Figure 6.9.3
  - The Winnipeg rate was 10.2%.
  - Downtown (12.2%) and Point Douglas (13.3%) were significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2007/08–2008/09), Figure 6.9.4
  There was a statistically significant difference in the SCU admission for the following characteristics:
  - Maternal Age – With each successive increase in maternal age (by age group) over age 29, there were more newborns admitted to SCU.
  - Income Quintile – In rural areas, Rural 3 (8.0%) and Rural 1 (8.0%) had more babies admitted to SCU than the reference group (Rural 5, 6.1%). In urban areas, there was a significant relationship with area–level income. With each successive decrease in area–level income, there was an increase in the proportion of newborns admitted to an SCU.
  - Income Assistance – 12.6% of the newborns born to women on income assistance were admitted to an SCU compared to 8.5% of newborns born to women who were not on income assistance.
  - Marital Status – 11.8% of newborns born to women who were lone parents were admitted to an SCU compared to 8.4% of newborns born to women who were married or partnered.
  - Parity – 10.6% of babies born to primiparous women were admitted to an SCU compared to 8.2% of newborns born to multiparous women.
  - Maternal Hypertension – 19.1% of newborns born to women who had hypertension were admitted to an SCU compared to 8.1% to women who did not have hypertension.
  - Maternal Diabetes – 24.9% of the newborns born to mother with diabetes were admitted to an SCU compared to 8.0% to women who did not have diabetes.
  - Delivery Method – 6.3% of the newborns who had a spontaneous vaginal birth were admitted to an SCU compared to 16.9% of cesarean births and 10.3% of assisted vaginal births.
  - Multiple Births – 36.4% of multiple births were admitted to an SCU compared to 8.4% of singleton births.
  - Antepartum Hemorrhage – 19.8% of newborns born to women who had an antepartum hemorrhage were admitted to an SCU compared to 8.5% of newborns born to women who did not have an antepartum hemorrhage.
  - Sex of Newborn – 10.0% of male newborns were admitted to an SCU compared to 8.1% of female newborns.
  - Gestation – 76.3% of early preterm, and 47.8% of late preterm, 9.5% of early term and 6.6% of postterm newborns were admitted to a SCU compared to 3.8% of term newborns.
  - Size for Gestational Age – 15.2% of small–for–gestational–age newborns were admitted to a SCU compared to 8.4% of large–for–gestational–age/**appropriate–for–gestational–age** newborns.

Comparison to Other Findings

Rates of neonatal admission to SCUs were not available in the Canadian Perinatal Health Report. In the Canadian Maternity Experiences Survey, 12.7% of infants were admitted to a special or intensive care nursery with 9.3% staying for 12 hours or more in 2006–2007, based on maternal self–report (note: the Canadian Maternity Experiences Survey excluded multiple births) (Public Health Agency of Canada, 2009). The Manitoba rate of SCU admission was lower, ranging from 10.9% (2004/05) to 8.6% (2008/09).

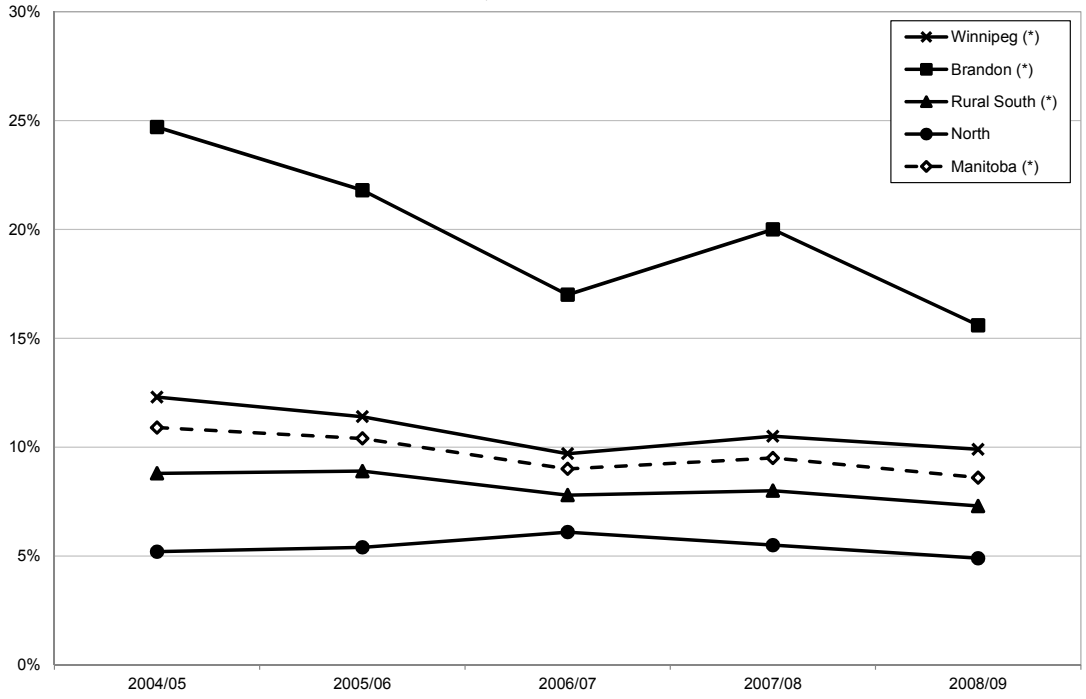
Limitations

Admission criteria and procedures for admitting infants to Level II or III nurseries differ from centre to centre, and in some centres both levels of care would be provided in one geographic location. Due to differing coding practices it is not consistently possible to separate Level II from Level III admissions and thus they were analyzed as one group, under the title of special care unit (SCU) admission.

Summary

In 2007/08–2008/09 the rate of neonatal admission to a special care unit was 9.1% with a substantial variation in rates observed across provincial RHAs (range of 5.0% to 17.9%). The high rates of SCU admission in Brandon require further exploration. Within Winnipeg the rate was 10.2% with higher rates observed in Downtown (12.2%) and Point Douglas (13.3%). During 2004/05–2008/09, the provincial rate decreased significantly from 10.9% to 8.6%. Women whose infants were admitted to a SCU were more likely to be aged 30 and older, live in rural areas with low or mid–income quintiles or low income quintile urban areas, be on income assistance, be lone parents, be primiparous, have pregnancy complications (e.g., hypertension, diabetes, antepartum hemorrhage), or have a cesarean or an assisted vaginal birth. Infants who were admitted to a SCU were more commonly male, multiples, preterm, early term, or small–for–gestational–age.

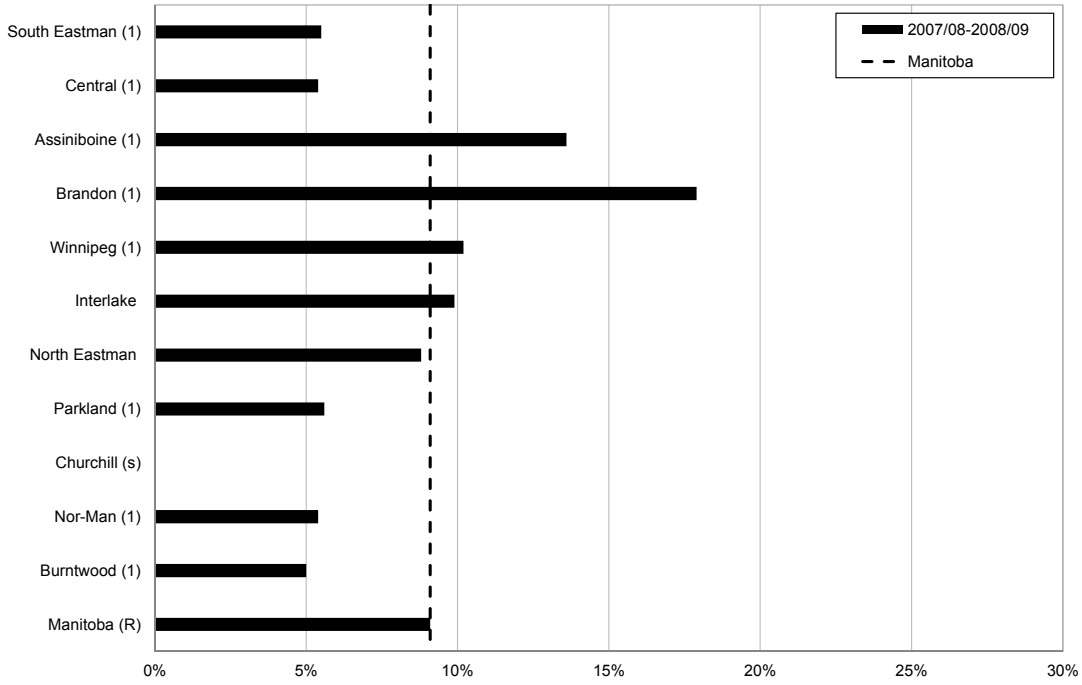
Figure 6.9.1: Proportion of Live Births Admitted to a Special Care Unit Prior to Hospital Discharge by Region and Year, 2004/05-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

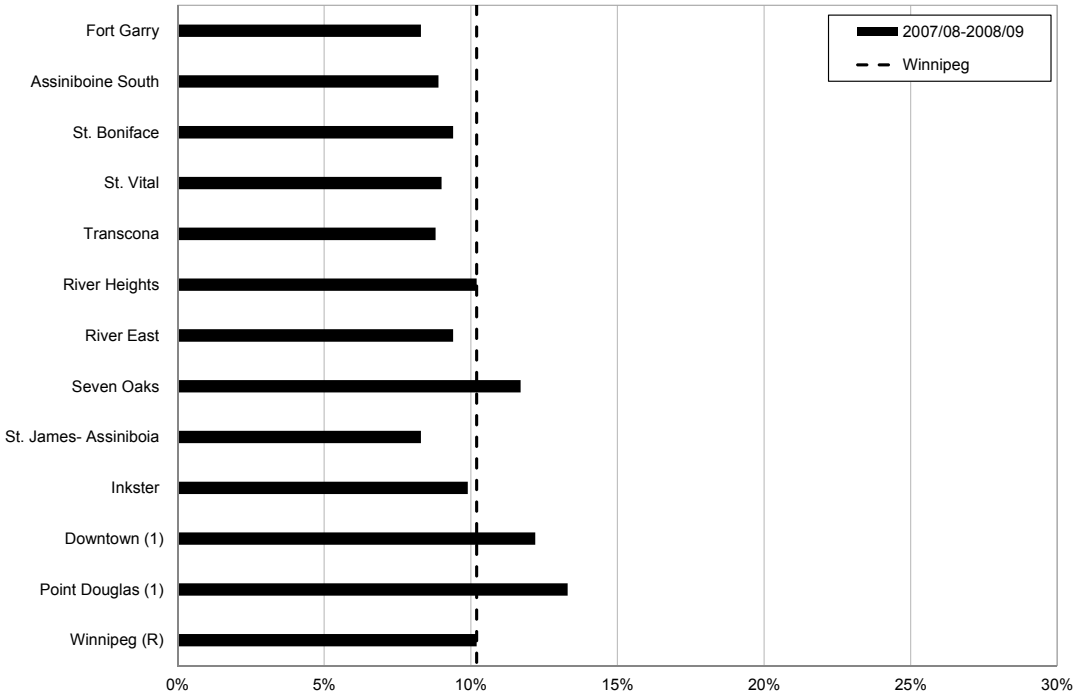
Figure 6.9.2: Proportion of Live Births Admitted to a Special Care Unit Prior to Hospital Discharge by RHA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

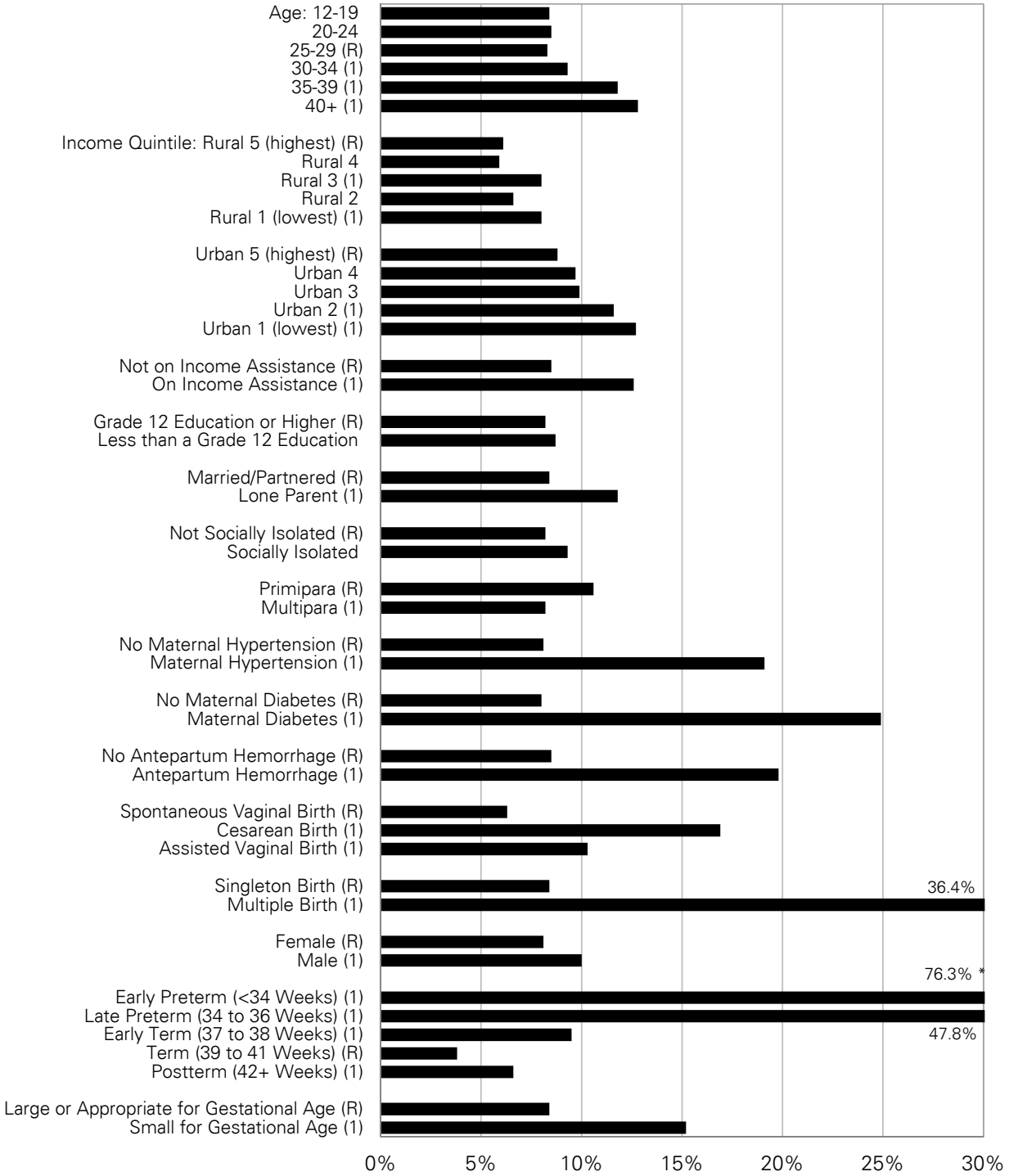
Figure 6.9.3: Proportion of Live Births Admitted to a Special Care Unit Prior to Hospital Discharge by Winnipeg CA, 2007/08-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.9.4: Proportion of Live Births Admitted to a Special Care Unit Prior to Hospital Discharge by Sociodemographic and Other Characteristics, 2007/08-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers
'*' if deaths within 1 day were excluded, this number would increase to 90%

Source: Manitoba Centre for Health Policy, 2012

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6.10 Neonatal Readmission

Background

The healthcare costs associated with **neonatal hospital readmission** are substantial (Burgos, Schmitt, Stevenson, & Phibbs, 2008). Neonatal readmission rates vary by both infant and health service characteristics. Infants born at younger gestational ages (Escobar et al., 1999), who were low birth weight (Burgos et al., 2008), or who experienced Neonatal Intensive Care Unit (NICU) or Special Care Unit (SCU) admission following birth are more likely to be readmitted for care (Seki et al., 2011), as well as those with jaundice (Geiger, Petitti, & Yao, 2001; Seki et al., 2011) or male sex (Burgos et al., 2008). In a study of Manitoba newborns, risk of readmission was higher for infants who were born preterm, were from the three lowest income quintiles, resided in the North or Rural South part of the province, were not breastfed, had a mother aged 19 and younger, or were born by cesarean (Martens, Derksen, & Gupta, 2004). In contrast, infants re–hospitalized specifically for neonatal jaundice were more likely to be breastfeeding (Geiger et al., 2001) or born by vaginal delivery (Burgos et al., 2008). Readmission rates also vary by healthcare system policies and provider practices regarding care and discharge (Tjora, Karlsen, Moster, & Markestad, 2010; Tomashek et al., 2006). The implementation of guidelines and screening protocols have been effective in reducing some readmission rates (Alkalay, Bresee, & Simmons, 2010).

Calculation of the Indicator

"The rate of neonatal hospital readmission after discharge following birth is defined as the number of readmissions of newborns within 28 days of birth, expressed as a proportion of all newborns discharged from hospital after birth" (Public Health Agency of Canada, 2008). Only inpatient hospitalizations were included (i.e. newborns admitted for day procedures were not included). Additionally newborns that were directly transferred to another hospital after birth were not counted as a readmission. Newborns with a length of stay greater than 20 days were excluded as were stillbirths and babies with a birth weight of less than 1,000 grams. In some cases, newborns may be readmitted to hospital not because they are ill themselves but because their mother is hospitalized and an effort is being made to keep the mother and newborn together. As these "**boarder babies**" are not sick themselves we have excluded them from the analysis of newborn readmission discussed in this section. Results including the boarder babies can be found in the Appendix (Figures A.1 to A.4). Time trends were calculated across 2001/02–2008/09. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2007/08–2008/09. Stillbirths were excluded from the analysis. Refer to Appendix Table A.4 for more details.

Key Observations

- Time Trend (2001/02–2008/09), Figure 6.10.1
  - The Manitoba rate ranged from 5.6% (2001/02) to 1.7% (2008/09); the linear trend was significant; the rate decreased over time from a high of 5.6% in 2001/02 to a low of 1.6% in 2004/05.
  - The Winnipeg rate ranged from 6.6% (2001/02) to 1.5% (2008/09); the linear trend was significant; the rate decreased over time from a high of 6.6% in 2001/02 to a low of 1.5% in 2008/09.
  - The Brandon rate ranged from 5.5% (2001/02) to 5.4% (2008/09); the linear trend was significant; the rate decreased over time from a high of 6.9% in 2003/04 to a low of 1.5% in 2004/05.

    - The rate for the Rural South ranged from 4.1% (2001/02) to 1.6% (2008/09); the linear trend was significant; the rate decreased over time from a high of 4.1% in 2001/02 to a low of 1.1% in 2006/07.
    - The rate for the North ranged from 5.5% (2001/02) to 1.4% (2008/09); the linear trend was significant; the rate decreased over time from a high of 5.5% in 2001/02 to a low of 1.2% in 2004/05.
- RHA (2003/04–2008/09), Figure 6.10.2
    - The Manitoba rate was 2.0%.
    - South Eastman (1.2%) and Central (1.5%) were significantly lower than the Manitoba rate; while Brandon (3.4%), Parkland (2.8%), and NOR–MAN (3.1%) were significantly higher.
- Winnipeg CA (2003/04–2008/09), Figure 6.10.3
    - The Winnipeg rate was 2.0%.
    - Inkster (2.9%) was significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2003/04–2008/09), Figure 6.10.4
  There was a statistically significant difference in the neonatal hospital readmission for the following characteristics:
    - Income Quintile – 2.1% of newborns born to mothers living in the lowest rural income quintile (Rural 1) were readmitted to hospital within 28 days of birth. This was significantly higher than the rate for newborns born to mothers living in the highest rural income quintile (Rural 5, 1.8%). In urban areas, Urban 2 (2.1%) and Urban 1 (2.6%) had more newborns with hospital readmission than the reference group (Urban 5, 1.7%).
    - Income Assistance – 2.6% of the newborns born to women on income assistance were readmitted to hospital within 28 days of birth compared to 1.8% of newborns born to women who were not on income assistance.
    - Marital Status – 2.6% of newborns born to women who were lone parents were readmitted to hospital within 28 days of birth compared to 1.9% of newborns born to women who were married or partnered.
    - Maternal Diabetes – 3.1% of the newborns born to mother with diabetes were readmitted to hospital within 28 days of birth compared to 1.9% to women who did not have diabetes.
    - Delivery Method – 2.1% of the newborns who had a vaginal birth were readmitted to hospital within 28 days of birth compared to 1.5% of cesarean births.
    - Breastfeeding Initiation at Hospital Discharge – 1.7% of newborns who were not breastfeeding at hospital discharge were readmitted to hospital within 28 days of birth compared to 2.0% of newborns who were breastfeeding at hospital discharge.
    - Sex of Newborn – 2.3% of male newborns were readmitted to hospital within 28 days of birth compared to 1.6% of female newborns.
    - Birth Weight – 1.3% of newborns with a birth weight of less than 2,500 grams were readmitted to hospital within 28 days of birth compared to 2.0% of newborns with a birth weight of 2,500 to 3,999 grams.
    - Gestation – 0.5% of early preterm, 3.2% of preterm, and 2.6% of early term newborns were readmitted to hospital within 28 days of birth compared to 1.7% of term newborns.
- Reasons for readmission
    - The main reasons for neonatal readmission were jaundice (14.1%%), respiratory problems (9.3%), infection/parasite (6.6%), congenital anomalies (5.8%), digestive problems (3.5%), feeding problems (2.6%), and dehydration/fever (2.2%).

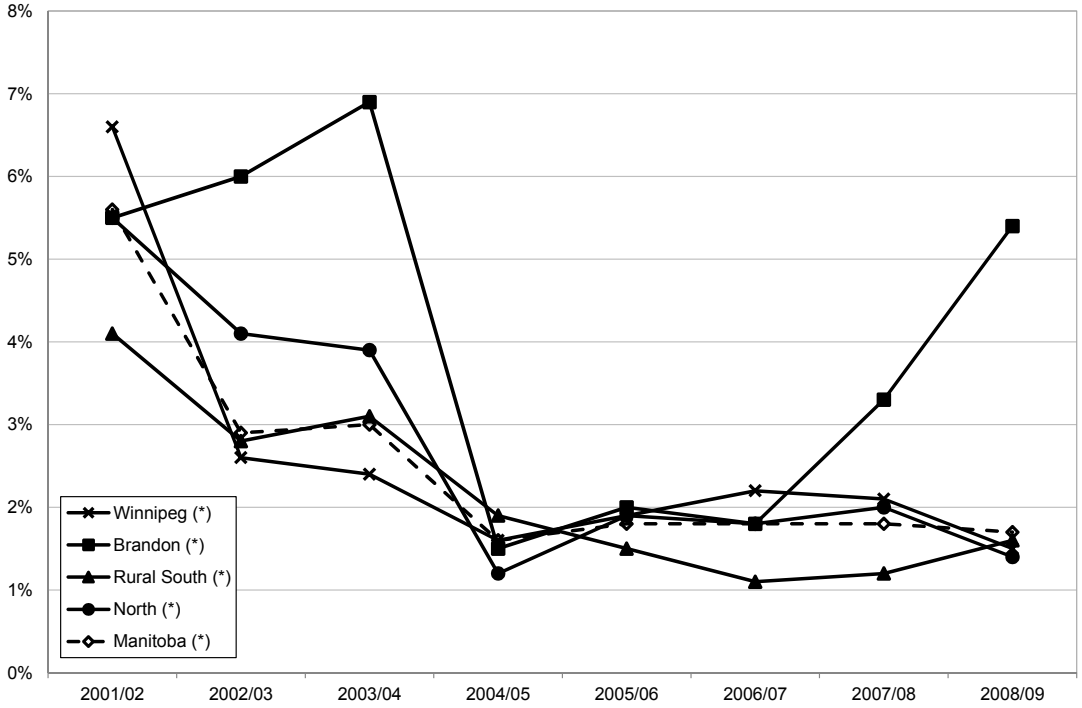
Comparison to Other Findings

The Manitoba rate of 2.0% (2007/08–2008/09) was lower than that reported by the Canadian Perinatal Health Report of 3.4 admissions per 100 births for 2004–2005 (excluding infants with LOS of more than 20 days) (Public Health Agency of Canada, 2008). However, these Canadian rates include "boarder babies" and are not directly comparable to our Manitoba rates. Similar to Manitoba, a declining trend of neonatal readmission was observed in Canada from 1995–1996 to 2004–2005 as national rates decreased from 3.7 admissions per 100 births to 3.4; however, a steeper decline in this rate was noted in Manitoba. Comparison between reported rates of neonatal readmission is challenging because rates vary substantially by the length of time over which readmission is measured (e.g., 1 week, 6 months, 1 year). The main reasons for neonatal readmission in Manitoba were similar to those reported in the Canadian Perinatal Health Report (jaundice, respiratory problems, congenital anomalies, infection) (Public Health Agency of Canada, 2008).

Summary

In 2007/08–2008/09, the rate of neonatal readmission in Manitoba was 2.0% with significantly higher rates observed in Brandon (3.4%), Parkland (2.8%), and NOR–MAN (3.1%). Within Winnipeg, Inkster (2.9%) had a higher rate than the Winnipeg rate (2.0%). During the period of 2001/02–2008/09, the provincial rate decreased from 5.6% to 1.7%. Neonatal readmission was most common for infants whose mothers lived in rural (Rural 1) and urban areas (Urban 1 through 4) with the lowest income quintiles, were on income assistance, were lone parents, had diabetes, were breastfeeding at hospital discharge, and had vaginal deliveries. Infants that were readmitted tended to be male, preterm or early term, and had a birth weight of less than 2500 grams. The main reasons for neonatal readmission were: jaundice (26.1%), respiratory problems (17.1%), infection/parasite (12.2%), congenital anomalies (10.7%), digestive problems (6.4%), feeding problems (4.9%), and dehydration/fever (4.3%).

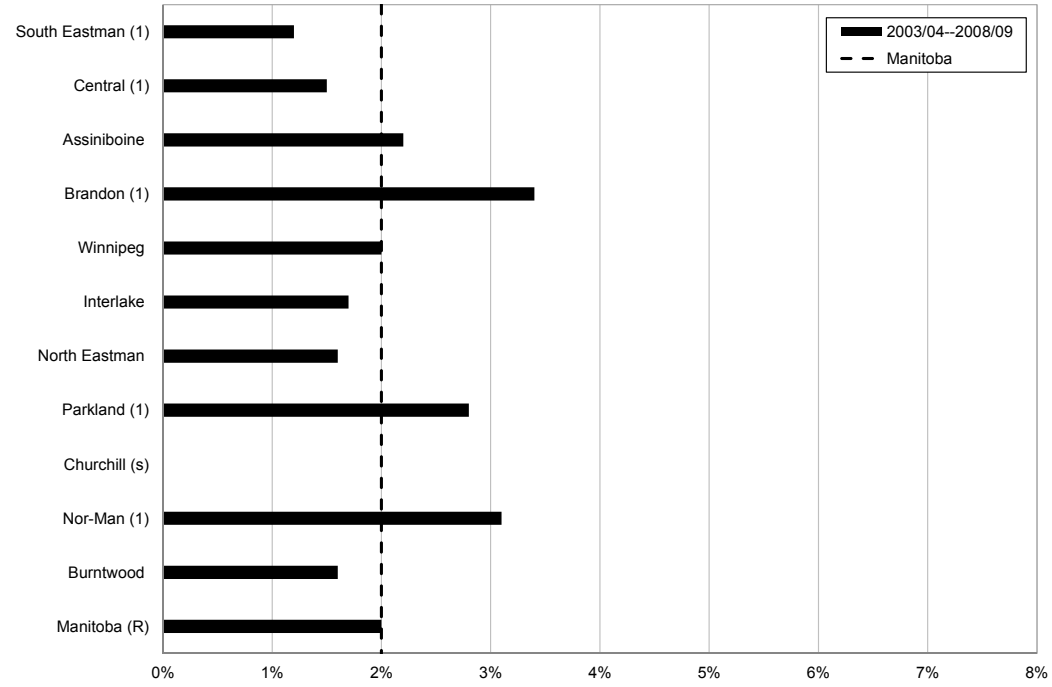
Figure 6.10.1: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (excludes Boarder Babies) by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

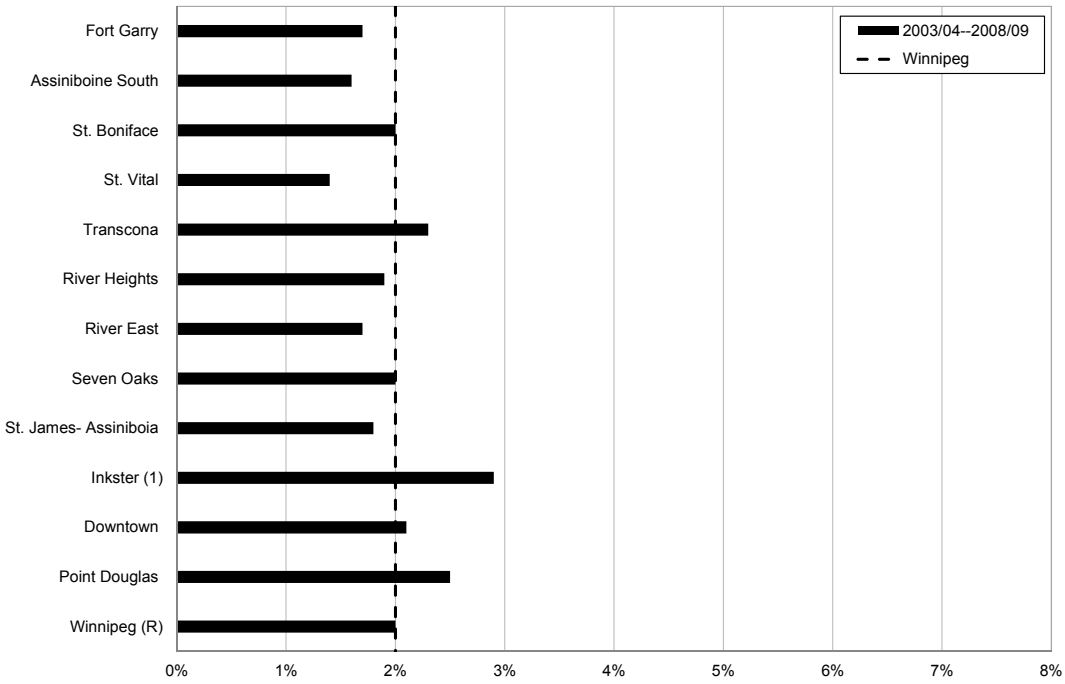
Figure 6.10.2: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (excludes Boarder Babies) by RHA, 2003/04-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

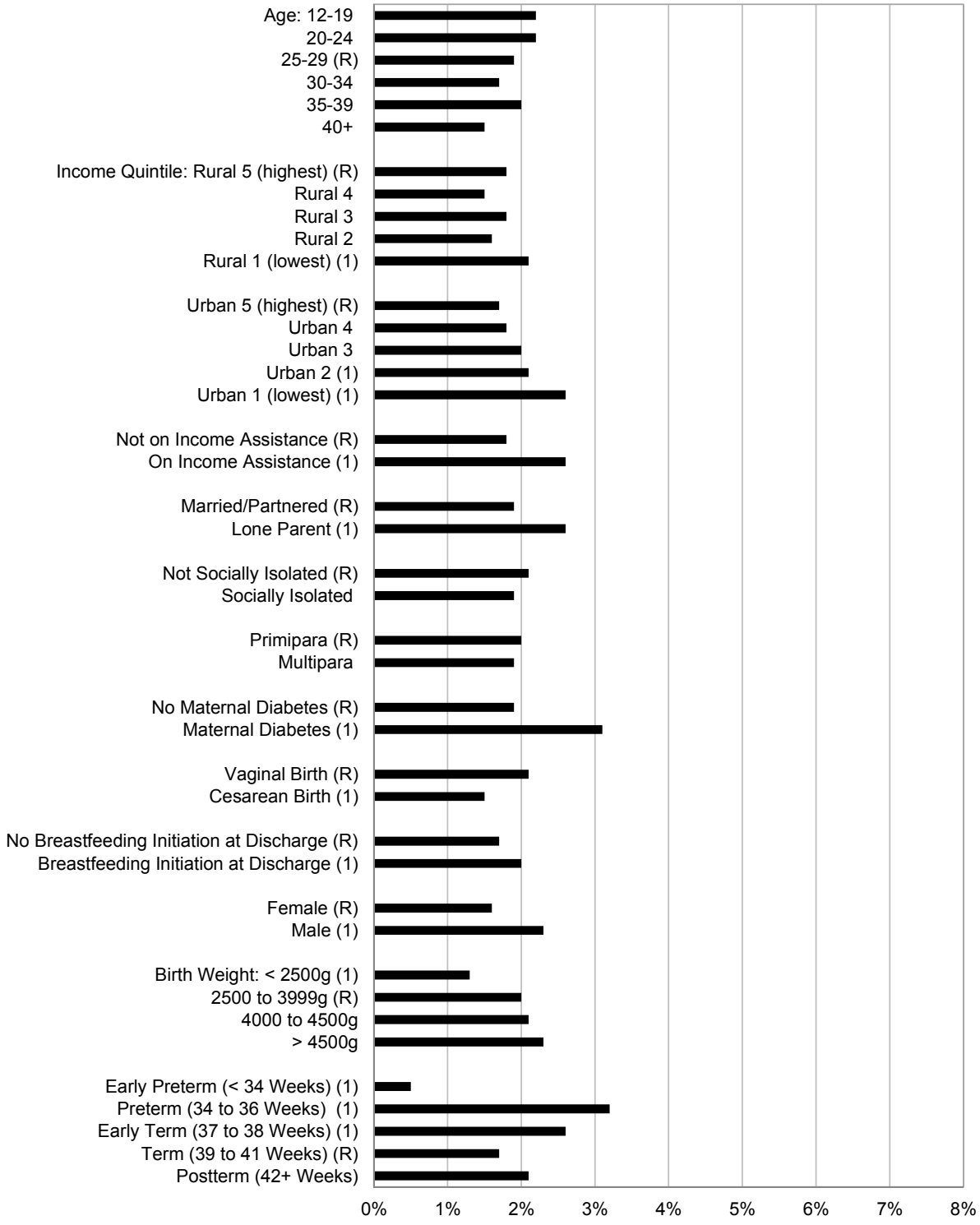
Figure 6.10.3: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (excludes Boarder Babies) by Winnipeg CA, 2003/04-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

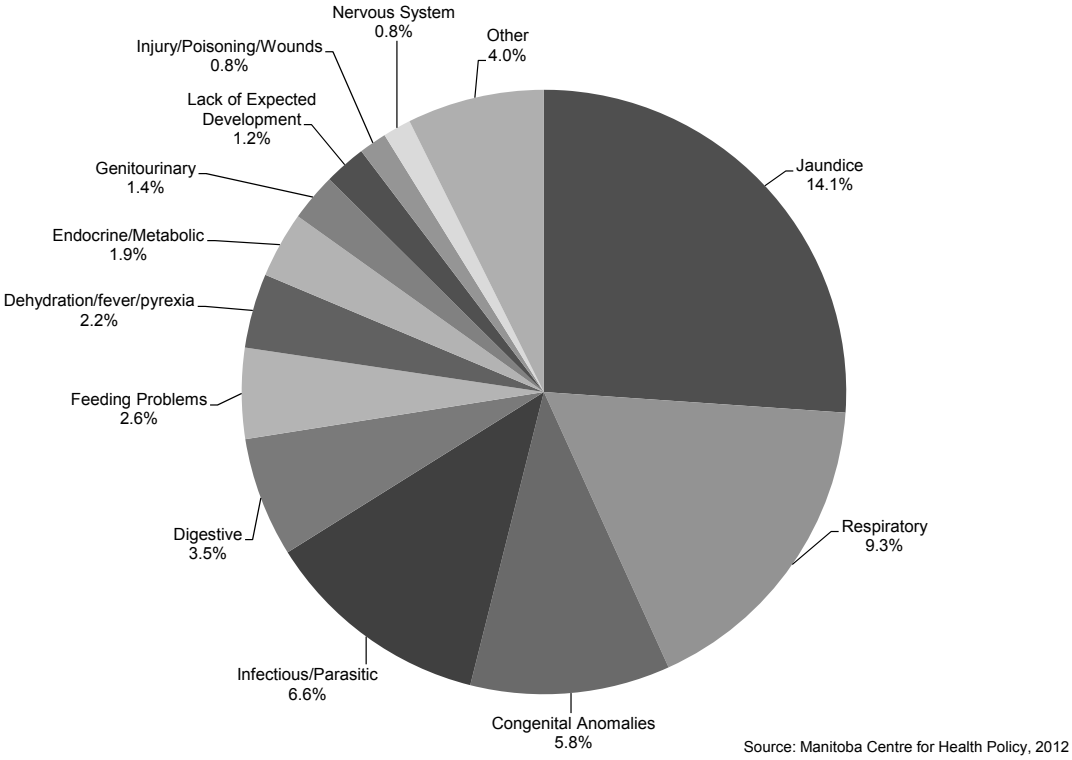
Figure 6.10.4: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (excludes Boarder Babies) by Sociodemographic and Other Characteristics, 2003/04-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.10.5: Reasons for Newborn Readmission to the Hospital within 28 Days of Birth, 2001/02-2007/08 (excludes Boarder babies)



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6.11 Neonatal, Postneonatal, and Infant Mortality

Preamble

The infant mortality rate is defined as the number of deaths of live born infants in the first year of life (0 to 364 days) per 1,000 live births. Infant mortality can be divided into two components: neonatal mortality (0 to 27 days) and postneonatal mortality (28 to 364 days) (Public Health Agency of Canada, 2008). A lack of standardization in birth registration practices related to age of viability and birth weight contributes to wide variation in regionally, nationally, and internationally reported infant mortality rates. Because of the differences in reporting deaths of infants born at the borderline of viability (Joseph & Kramer, 1996), we have limited our presentation of neonatal, postneonatal, and infant mortality rates to infants with a birth weight greater than or equal to 500 grams; we have not presented mortality rates for infants of all birth weights (i.e., crude mortality rates). Our definitions for neonatal, postneonatal, and infant mortality rates of infants with a birth weight greater than or equal to 500 grams are consistent with those reported by the Public Health Agency of Canada (Public Health Agency of Canada, 2008; Public Health Agency of Canada, 2012).

Neonatal Mortality

Background

In Canada, neonatal deaths constituted 72% of infant deaths in 2007 (Public Health Agency of Canada, 2012). The most common causes of death during the neonatal period are immaturity and congenital anomalies (Public Health Agency of Canada, 2012; Sankaran, Chien, Walker, Seshia, & Ohlsson, 2002). In industrialized countries, the risk of neonatal mortality is increased in infants who are multiples (Glinianaia et al., 2008), are small–for–gestational–age (Qiu et al., 2012), are preterm (Auger, Le, Park, & Luo, 2011; Sankaran et al., 2002), have congenital anomalies (Sankaran et al., 2002), and have hypoxic–ischemic encephalopathy (Sankaran et al., 2002). Infants are also at greater risk of mortality if their mothers had eclampsia (Liu et al., 2011) or a previous cesarean delivery (Huang et al., 2011). There is some evidence that ethnic disparities exist in the risk of neonatal mortality (Claydon, Mitton, Sankaran, & Lee, 2007; Shah, Zao, Al–Wassia, & Shah, 2011) and its predisposing causes (Claydon et al., 2007). One Canadian study found that 40% of neonatal deaths occur within the first two days of birth, 50% within three days, and 75% within 12 days (Sankaran et al., 2002). A Canadian study of neonatal mortality in a single Neonatal Intensive Care Unit (NICU) reported that the proportion of neonatal deaths due to extreme prematurity and intraventricular hemorrhage decreased between 1988 and 2007, whereas deaths related to gastrointestinal causes (e.g., necrotizing enterocolitis) increased (Simpson, Ye, Hellmann, & Tomlinson, 2010).

Calculation of Indicator

The **neonatal mortality rate** is defined as the number of deaths of live born babies weighing 500 grams or more within 27 days of birth per 1,000 live births. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2001/02–2007/08. Newborns weighing less than 500 grams, those whose gestation was less than 20 weeks, and stillbirths were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

All rates are reported as per 1,000 live births unless otherwise specified.

- RHA (2001/02–2008/09), Figure 6.11.1
    - The Manitoba neonatal death rate was 3.2 per 1,000.
    - In Burntwood, the neonatal death rate of 5.1 per 1,000 was significantly higher than the Manitoba rate.

- Winnipeg CA (2001/02–2008/09), Figure 6.11.2
  - The Winnipeg rate of neonatal deaths was 2.9 per 1,000.
- Sociodemographic and Other Characteristics (2001/02–2008/09), Figure 6.11.3
  There was a significant difference in the proportion of neonatal deaths for the following characteristics:
  - Income Quintile – There were 4.2 neonatal deaths per 1,000 in Rural 1 and 4.4 in Rural 2. This was significantly higher than the reference group (Rural 5, 2.8 per 1,000). The rate of neonatal deaths in Urban 1 was 3.9 per 1,000 and 3.4 per 1,000 in Urban 2, which were also significantly higher than the reference group (Urban 5, 1.7 per 1,000).
  - Antepartum Hemorrhage – 13.1 neonatal deaths per 1,000 to women who had an antepartum hemorrhage compared to 2.5 per 1,000 to women who did not have an antepartum hemorrhage.
  - Multiple Births – 14.4 neonatal deaths per 1,000 live multiple births compared to 2.9 deaths per 1,000 live singleton births.
  - Sex of Newborn – 3.7 neonatal deaths per 1,000 male newborns compared to 2.7 per 1,000 female newborns.
  - Gestation – 105.8 neonatal deaths per 1,000 **early preterm births,** 7.8 per 1,000 late preterm births, 1.2 per 1,000 **early term births,** and 4.3 per 1,000 postterm compared to 0.6 per 1, 000 term births.
- Causes of death (2001/02– 2008/09), Figure 6.11.4
  - The major causes of neonatal mortality were congenital anomalies (33.5%), short gestation/low birth weight (15.2%), complications of labour (10.5%), and maternal conditions/complications (8.0%).

Comparison to Other Findings

The Manitoba neonatal mortality rate of 3.2 per 1,000 (2001/02–2008/09) for infants born at 500 or more grams was higher than the Canadian neonatal mortality rate of 2.5 per 1,000 in 2003 (Public Health Agency of Canada, 2008) and 2.7 in 2005 (Public Health Agency of Canada, 2012). From 1995 to 2003, the Canadian neonatal mortality rate among infants born 500 or more grams declined from 3.5 to 2.5 per 1,000 (Public Health Agency of Canada, 2008).

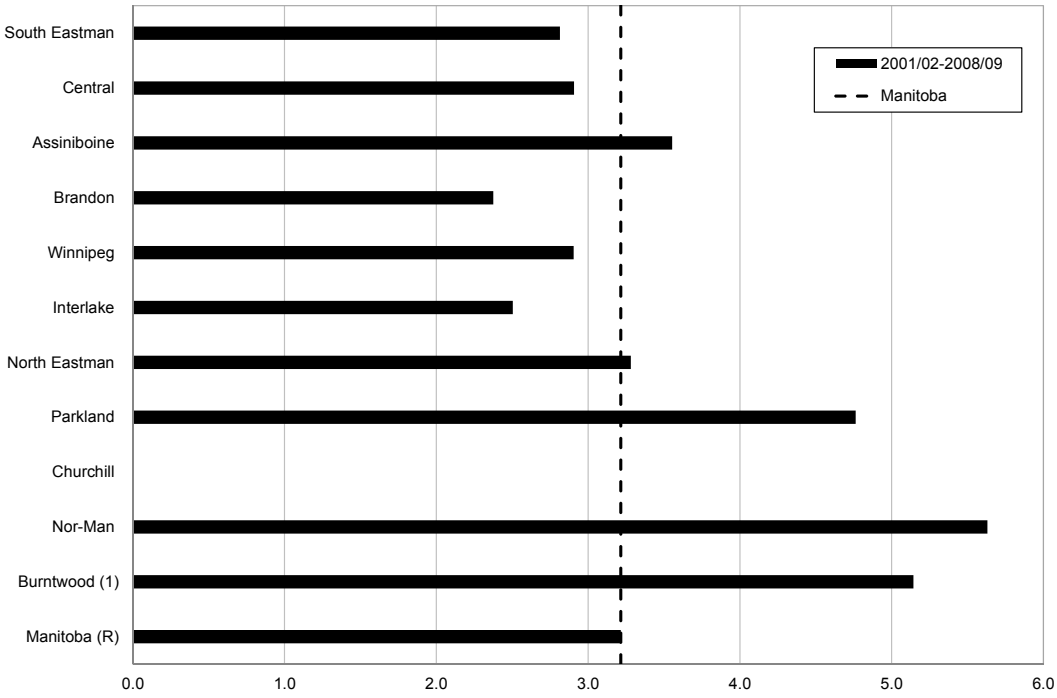
Limitations

Neonatal mortality rates may be affected by regional variations in birth registration, particularly for very preterm infants at the borderline of viability. Most women having a neonatal death likely would not have received a Families First Screen**,** limiting our ability to study the association of certain maternal characteristics (e.g., low education, lone parent status, and social isolation) with neonatal mortality.

Summary

During 2001/02–2008/09, the rate of neonatal mortality in Manitoba was 3.2 deaths per 1,000 live births, with a significantly higher rate observed in the region of Burntwood at 5.1 deaths per 1,000 live births. The Winnipeg rate was 2.9 deaths per 1,000 live births. The rate of neonatal mortality was highest among women who lived in the lower rural (Rural 1 and 2) and urban (Urban 1 and 2) income quintiles and who experienced antepartum hemorrhage and multiple pregnancies. Mortality rates were greater in infants who were preterm (early and late), early term, and postterm. The main causes of neonatal death were congenital anomalies and short gestation/low birth weight.

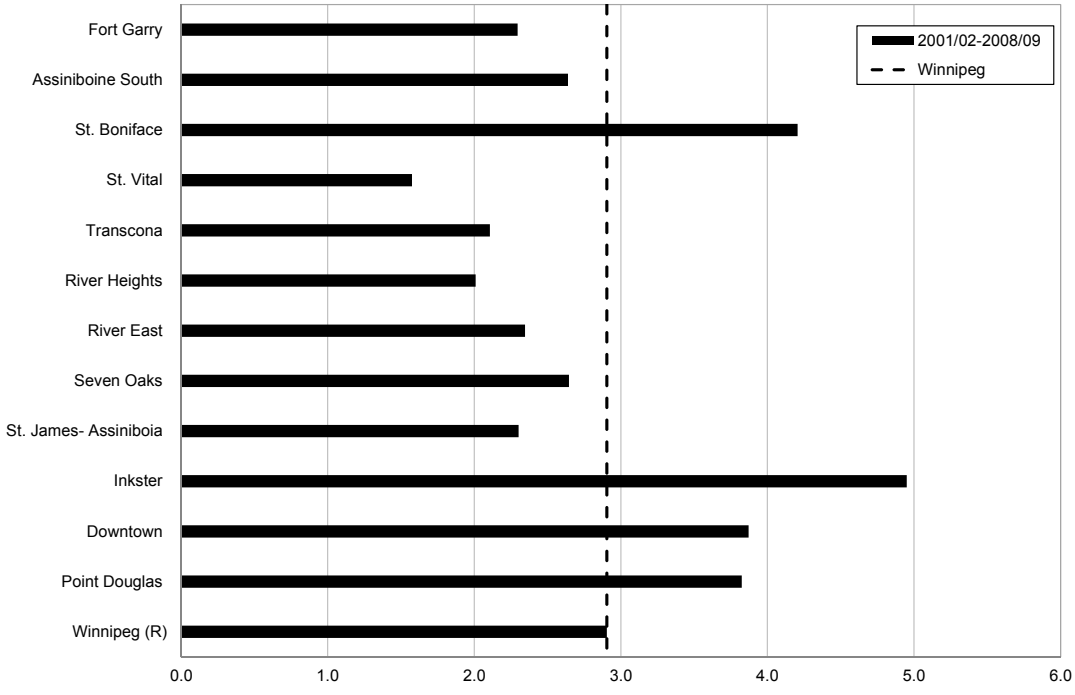
Figure 6.11.1: Neonatal Mortality (Death Within 0-27 Days of Birth) Rates by RHA, 2001/02-2008/09
per 1,000 live births



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

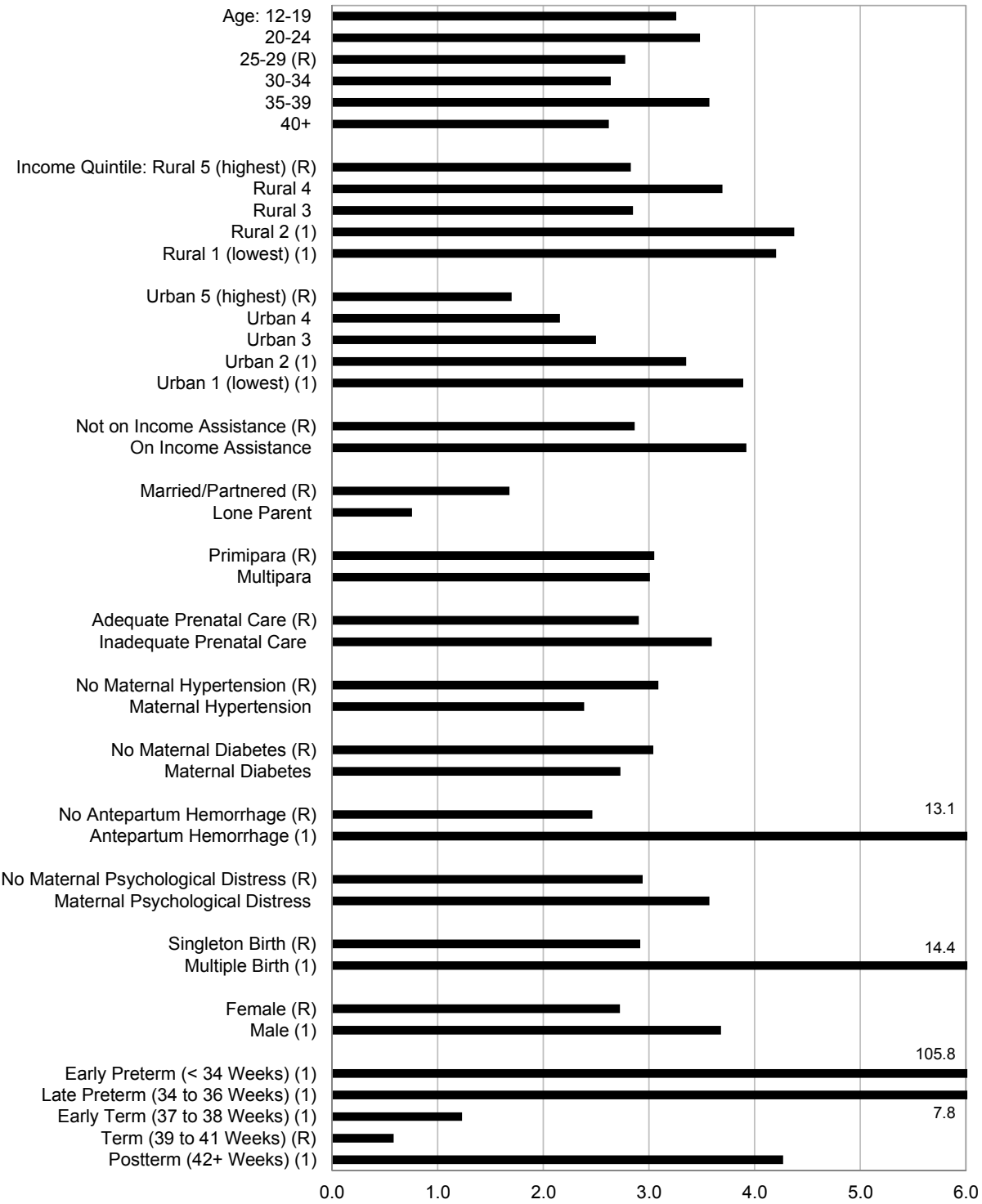
Figure 6.11.2: Neonatal Mortality (Death Within 0-27 Days of Birth) Rates by Winnipeg CA, 2001/02-2008/09
per 1,000 live births



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

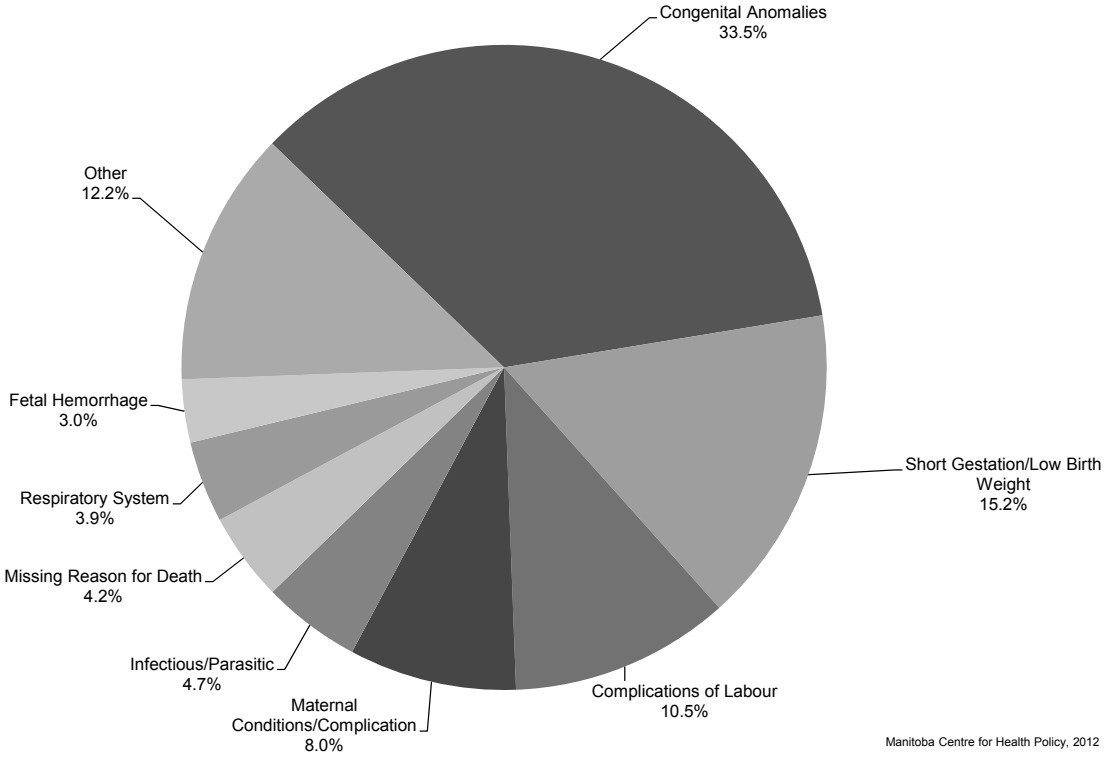
Figure 6.11.3: Neonatal Mortality (Death Within 0-27 Days of Birth) Rates by Sociodemographic and Other Characteristics, 2001/02-2008/09
per 1,000 live births



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.11.4: Causes of Neonatal Death in Manitoba, 2001/02-2008/09



Postneonatal Mortality

Background

The rate of death in the postneonatal period is lower than in the neonatal period (Statistics Canada, 2008). A U.S. study found that Apgar scores and birth weight were significant predictors of neonatal mortality and maintained their predictive ability even into the postneonatal period, although the causes of death in this period are diverse (Ma & Finch, 2010). The most common causes of postneonatal death in Canada are congenital anomalies, Sudden Infant Death Syndrome (SIDS), and infection (Public Health Agency of Canada, 2012). Racial/ethnic and socioeconomic disparities in **postneonatal mortality rates** have also been reported. In a Manitoba study, postneonatal mortality rates were significantly higher among First Nations compared to non–First Nations (Luo et al, 2010). In addition, low neighbourhood socioeconomic status was associated with a higher **relative risk** of postneonatal mortality for both First Nations and non–First Nations (Luo et al., 2010).

Calculation of Indicator

The postneonatal mortality rate is defined as the number of deaths of live born babies weighing 500 grams or more between 28 and 364 days after birth per 1,000 live births. The rates by RHA, Winnipeg CA, and Sociodemographic and Other Characteristics were calculated for 2001/02–2007/08. Newborns weighing less than 500 grams and those whose gestation was less than 20 weeks were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

All rates are reported as per 1,000 live births unless otherwise specified.

- RHA (2001/02–2008/09), Figure 6.11.5
    - The Manitoba rate of postneonatal deaths was 2.0 per 1,000.
    - Burntwood (4.4 per 1,000) was significantly higher than the Manitoba rate.
- Winnipeg CA (2001/02–2008/09), Figure 6.11.6
    - The Winnipeg rate of postneonatal deaths was 1.8 per 1,000.
    - Downtown (3.5 per 1,000) and Point Douglas (3.4 per 1,000) were significantly higher than the Winnipeg rate.
- Sociodemographic and Other Characteristics (2001/02–2008/09), Figure 6.11.7
  There was a significant difference in the proportion of postneonatal deaths for the following characteristics:
    - Maternal Age – As maternal age increased, there were fewer postneonatal deaths.
    - Income Quintile – 2.9 postneonatal deaths per 1,000 in Rural 1 and 2.6 per 1,000 in Rural 2. These were was significantly higher than the reference group (Rural 5, 1.5 per 1,000). There were 3.0 per 1,000 in Urban 1. This was significantly higher than the reference group (Urban 5, 1.1 per 1,000).
    - Income Assistance – 4.2 postneonatal deaths per 1,000 to women on income assistance compared to 1.6 per 1,000 to women not on income assistance.
    - Parity – 1.4 postneonatal deaths per 1,000 to primiparous women compared to 2.4 to multiparous women.
    - Prenatal Care – 4.2 postneonatal deaths per 1,000 to women who had inadequate prenatal care compared to 1.7 per 1,000 to women who had adequate prenatal care.
    - Maternal Diabetes – 3.3 postneonatal deaths per 1,000 to women who had diabetes compared to 1.9 per 1,000 to women who did not have diabetes.
    - Maternal Smoking during Pregnancy – 2.2 postneonatal deaths per 1,000 to women who reported smoking during pregnancy compared to 0.8 who did not.
    - Breastfeeding Initiation at Hospital Discharge – 5.1 postneonatal deaths per 1,000 to women who had not initiated breastfeeding at hospital discharge compared to 1.2 who had.

  - Multiple Births – 5.5 postneonatal deaths per 1,000 live multiple births compared to 1.9 deaths per 1,000 live singleton births.
  - Gestation – 21.4 per 1,000 early preterm births, 4.4 per 1,000 late preterm births, and 2.2 per 1,000 early term births compared to 1.2 per 1,000 term births.
  - Gestational Size – 5.3 postneonatal deaths per 1,000 small–for–gestational–age babies compared to 1.6 per 1,000 large–for–gestational–age babies.
  - Apgar – 15.6 postneonatal deaths per 1,000 babies with a five–minute Apgar of 7 or less compared to 1.5 per 1,000 babies with a 5 minute Apgar of 8 or more.
  - Special Care Unit Stay – 9.6 postneonatal deaths per 1,000 newborns who had a special care unit admission compared to 1.4 per 1,000 newborns who did not have a special care unit admission
  - Neonatal Hospital Readmission – 5.0 postneonatal deaths per 1,000 to babies with a hospital readmission compared to 1.4 per 1,000 to babies who were not readmitted to the hospital.
- Causes of Death
  - The major causes of postneonatal mortality were congenital anomalies (21.5%), sudden infant death (13.9%), and injury (11.7%).

Comparison to Other Findings

The Manitoba postneonatal mortality rate of 2.0 deaths per 1,000 (2001/02–2008/09) for infants born 500 grams or more was higher than the Canadian postneonatal mortality rate of 1.3 per 1,000 in 2003 (Public Health Agency of Canada, 2008) and 1.3 in 2005 (Public Health Agency of Canada, 2012).

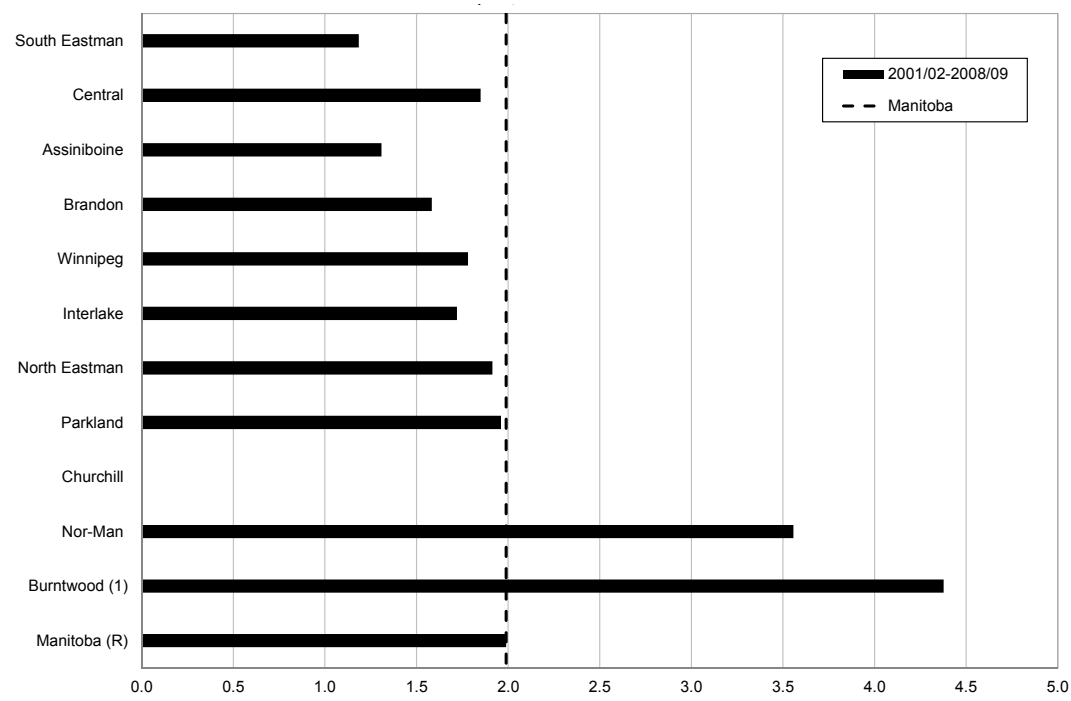
Limitations

Postneonatal mortality rates may also be affected by regional variations in birth registration, particularly for very preterm infants at the borderline of viability.

Summary

During 2001/02–2008/09, the rate of postneonatal mortality in Manitoba was 2.0 deaths per 1,000 live births, with a significantly higher rate observed in the region of Burntwood (4.4 deaths per 1,000 live births). Within Winnipeg, the areas of Downtown (3.5 deaths per 1,000 live births) and Point Douglas (3.4 deaths per 1,000 live births) were significantly higher than the Winnipeg rate (1.8 deaths per 1,000 live births). The rate of postneonatal mortality was highest among women who were aged 24 and younger, lived in the lowest income quintiles, were on income assistance, were multiparous, had inadequate prenatal care, had diabetes, smoked during pregnancy, had not initiated breastfeeding at hospital discharge, and had multiple pregnancies. Mortality rates were greater in infants who were preterm (early and late) and early term, were small–for–gestational–age, had a five–minute Apgar of 7 or less, had a neonatal special care unit admission, and who had a neonatal hospital readmission. The main causes of postneonatal death were congenital anomalies, SIDS, and injury.

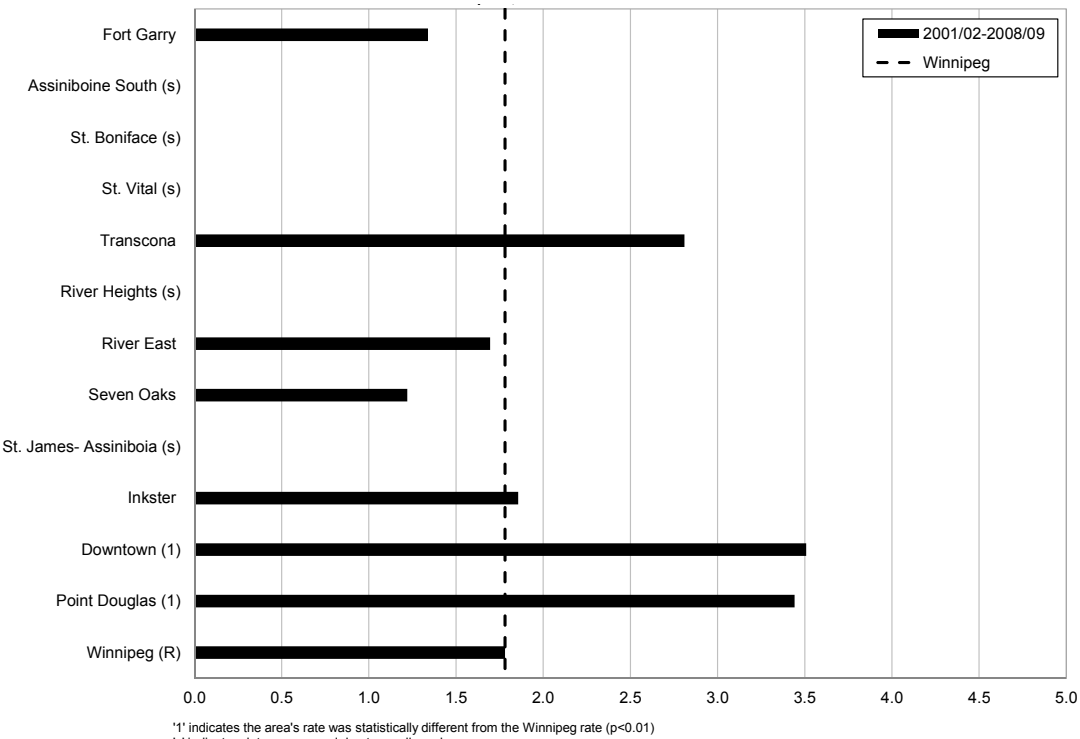
Figure 6.11.5: Postneonatal (28-364 Days of Birth) Mortality Rates by RHA, 2001/02-2008/09
per 1,000 live births



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

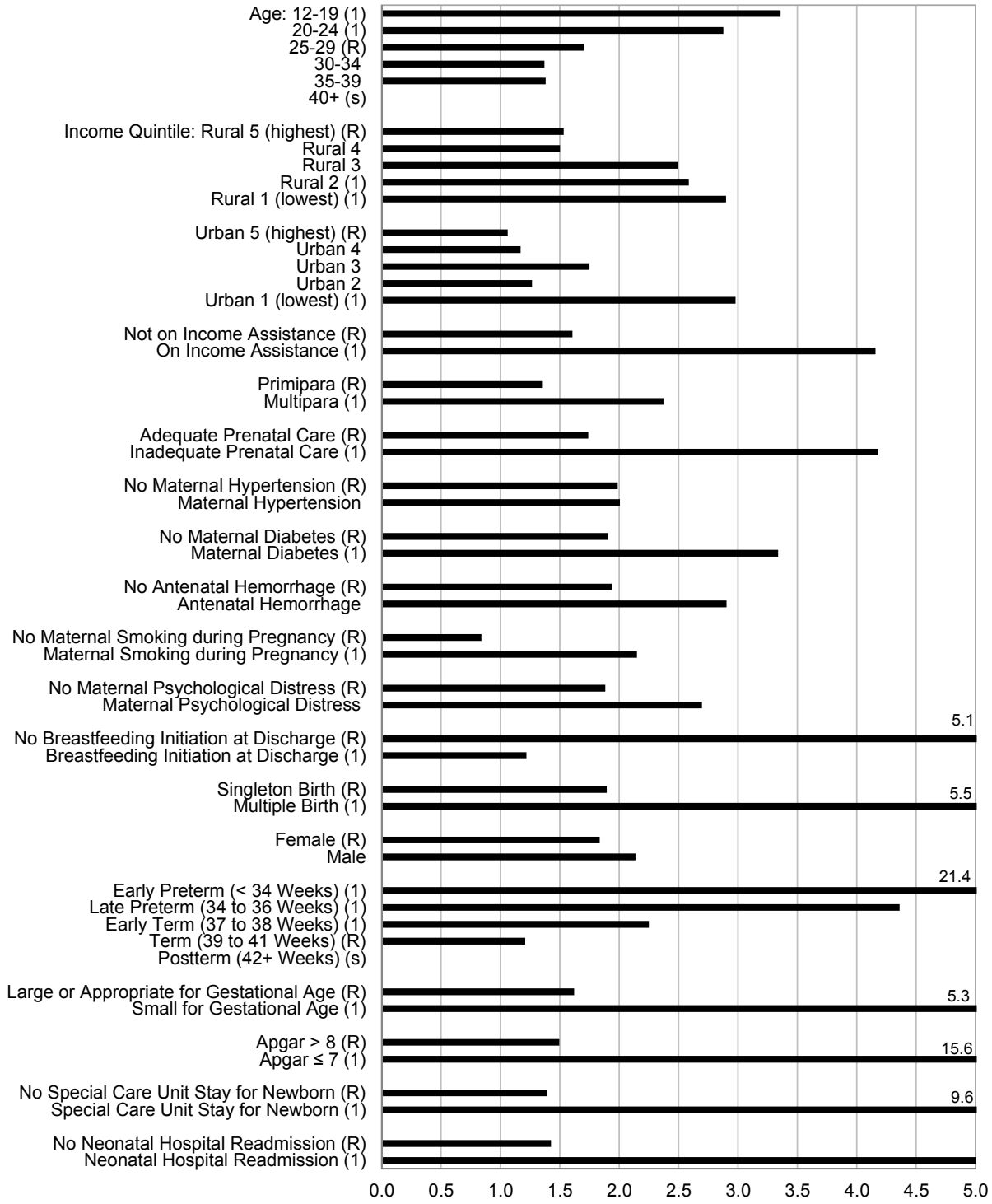
Figure 6.11.6: Postneonatal (28-364 Days of Birth) Mortality Rates by Winnipeg CA, 2001/02-2008/09
per 1,000 live births



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

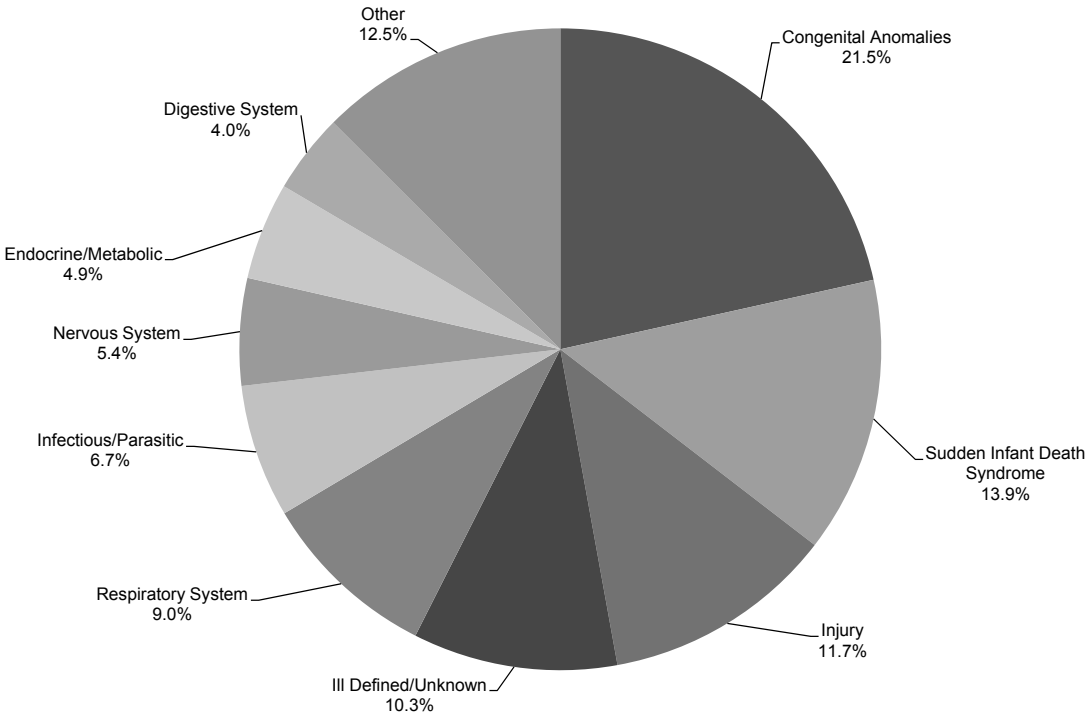
Figure 6.11.7: Postneonatal (28-364 Days of Birth) Mortality Rates by Sociodemographic and Other Characteristics, 2001/02-2008/09
per 1,000 live births



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.11.8: Causes of Postneonatal Death in Manitoba, 2001/02-2008/09



Manitoba Centre for Health Policy, 2012

Infant Mortality

Background

The infant mortality rate is considered to be one of the most important indicators of the health of a population (Ma & Finch, 2010). Dr. K. Kellie Leitch, in her report, *Reaching for the Top: A Report by the Advisor on Healthy Children and Youth* states, "From a public policy perspective, investing in the health of our children is as essential to our growth as a nation as investing in infrastructure. Infant mortality is recognized internationally as one of the most important measures of the health of a nation and its children. It is also an important indicator of the health of pregnant women" (2007). While Canada's rate of infant mortality had been one the lowest in the world, the number of infant deaths in Canada has been increasing. Canada's infant mortality rate in 2008 was 5.1 infant deaths per 1,000 live births (Statistics Canada, 2008). This figure ranks Canada at number 10 in the world for infant deaths (OECD, 2011). This increase in infant mortality may be due to the increasing numbers of very preterm infants, which Canada registers as live births (Statistics Canada, 2008). Racial/ethnic and socioeconomic disparities in infant mortality rates have also been reported. In a Manitoba study, infant mortality rates were significantly higher (roughly doubled) among First Nations compared to non–First Nations (Luo et al, 2010). In addition, low neighbourhood socioeconomic status was associated with a higher relative risk of infant mortality for both First Nations and non–First Nations (Luo et al., 2010).

Calculation of the Indicator

The infant mortality rate is defined as the proportion of live births weighing 500 grams or more that die within 0 to 364 days of birth. This indicator is reported as a rate per 1,000 live births. The RHA, Winnipeg CA and Sociodemographic analyses were calculated for 2003/04–2007/08. Newborns weighing less than 500 grams and those whose gestation was less than 20 weeks were excluded from this analysis. Refer to Appendix Table A.4 for more details.

Key Observations

All rates are reported as per 1,000 live births unless otherwise specified.

- RHA (2001/02–2008/09), Figure 6.11.9
  - The Manitoba rate of infant deaths was 5.2 per 1,000
  - The Burntwood rate of infant deaths (9.5 per 1,000) and the NOR–MAN rate (9.2 per 1,000) were significantly higher than the Manitoba rate.
- Winnipeg CA (2001/02–2008/09), Figure 6.11.10
  - The Winnipeg rate of infant deaths was 4.7 per 1,000.
  - The Downtown rate of infant deaths (7.4 per 1,000) and the Point Douglas rate (7.3 per 1,000) were significantly higher than the Winnipeg rate, while the rate for St. Vital (1.8 per 1,000) was significantly lower.
- Sociodemographic and Other Characteristics (2001/02–2008/09), Figure 6.11.11
  There was a significant difference in the proportion of infant deaths for the following characteristics:
  - Maternal Age – 6.6 infant deaths per 1,000 occurred to mothers aged 12 to 19 and 6.4 per 1,000 to mothers aged 20 to 24, compared to 4.5 per 1,000 to mothers aged 25 to 29.
  - Income Quintile –There were 7.1 and 7.0 infant deaths per 1,000 to mothers living in Rural 1 and Rural, compared to 4.4 per 1,000 in Rural 5. There were 6.9 infant deaths per 1,000 to mothers living in Urban 1, 4.6 per 1,000 in Urban 2, and 4.3 per 1,000 in Urban 3 compared to 2.8 per 1,000 in Urban 5.
  - Income Assistance – 8.1 infant deaths per 1,000 occurred to women on income assistance compared to 4.5 per 1,000 to women not on income assistance.
  - Maternal Education – 3.4 infant deaths per 1,000 occurred to women who had less than a Grade 12 education compared to 1.1 per 1,000 to women who had a Grade 12 education.

- Parity – 5.4 infant deaths per 1,000 occurred to multiparous women compared to 4.4 per 1,000 to primiparous women.
- Prenatal Care – 7.8 infant deaths per 1,000 occurred to women who had inadequate prenatal care compared to 4.6 per 1,000 to women who had adequate prenatal care.
- Antepartum Hemorrhage – 16.1 infant deaths per 1,000 to women who had an antepartum hemorrhage compared to 4.4 per 1,000 to women who did not have an antepartum hemorrhage.
- Maternal Smoking during Pregnancy – 2.6 infant deaths per 1,000 to women who reported smoking during pregnancy compared to 1.2 per 1,000 to women who did not report smoking during pregnancy.
- Breastfeeding Initiation at Hospital Discharge – 18.4 infant deaths per 1,000 occurred to women who were not breastfeeding at hospital discharge compared to 1.7 per 1,000 to women who were breastfeeding at hospital discharge.
- Multiple Births – 19.9 infant deaths per 1,000 multiple births compared to 4.8 deaths per 1,000 singleton births.
- Sex of Newborn – 5.8 infant deaths per 1,000 males compared to 4.6 per 1,000 females
- Gestation – 127.3 infant deaths per 1,000 early preterm births, 12.1 per 1,000 late preterm births, 3.5 per 1,000 early term births, and 5.5 per 1,000 postterm births compared to 1.8 per 1,000 term births.
- Size for Gestational Age – 20.5 infant deaths per 1,000 small–for–gestational–age infants compared to 3.5 per 1,000 adequate– or large–for–gestational–age infants.
- Apgar – 77.2 infant deaths per 1,000 infants who had a five–minute Apgar score of 7 or less compared to 2.2 per 1,000 infants who had a five–minute Apgar score of 8 or more.
- Special Care Unit (SCU) Admission – 27.6 infant deaths per 1,000 infants who were admitted to an SCU compared to 3.4 per 1,000 infants who were not admitted to an SCU.
- Hospital Readmission – 6.8 infant deaths per 1,000 infants who had a neonatal hospital readmission compared to 1.9 per 1,000 infants who did not have a neonatal hospital readmission.

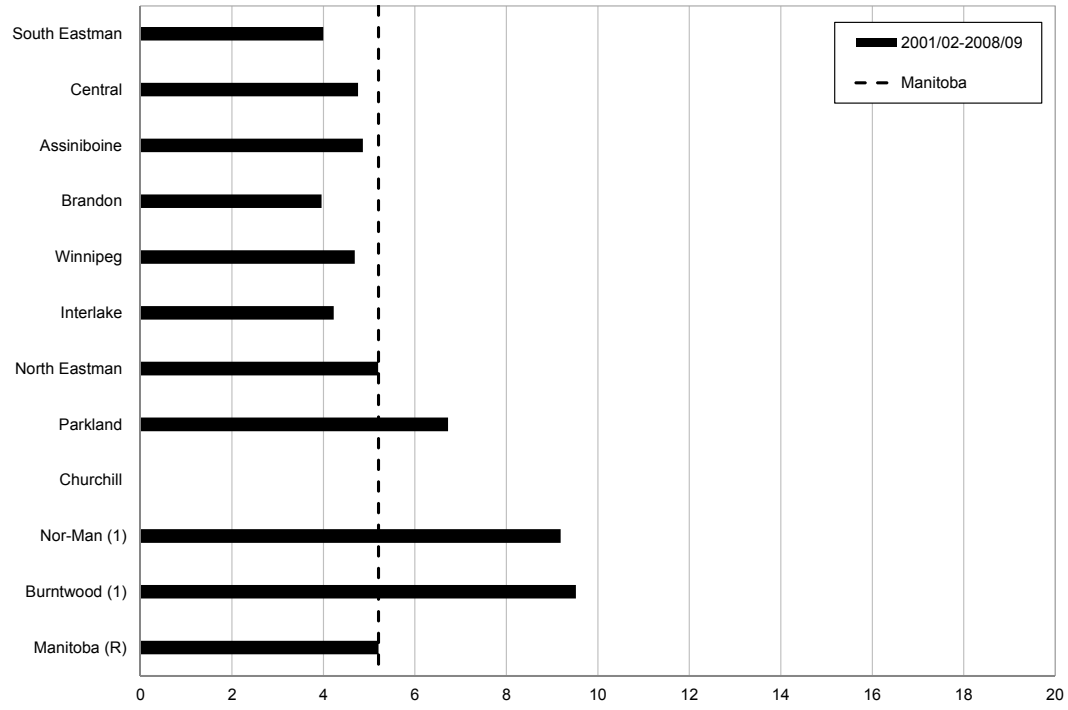
Comparison to Other Findings

The Manitoba rate of 5.2 infant deaths 500 or more grams per 1,000 live births is higher than the Canadian rate, which ranged from 3.7 in 2003, to 3.8 in 2004, to 4.0 in 2005 (Public Health Agency of Canada, 2012).

Summary

During 2001/02–2008/09, the rate of infant mortality in Manitoba was 5.2 deaths per 1,000 live births with a significantly higher rate observed in Burntwood (9.5) and NOR–MAN (9.2). Within Winnipeg, the CAs of Downtown (7.4) and Point Douglas (7.3) were significantly higher than the Winnipeg rate (4.7). The rate of infant mortality was highest among women who were aged 12 to 19 and 20 to 24, lived in the lowest income quintiles, were on income assistance, had less than Grade 12 education, were multiparous, had inadequate prenatal care, experienced an antepartum hemorrhage, smoked during pregnancy, had not initiated breastfeeding at hospital discharge, or had a multiple birth. Mortality rates were greater in infants who were male; were preterm (early and late), early term, or postterm; were small–for–gestational–age; had a five–minute Apgar of 7 or less; had a neonatal Special Care Unit Admission; or who had a neonatal hospital readmission.

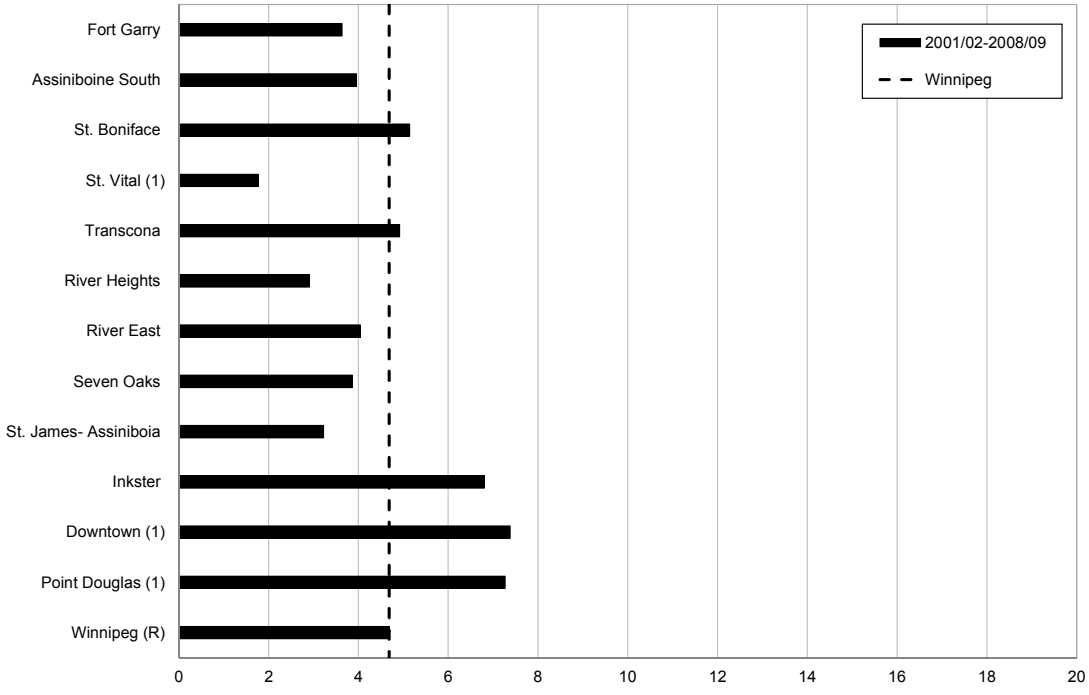
Figure 6.11.9: Infant (Within 0-364 Days of Birth) Mortality Rates by RHA, 2001/02-2008/09
per 1,000 live births



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

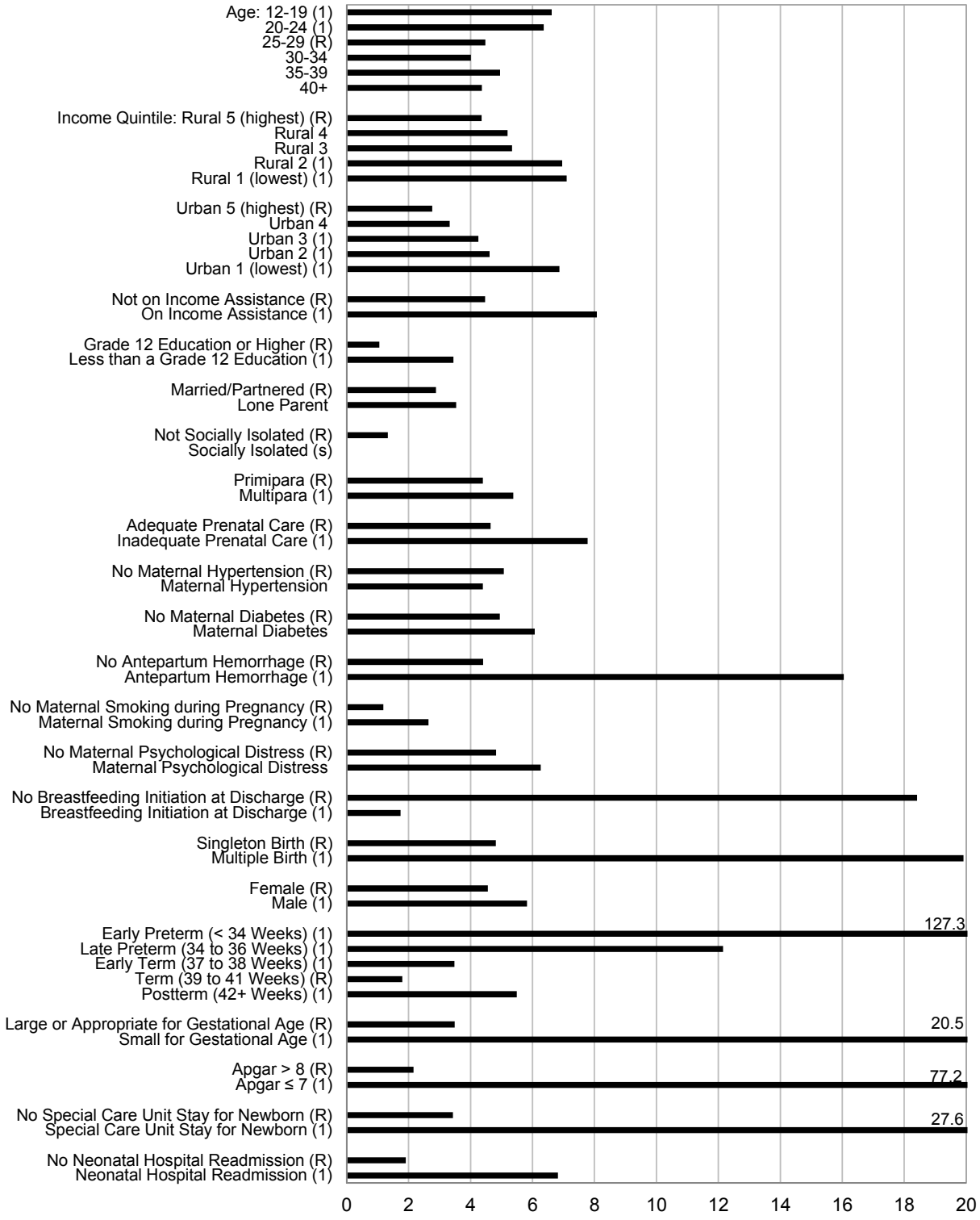
Figure 6.11.10: Infant (Within 0-364 Days of Birth) Mortality Rates by Winnipeg CA, 2001/02-2008/09
per 1,000 Live births



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Figure 6.11.11: Infant (Within 0-364 Days of Birth) Mortality Rates by Sociodemographic and Other Characteristics, 2001/02-2008/09
per 1,000 live births



'1' indicates the group's rate was statistically different from the reference (R) category (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Table 6.11.1: Comparisons of Neonatal, Postneonatal, and Infant Mortality Rates by Region and Year, 2001/02-2008/09

	Rates per 1,000 Live Births		
Region and Year	**Neonatal Mortality**	**Postneonatal Mortality**	**Infant Mortality**
Winnipeg			
2001/02	3.2	2.5	5.6
2002/03	2.3	1.7	3.9
2003/04	3.5	2.6	6.1
2004/05	2.8	1.8	4.5
2005/06	2.9	1.3	4.2
2006/07	2.1	1.7	3.7
2007/08	3.9	2.3	6.2
2008/09	s	s	3.2
Brandon			
2001/02	s	s	s
2002/03	s	s	11.5
2003/04	s	s	s
2004/05	0.0	s	s
2005/06	0.0	s	s
2006/07	s	s	s
2007/08	s	0.0	s
2008/09	s	s	s
Rural South			
2001/02	3.4	2.5	5.9
2002/03	s	s	4.9
2003/04	2.3	1.6	3.9
2004/05	s	s	4.0
2005/06	3.1	1.5	4.6
2006/07	3.2	2.5	5.7
2007/08	2.2	2.0	4.2
2008/09	3.3	1.8	5.1
North			
2001/02	s	s	8.8
2002/03	s	s	8.5
2003/04	7.2	4.6	11.8
2004/05	7.3	4.0	11.3
2005/06	s	s	6.6
2006/07	3.7	4.9	8.5
2007/08	5.6	4.4	10.0
2008/09	4.5	4.5	9.1
Manitoba			
2001/02	3.6	2.4	6.0
2002/03	3.3	1.8	5.1
2003/04	3.4	2.5	5.9
2004/05	3.4	1.6	5.0
2005/06	2.9	1.6	4.5
2006/07	2.7	2.3	5.0
2007/08	3.4	2.3	5.8
2008/09	3.1	1.5	4.5

Source: Manitoba Centre for Health Policy, 2012

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Chapter 7: Logistic Regression Modeling of Selected Outcome Indicators

For selected indicators, the use of multivariable logistic regression enabled us to determine the independent association of each explanatory variable or risk factor to the outcome of interest, after adjusting (or controlling) for other factors in the model. Multivariable logistic regression models are presented for the following outcomes: cesarean birth, infant death, preterm birth, and maternal prenatal and postpartum psychological distress. We selected these outcomes for a variety of reasons: (1) preterm birth because of its many adverse consequences and costs to the healthcare system and society; (2) cesarean birth because of our low rates in Manitoba and an interest in determining what factors are associate with cesarean birth; (3) infant death because our rates remained high compared to the Canadian rate, and prevention efforts might benefit from a better understanding of risk factors; (4 and 5) maternal prenatal and postpartum psychological distress because these are new indicators never before reported for Manitoba, and prevention efforts and intervention strategies might be informed by a better understanding of predictors/risk factors.

Logistic regression is a technique to determine the likelihood of a "yes/no" outcome given certain individual or regional characteristics. These models generate adjusted **Odds Ratios** (aOR). An aOR of greater than 1 (with 95% **Confidence Limits** both above 1 and a p–value less than 0.05, meaning statistically significant) means that there is a higher likelihood of the outcome. An aOR of less than 1 (with 95% Confidence Limits both below 1) means a lower likelihood of the outcome. An aOR around 1 (or 95% Confidence Limits crossing over 1 and a p–value which is greater than 0.05, meaning not statistically significant) means that this characteristic has no statistically significant association with the outcome once you control for the effects of the other variables. An Odds Ratio of 3 means that there is three times the odds; and an Odds Ratio of 0.5 means there is half the odds of this outcome occurring compared to a reference group. Caution needs to be used, however, since an Odds Ratio cannot necessarily be translated into "three times the risk" unless it is a relatively rare event, in which case Odds Ratios and Relative Risks are similar.

Additionally, in each logistic regression model you will find a column with the **Type III Analysis of Effects tests.** This test provides a global test of each of the explanatory variables in the model. If this value is significant then that explanatory variable is a significant predictor in the model. One can then safely compare each of the underlying values of the explanatory variable to the reference value to more precisely identify where the differences lie. If the global test is not significant there is no need to do any further testing. Using the type III test provides a way of controlling the **type I error** rate especially when the number of levels in the explanatory variable is high. Individual parameter estimates are only provided when the type III analysis of effects is significant.

7.1 Prenatal Psychological Distress

A woman was considered to have prenatal psychological distress if in the eight months prior to giving birth (or hospital discharge in case of a stillbirth) she had:

- one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression, or adjustment reaction OR
- one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction OR
- one or more hospitalizations with a diagnosis for anxiety disorders OR
- one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more physician visits with a diagnosis for anxiety disorders AND one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders OR
- two or more physician visits with a diagnosis for anxiety disorders

Refer to the Appendix Table A.4 for more details.

Logistic Regression Results

- The use of multivariable logistic regression enabled us to determine the independent association of each risk factor for prenatal psychological distress after adjusting for other factors in the model. The reference category for each explanatory variable is indicated by the "(vs ___)" next to the variable's name.
- Two regression models are shown in Tables 7.1.1 and 7.1.2 Both were modeled using the births occurring over two years, 2007/08–2008/09.
- The first model was population–based (N=28,037). This model explored the relationships between a variety of demographic factors and maternal and fetal/infant characteristics that the literature has shown to be associated with prenatal psychological distress. The second model (N=18,821) added variables available from the Families First screen (Grade 12 education, social isolation, substance abuse—a composite variable of smoking, alcohol, and/or illicit drug use during pregnancy). This sample size for the second model is much smaller because the Families First data are not available for all births (see section 1.3 on Families First for a description of the exclusions).
- In the first model, several demographic factors were significant independent predictors of prenatal psychological distress (maternal age, area of residence, income quintile, marital status, and income assistance), taking into account other factors in the model. Adjusted odds ratios (aORs) indicated that pregnant women who were more likely to experience psychological distress were aged 30 to 39 or living in Brandon. In addition, medical complications (hypertension, antepartum hemorrhage) were significantly related to prenatal psychological distress. Teen (aged 12 to 19) pregnant women were significantly less likely to have psychological distress as defined by health service and medication use than those aged 25 to 29 as were those who lived in the North or the Rural South. Inadequate prenatal care and using fertility treatment did not influence pregnant women's likelihood of psychological distress. Pre–pregnancy psychological distress had the largest effect on the likelihood of developing prenatal psychological distress (aOR 9.79, 95% **CI** 8.89–10.77) after adjusting for other variables in the model.
- In the second model, the only demographic factors from the first model that continued to be significantly associated with prenatal psychological distress were maternal age, area of residence, and income assistance. Other factors associated with prenatal psychological distress were social isolation and substance use during pregnancy. Adjusted odds ratios (aORs) indicated that pregnant women who were more likely to experience psychological distress were aged 30 to 34 or living in

Brandon. One medical complication (hypertension) continued to be significantly related to prenatal psychological distress. Teen (aged 12 to 19) pregnant women were significantly less likely to have psychological distress as defined by health service use than those aged 25 to 29, as were those who lived in the North or the Rural South. Women who experienced psychological distress *before* they became pregnant were over 10 times more likely to experience distress in pregnancy (aOR 10.58, 95% CI 9.40–11.91) after controlling for a variety of sociodemographic, health behaviour, and medical factors.

Table 7.1.1: Logistic Regression of Prenatal Psychological Distress, 2007/08-2008/09 (Model 1)

Number of mothers with prenatal psychological distress = 2,133
Number of mothers without prenatal psychological distress = 25,904

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.69 (0.55, 0.85)**	**0.0007**	<.0001
20-24	0.95 (0.83, 1.09)	0.4699	
30-34	**1.19 (1.05, 1.35)**	**0.0086**	
35-39	**1.23 (1.04, 1.44)**	**0.0151**	
40+	1.35 (0.99, 1.85)	0.0612	
Aggregate Region (vs. Winnipeg)			
Brandon	**1.51 (1.25, 1.83)**	**<.0001**	<.0001
North	**0.57 (0.47, 0.70)**	**<.0001**	
Rural South	**0.84 (0.75, 0.94)**	**0.0016**	
Income Quintile (vs. Quintile 5)			
Quintile 1	0.87 (0.74, 1.03)	0.1002	0.004
Quintile 2	**0.85 (0.72, 1.00)**	**0.0494**	
Quintile 3	1.09 (0.92, 1.28)	0.3240	
Quintile 4	1.04 (0.88, 1.23)	0.6282	
Primipara (vs. Multipara)	1.10 (0.98, 1.22)		0.1037
Marital Status (vs. Married/Partnered)			
Lone Parent	**1.21 (1.02, 1.43)**	**0.0269**	0.0426
Unknown	1.14 (0.99, 1.32)	0.0709	
On Income Assistance (vs. Not on Income Assistance)	**1.53 (1.33, 1.77)**	**<.0001**	<.0001
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	1.18 (0.98, 1.41)		0.0799
Maternal Hypertension (vs. No Maternal Hypertension)	**1.29 (1.10, 1.50)**	**0.0014**	0.0014
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	**1.28 (1.06, 1.55)**	**0.0105**	0.0105
Psychological Distress Prior to Pregnancy (vs. No Psychological Distress Prior to Pregnancy)	**9.79 (8.89, 10.77)**	**<.0001**	<.0001
Prenatal Care (vs. Adequate Prenatal Care)			0.5488
Inadequate Prenatal Care	1.10 (0.93, 1.29)		
Intensive Prenatal Care	0.99 (0.79, 1.24)		
Ovulation Induction† (vs. No Ovulation Induction†)	0.90 (0.64, 1.26)		0.5425

Bold indicates statistically significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

'†' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

'*' Individual parameter estimates are only provided when the type III analysis of effects is significant

Table 7.1.2: Logistic Regression of Prenatal Psychological Distress, 2007/08-2008/09 (Model 2)

Number of mothers with prenatal psychological distress = 1,425
Number of mothers without prenatal psychological distress = 17,39

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.68 (0.50, 0.92)**	**0.0130**	0.0031
20-24	0.98 (0.83, 1.17)	0.8590	
30-34	**1.22 (1.05, 1.43)**	**0.0112**	
35-39	1.18 (0.96, 1.44)	0.1128	
40+	1.41 (0.97, 2.04)	0.0752	
Aggregate Region (vs. Winnipeg)			
Brandon	**1.40 (1.13, 1.73)**	**0.0022**	<.0001
North	**0.66 (0.47, 0.92)**	**0.0139**	
Rural South	**0.82 (0.72, 0.94)**	**0.0049**	
Income Quintile (vs. Quintile 5)			0.1888
Quintile 1	0.88 (0.72, 1.09)		
Quintile 2	0.88 (0.73, 1.07)		
Quintile 3	1.04 (0.87, 1.26)		
Quintile 4	1.05 (0.87, 1.27)		
Primipara (vs. Multipara)	1.12 (0.98, 1.28)		0.0976
Marital Status (vs. Married/Partnered)			0.3912
Lone Parent	1.08 (0.88, 1.32)		
Unknown	1.57 (0.77, 3.22)		
On Income Assistance (vs. Not on Income Assistance)	**1.24 (1.01, 1.52)**	**0.0430**	0.043
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	1.14 (0.90, 1.45)		0.2758
Maternal Hypertension (vs. No Maternal Hypertension)	**1.23 (1.01, 1.48)**	**0.0352**	0.0352
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	1.27 (0.99, 1.62)		0.0563
Psychological Distress Prior to Pregnancy (vs. No Psychological Distress Prior to Pregnancy)	**10.58 (9.40, 11.91)**	**<.0001**	<.0001
Prenatal Care (vs. Adequate Prenatal Care)			0.3209
Inadequate Prenatal Care	1.17 (0.91, 1.50)		
Intensive Prenatal Care	1.13 (0.87, 1.46)		
Ovulation Induction† (vs. No Ovulation Induction†)	0.87 (0.59, 1.28)		0.4752
Less Than Grade 12 Education (vs. Completed High School)	1.08 (0.91, 1.28)		0.3997
Socially Isolated (vs. Not Socially Isolated)	**1.61 (1.25, 2.08)**	**0.0002**	0.0002
Substance Abuse During Pregnancy (vs. No Substance Abuse During Pregnancy)	**1.25 (1.08, 1.43)**	**0.0023**	0.0023

Bold indicates statistically significant at p<0.05

'†' Refers to the use of any drug for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth

'*' Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

7.2 Cesarean Births

Logistic Regression Results

- The use of multivariable logistic regression enabled us to determine the independent association of each risk factor after adjusting for other factors in the model. The reference category for each explanatory variable is indicated by the "(vs ___)" next to the variable's name.
- Two models are shown in Tables 7.2.1 and 7.2. Both were modeled using 2007/08–2008/09 data.
- The first model was population–based (N=29,068), adding in a variety of explanatory variables supported in the literature. The second model (N=19,558) added variables available from the Families First screen (Grade 12 education, social isolation, maternal smoking during pregnancy), as well as income assistance. This sample size for the second model is much lower as the Families First data are not available for all births (see section 1.3 on Families First for a description of the exclusions).
- In the first model, maternal age of 30 and older; living outside of Winnipeg; having diabetes, hypertension, antepartum hemorrhage, multiple birth, a breech or other malpresentation, fetal distress, an infant weighing more than 4,500 grams, or a previous cesarean birth; or being a primipara were significant independent predictors of cesarean birth, taking into account other factors in the model. Preterm, early term, and postterm gestations were all at increased risk compared to term gestation. Induction of labour was associated with a reduced risk of cesarean birth (OR 0.91; 95% CI 0.82–0.997, p=0.043). Income quintile and marital status were not significant predictors of cesarean birth.
- In the second model, most of the same predictors as in Model 1 remained as significant risk factors. None of the added variables (being on income assistance, less than Grade 12 education, or social isolation) were significant predictors of cesarean birth.

Table 7.2.1: Logistic Regression of Cesarean Births, 2007/08-2008/09 (Model 1)

Number of women with a cesarean births = 5,768
Number of women with a vaginal birth = 23,300

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.534 (0.453, 0.630)**	**<.0001**	<.0001
20-24	**0.814 (0.730, 0.909)**	**0.0002**	
30-34	**1.306 (1.183, 1.441)**	**<.0001**	
35-39	**1.741 (1.537, 1.972)**	**<.0001**	
40+	**1.942 (1.536, 2.454)**	**<.0001**	
Aggregate Region (vs. Winnipeg)			
Brandon	**1.465 (1.248, 1.720)**	**<.0001**	<.0001
North	**1.308 (1.136, 1.507)**	**0.0002**	
Rural South	**1.185 (1.090, 1.289)**	**<.0001**	
Income Quintile (vs. Quintile 5)			
Quintile 1	1.092 (0.963, 1.237)		0.3828
Quintile 2	1.113 (0.984, 1.259)		
Quintile 3	1.117 (0.986, 1.266)		
Quintile 4	1.048 (0.923, 1.189)		
Marital Status (vs. Married/Partnered)			
Lone Parent	0.960 (0.832, 1.109)		0.2532
Unknown	0.907 (0.807, 1.019)		
High Birth Weight (vs. ≤ 4,500 g)	**2.640 (2.192, 3.180)**	**<.0001**	<.0001
Multiple Birth (vs. Singleton)	**1.871 (1.431, 2.447)**	**<.0001**	<.0001
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	**1.620 (1.410, 1.862)**	**<.0001**	<.0001
Maternal Hypertension (vs. No Maternal Hypertension)	**1.892 (1.687, 2.123)**	**<.0001**	<.0001
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	**1.942 (1.676, 2.250)**	**<.0001**	<.0001
Malpresentation (vs. No Malpresentation)			
Breech	**52.695 (44.061, 63.021)**	**<.0001**	<.0001
Other Malpresentation	**3.854 (3.483, 4.265)**	**<.0001**	
Fetal Distress (vs. No Fetal Distress)	**3.278 (3.000, 3.581)**	**<.0001**	<.0001
Induction (vs. No Induction)	**0.905 (0.822, 0.997)**	**0.0431**	0.0431
Gestation (vs. Term 39-41 weeks)			
Early Preterm (<34 weeks)	1.288 (0.996, 1.665)	0.0538	<.0001
Preterm (34-36 weeks)	**1.330 (1.135, 1.559)**	**0.0004**	
Early Term (37-38 weeks)	**1.287 (1.175, 1.410)**	**<.0001**	
Postterm (42+ weeks)	**1.743 (1.362, 2.231)**	**<.0001**	
Prior Deliveries (vs. Multiparous with No Previous Cesarean Birth)			
Multiparous with Previous Cesarean Birth	**39.694 (35.576, 44.287)**	**<.0001**	<.0001
Primipara	**3.448 (3.142, 3.785)**	**<.0001**	

Bold indicates statistically significant at p<0.05

* Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

Table 7.2.2: Logistic Regression of Cesarean Births, 2007/08-2008/09 (Model 2)

Number of women with a cesarean births = 4,090
Number of women with a vaginal birth = 15,468

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.526 (0.412, 0.672)**	**<.0001**	<.0001
20-24	**0.738 (0.644, 0.847)**	**<.0001**	
30-34	**1.263 (1.125, 1.418)**	**<.0001**	
35-39	**1.769 (1.528, 2.047)**	**<.0001**	
40+	**2.240 (1.696, 2.957)**	**<.0001**	
Aggregate Region (vs. Winnipeg)			
Brandon	**1.474 (1.238, 1.754)**	**<.0001**	<.0001
North	**1.492 (1.177, 1.890)**	**0.0009**	
Rural South	**1.206 (1.090, 1.334)**	**0.0003**	
Income Quintile (vs. Quintile 5)			
Quintile 1	1.201 (1.026, 1.405)		0.1050
Quintile 2	1.131 (0.979, 1.307)		
Quintile 3	1.199 (1.041, 1.381)		
Quintile 4	1.127 (0.978, 1.298)		
Marital Status (vs. Married/Partnered)			
Lone Parent	1.117 (0.931, 1.341)		0.1370
Unknown	0.477 (0.183, 1.242)		
High Birth Weight (vs. ≤ 4,500 g)	**2.553 (2.001, 3.258)**	**<.0001**	<.0001
Multiple Birth (vs. Singleton)	**1.935 (1.373, 2.726)**	**0.0002**	0.0002
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	**1.720 (1.438, 2.056)**	**<.0001**	<.0001
Maternal Hypertension (vs. No Maternal Hypertension)	**1.822 (1.587, 2.093)**	**<.0001**	<.0001
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage	**1.814 (1.510, 2.179)**	**<.0001**	<.0001
Malpresentation (vs. No Malpresentation)			
Breech	**68.920 (54.637, 86.938)**	**<.0001**	<.0001
Other Malpresentation	**3.855 (3.419, 4.348)**	**<.0001**	
Fetal Distress (vs. No Fetal Distress)	**2.915 (2.622, 3.242)**	**<.0001**	<.0001
Induction (vs. No Induction)	1.033 (0.920, 1.159)		0.5851
Gestation (vs. Term 39-41 weeks)			
Early Preterm (<34 weeks)	**2.370 (1.653, 3.398)**	**<.0001**	<.0001
Preterm (34-36 weeks)	1.211 (0.987, 1.485)	0.0663	
Early Term (37-38 weeks)	**1.242 (1.112, 1.387)**	**0.0001**	
Postterm (42+ weeks)	**2.006 (1.502, 2.681)**	**<.0001**	
Prior Deliveries (vs. Multiparous with No Previous Cesarean Birth)			
Multiparous with Previous Cesarean Birth	**46.438 (40.492, 53.257)**	**<.0001**	<.0001
Primipara	**3.518 (3.135, 3.947)**	**<.0001**	
On Income Assistance (vs. Not on Income Assistance)	0.876 (0.724, 1.062)		0.1779
Less Than Grade 12 Education (vs. Completed High School)	0.945 (0.819, 1.091)		0.4416
Socially Isolated (vs. Not Socially Isolated)	0.860 (0.689, 1.075)		0.1854

Bold indicates statistically significant at p<0.05

* Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

7.3 Preterm Birth

Logistic Regressions

- The use of multivariable logistic regression enabled us to determine the independent association of each risk factor after adjusting for other factors in the model. The reference category for each explanatory variable is indicated by the "(vs ___)" next to the variable's name.
- Two models are shown in Tables 7.3.1 and 7.3.2. Both were modeled using 2005/06–2008/09 data.
- The first model was population–based (N= 55,253), adding in a variety of explanatory variables supported in the literature. The second model (N=36,915) added variables available from the Families First screen (Grade 12 education, social isolation, maternal smoking during pregnancy), as well as income assistance. This sample size for the second model is much lower as the Families First data are not available for all births (see section 1.3 on Families First for a description of the exclusions).
- In the first model, maternal age (35 and older), marital status (lone parent or unknown), male baby, low parity (0 to 2), diabetes, hypertension, prenatal psychological distress, multiple birth, primipara or previous preterm birth, and type of birth (cesarean or induction) were significant independent predictors of preterm birth, taking into account other factors in the model. Protective factors included **intensive prenatal care** and living in the North or the Rural South areas of the province. Income quintile was not a significant predictor.
- In the second model, many of the same predictors remained as significant risk factors; additional significant predictors included being on income assistance and smoking during pregnancy. Having less than a Grade 12 education or being socially isolated were not significant predictors. Young maternal age (12 to 19) became a protective factor, and region of residence and prenatal psychological distress were no longer significant.

Table 7.3.1: Logistic Regression of Preterm Birth, 2005/06-2008/09 (Model 1)

Number of babies born preterm (less than 37 weeks gestation) = 4,277
Number of babies born at term (37 or more weeks gestation) = 50,976

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	0.94 (0.81, 1.09)	0.4046	0.0006
20-24	1.02 (0.92, 1.12)	0.7739	
30-34	1.02 (0.93, 1.12)	0.6484	
35-39	**1.21 (1.08, 1.35)**	**0.0009**	
40+	**1.40 (1.14, 1.72)**	**0.0012**	
Aggregate Region (vs. Winnipeg)			
Brandon	0.98 (0.84, 1.15)	0.8377	<.0001
North	**0.82 (0.73, 0.92)**	**0.0006**	
Rural South	**0.86 (0.79, 0.92)**	**<.0001**	
Income Quintile (vs. Quintile 5)			
Quintile 1	1.03 (0.92, 1.15)		0.3914
Quintile 2	0.93 (0.83, 1.05)		
Quintile 3	0.98 (0.87, 1.11)		
Quintile 4	1.00 (0.89, 1.12)		
Marital Status (vs. Married/Partnered)			
Lone Parent	**1.39 (1.23, 1.56)**	**<.0001**	<.0001
Unknown	**1.55 (1.41, 1.71)**	**<.0001**	
Male Baby (vs. Female)	**1.19 (1.11, 1.27)**	**<.0001**	<.0001
Parity of 0-2 (vs. 3+)	**1.34 (1.22, 1.48)**	**<.0001**	<.0001
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	**2.57 (2.32, 2.84)**	**<.0001**	<.0001
Maternal Hypertension (vs. No Maternal Hypertension)	**1.89 (1.72, 2.08)**	**<.0001**	<.0001
Prenatal Psychological Distress (vs. No Prenatal Psychological Distress)	**1.17 (1.07, 1.28)**	**0.0008**	0.0008
Prenatal Care (vs. Adequate Prenatal Care)			
Inadequate Prenatal Care	0.98 (0.88, 1.09)	0.7139	<.0001
Intensive Prenatal Care	**0.58 (0.49, 0.68)**	**<.0001**	
Multiple Birth (vs. Singleton)	**12.94 (11.52, 14.55)**	**<.0001**	<.0001
Previous Births (vs. Previous Full Term Birth)			
Primipara	**1.32 (1.22, 1.43)**	**<.0001**	<.0001
Previous Preterm	**4.25 (3.80, 4.75)**	**<.0001**	
Birth Type (vs. Spontaneous Vaginal)			
Cesarean Birth	**1.76 (1.63, 1.91)**	**<.0001**	<.0001
Induced Vaginal	**1.23 (1.13, 1.35)**	**<.0001**	

Bold indicates statistically significant at p<0.05

'*' Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

Table 7.3.2: Logistic Regression of Preterm Birth, 2005/06-2008/09 (Model 2)

Number of babies born preterm (less than 37 weeks gestation) = 2,465
Number of babies born at term (37 or more weeks gestation) = 34,450

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.78 (0.62, 0.98)**	**0.0331**	0.0004
20-24	1.00 (0.88, 1.14)	0.9956	
30-34	1.03 (0.92, 1.16)	0.5934	
35-39	**1.28 (1.11, 1.48)**	**0.0007**	
40+	**1.41 (1.08, 1.85)**	**0.0116**	
Aggregate Region (vs. Winnipeg)			
Brandon	1.03 (0.87, 1.24)		0.1025
North	0.93 (0.74, 1.15)		
Rural South	0.89 (0.80, 0.98)		
Income Quintile (vs. Quintile 5)			
Quintile 1	0.94 (0.81, 1.09)		0.2893
Quintile 2	0.85 (0.74, 0.98)		
Quintile 3	0.94 (0.82, 1.08)		
Quintile 4	0.93 (0.82, 1.07)		
Marital Status (vs. Married/Partnered)			
Lone Parent	1.09 (0.93, 1.28)	0.3067	0.0309
Unknown	**1.94 (1.16, 3.23)**	**0.0111**	
Male Baby (vs. Female)	**1.20 (1.10, 1.31)**	**<.0001**	<.0001
Parity of 0-2 (vs. 3+)	**1.21 (1.04, 1.41)**	**0.0134**	0.0134
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	**2.32 (2.00, 2.68)**	**<.0001**	<.0001
Maternal Hypertension (vs. No Maternal Hypertension)	**1.91 (1.69, 2.15)**	**<.0001**	<.0001
Prenatal Psychological Distress (vs. No Prenatal Psychological Distress)	1.08 (0.96, 1.22)		0.2236
Prenatal Care (vs. Adequate Prenatal Care)			
Inadequate Prenatal Care	0.96 (0.79, 1.16)	0.6511	<.0001
Intensive Prenatal Care	**0.60 (0.49, 0.74)**	**<.0001**	
Multiple Birth (vs. Singleton)	**13.53 (11.69, 15.67)**	**<.0001**	<.0001
Previous Births (vs. Previous Full Term Birth)			
Primipara	**1.54 (1.39, 1.71)**	**<.0001**	<.0001
Previous Preterm	**4.72 (4.03, 5.54)**	**<.0001**	
Birth Type (vs. Spontaneous Vaginal)			
Cesarean Birth	**1.70 (1.53, 1.88)**	**<.0001**	<.0001
Induced Vaginal	**1.32 (1.17, 1.49)**	**<.0001**	
On Income Assistance (vs. Not on Income Assistance)	**1.24 (1.05, 1.46)**	**0.0122**	0.0122
Less Than Grade 12 Education (vs. Completed High School)	1.10 (0.96, 1.26)		0.1546
Socially Isolated (vs. Not Socially Isolated)	1.05 (0.85, 1.30)		0.6511
Maternal Smoking During Pregnancy (vs. No Maternal Smoking During Pregnancy)	**1.22 (1.08, 1.38)**	**0.0015**	0.0015

Bold indicates statistically significant at p<0.05

"*" Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

7.4 Postpartum Psychological Distress

A woman was considered to have postpartum psychological distress if in the 12 months after giving birth (or after hospital discharge in case of a stillbirth) if she had:

- one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression or adjustment reaction OR
- one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction OR
- one or more hospitalizations with a diagnosis for anxiety disorders OR
- one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more physician visits with a diagnosis for anxiety disorders AND one or more prescriptions for an antidepressant or mood stabilizer OR
- one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders OR
- two or more physician visits with a diagnosis for anxiety disorders

Refer to the Appendix Table A.4 for more details.

Logistic Regression Results

- The use of multivariable logistic regression enabled us to determine the independent association of each risk factor for postpartum psychological distress after adjusting for other factors in the model. The reference category for each **covariate** is indicated by the "(vs ___)" next to the covariate name.
- Two regression models are shown in Tables 7.4.1 and 7.4.2. Both were modeled using the births occurring over two years, 2007/08–2008/09.
- The first model was population–based (N= 29,269) comparing characteristics of women with postpartum psychological distress to those without distress. This model explored the relationships between a variety of demographic factors and maternal and infant characteristics that the literature has shown to be associated with postpartum psychological distress. The second model (N=19,565) added variables from the Families First screen (Grade 12 education, social isolation, substance abuse—a composite variable of smoking, alcohol and/or illicit drug use during pregnancy). This sample size for the second model is much smaller because the Families First data are not available for all births (see section 1.3 on Families First for a description of the exclusions).
- In the first model, several demographic factors were associated with postpartum psychological distress—maternal age, area of residence, marital status, and income assistance. In addition, one of the three medical complications, antepartum hemorrhage, was significantly related to postpartum psychological distress as was having prenatal psychological distress. Having a baby in a special care unit or having a low birth weight or preterm birth were also associated with postpartum psychological distress. Adjusted odds ratios (aORs) indicate that mothers who were more likely to experience psychological distress lived in Brandon and the Rural South. Teens (aged 12 to 19) and those 40 and older were significantly less likely to have psychological distress as defined by health service use than those aged 25 to 29 as were those who lived in the North. Prenatal psychological distress had the largest effect on the likelihood of developing postpartum psychological distress (aOR 8.11, 95% CI 7.50–8.77) after controlling for other variables in the model.
- In the second model, the only demographic factors from the first model that continued to be significantly associated with postpartum psychological distress were area of residence and income assistance. Antepartum hemorrhage and having a newborn admitted to a Special Care Unit continued to be significantly related to postpartum psychological distress. Women who experienced prenatal psychological distress were almost eight times more likely to experience psychological distress in the postpartum period (aOR 7.99, 95% CI 7.26–8.79). Other factors associated with postpartum psychological distress were social isolation and substance use during pregnancy. Adjusted odds ratios (aORs) indicated that new mothers who were more likely to experience psychological distress lived in Brandon or the Rural South.

Table 7.4.1: Logistic Regression of Postpartum Psychological Distress, 2007/08-2008/09 (Model 1)

Number of mothers with postpartum psychological distress = 4,045
Number of mothers without postpartum psychological distress = 25,224

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			
12-19	**0.70 (0.60, 0.82)**	**<.0001**	0.0001
20-24	0.93 (0.84, 1.03)	0.1651	
30-34	1.02 (0.92, 1.12)	0.7067	
35-39	1.02 (0.90, 1.16)	0.7655	
40+	**0.76 (0.58, 0.99)**	**0.0439**	
Aggregate Region (vs. Winnipeg)			
Brandon	**1.32 (1.12, 1.55)**	**0.0008**	<.0001
North	**0.63 (0.54, 0.72)**	**<.0001**	
Rural South	**1.14 (1.05, 1.24)**	**0.0016**	
Income Quintile (vs. Quintile 5)			
Quintile 1	0.94 (0.83, 1.07)		0.0983
Quintile 2	0.89 (0.79, 1.02)		
Quintile 3	1.05 (0.92, 1.19)		
Quintile 4	0.99 (0.87, 1.12)		
Primipara (vs. Multipara)	0.94 (0.86, 1.02)		0.1171
Marital Status (vs. Married/Partnered)			
Lone Parent	**1.21 (1.06, 1.38)**	**0.0047**	0.0002
Unknown	**1.22 (1.10, 1.36)**	**0.0002**	
On Income Assistance (vs. Not on Income Assistance)	**1.89 (1.70, 2.11)**	**<.0001**	<.0001
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	1.00 (0.87, 1.16)		0.9764
Maternal Hypertension (vs. No Maternal Hypertension)	1.09 (0.97, 1.24)		0.1611
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	**1.25 (1.08, 1.45)**	**0.0033**	0.0033
Prenatal Psychological Distress (vs. No Prenatal Psychological Distress)	**8.11 (7.50, 8.77)**	**<.0001**	<.0001
Newborn Morbidity (vs. No Newborn Morbidity)			
Admitted to a Special Care Unit (SCU)	**1.26 (1.12, 1.42)**	**<.0001**	<.0001
Not admitted to a SCU but low birth weight/preterm	**1.32 (1.12, 1.55)**	**0.0008**	

Bold indicates statistically significant at p<0.05

* Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

Table 7.4.2: Logistic Regression of Postpartum Psychological Distress, 2007/08-2008/09 (Model 2)
Number of mothers with postpartum psychological distress = 2,671
Number of mothers without postpartum psychological distress = 16,894

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value	Type III Analysis of Effects p-value
Maternal Age (vs. 25-29)			0.0839
12-19	0.81 (0.65, 1.02)		
20-24	0.96 (0.84, 1.10)		
30-34	1.08 (0.96, 1.22)		
35-39	1.07 (0.92, 1.25)		
40+	0.79 (0.57, 1.09)		
Aggregate Region (vs. Winnipeg)			0.0030
Brandon	**1.33 (1.12, 1.58)**	**0.0014**	
North	0.95 (0.75, 1.20)	0.6683	
Rural South	**1.13 (1.02, 1.25)**	**0.0199**	
Income Quintile (vs. Quintile 5)			0.7080
Quintile 1	1.02 (0.87, 1.19)		
Quintile 2	0.97 (0.84, 1.13)		
Quintile 3	1.07 (0.93, 1.24)		
Quintile 4	0.99 (0.86, 1.15)		
Primipara (vs. Multipara)	0.93 (0.85, 1.03)		0.1839
Marital Status (vs. Married/Partnered)			0.1569
Lone Parent	1.16 (1.00, 1.36)		
Unknown	1.18 (0.65, 2.12)		
On Income Assistance (vs. Not on Income Assistance)	**1.46 (1.25, 1.72)**	**<.0001**	<.0001
Maternal Diabetes Diagnosis (vs. No Maternal Diabetes Diagnosis)	1.10 (0.91, 1.33)		0.3219
Maternal Hypertension (vs. No Maternal Hypertension)	1.14 (0.98, 1.33)		0.0814
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	**1.34 (1.11, 1.62)**	**0.0026**	0.0026
Prenatal Psychological Distress (vs. No Prenatal Psychological Distress)	**7.99 (7.26, 8.79)**	**<.0001**	<.0001
Newborn Morbidity (vs. No Newborn Morbidity)			0.0056
Admitted to a Special Care Unit (SCU)	**1.27 (1.10, 1.48)**	**0.0015**	
Not admitted to a SCU but low birth weight/preterm	1.11 (0.87, 1.40)	0.4107	
Less Than Grade 12 Education (vs. Completed High School)	1.01 (0.88, 1.15)		0.9322
Socially Isolated (vs. Not Socially Isolated)	**1.42 (1.17, 1.72)**	**0.0004**	0.0004
Substance Abuse During Pregnancy (vs. No Substance Abuse During Pregnancy)	**1.28 (1.15, 1.42)**	**<.0001**	<.0001

Bold indicates statistically significant at p<0.05

* Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

7.5 Infant Mortality

Logistic Regression Results

- The use of multivariable logistic regression enabled us to determine the independent association of each risk factor after adjusting for other factors in the model. The reference category for each explanatory variable is indicated by the "(vs ___)" next to the variable's name.
- The regression model shown below analyzed the births occurring over five years, 2004/05–2008/09. The model was population–based and explored the relationships between a variety of demographic factors and maternal and infant characteristics that the literature has shown to be associated with infant mortality.
- In contrast to many of the other indicators presented in this report, only one regression model, using all live births over the study period (N=67,748), was run. A second model using only those births with a Families First Screen could not be run due to the small number of deaths and high proportion of missing data due to lack of Families First Screen being done, especially for neonatal deaths.
- In the regression model, maternal factors associated with infant mortality included being from the North and having antepartum hemorrhage. Infant characteristics associated with infant mortality were a stay in the Special Care Unit, low birth weight or preterm birth, and a five–minute Apgar score less than or equal to 7. Protective factors included maternal age (with each increase in age associated with a decrease in infant mortality) and breastfeeding initiation. Area–level income (income quintiles), infant sex, multiple births, and inadequate prenatal care were not significant predictors of infant mortality once all other factors were adjusted for in the model.

7.6 Reference List

Ramos E, Oraichi D, Rey E, Blais L, Berard A. Prevalence and predictors of antidepressant use in a cohort of pregnant women. *BJOG.* 2007;114(9):1055–1064.

Zhang J, Yu KF. What's the relative risk?: A method of correcting the odds ratio in cohort studies of common outcomes. *JAMA.* 1998;280(19):1690–1691.

Table 7.5.1: Logistic Regression of Infant Mortality, 2004/05-2008/09
Number of infant births = 67,748
Number of infant deaths = 310

Explanatory Variables	Adjusted Odds Ratio (95% Confidence Interval)	p-value*	Type III Analysis of Effects p-value
Maternal Age	**0.97 (0.95, 0.99)**	**0.0053**	0.0053
Aggregate Region (vs. Winnipeg)			0.0349
Brandon	0.52 (0.25, 1.07)	0.0769	
North	**1.40 (1.03, 1.91)**	**0.0345**	
Rural South	1.05 (0.80, 1.37)	0.7267	
Income Quintile (vs. Quintile 4 and 5)			0.1594
Quintile 1	0.87 (0.63, 1.19)		
Quintile 2 and 3	1.13 (0.84, 1.52)		
Male Baby (vs. Female)	1.01 (0.80, 1.26)		0.9672
Multiple Birth (vs. Singleton)	0.94 (0.63, 1.42)		0.7676
Inadequate Prenatal Care (vs. Adequate Prenatal Care)	0.80 (0.58, 1.10)		0.1683
Antepartum Hemorrhage (vs. No Antepartum Hemorrhage)	**1.68 (1.22, 2.32)**	**0.0016**	0.0016
Breastfeeding Initiation at Discharge (vs. No Breastfeeding Initiation at Discharge)	**0.13 (0.10, 0.17)**	**<.0001**	<.0001
Newborn Morbidity (vs. No Newborn Morbidity)			
Newborn Admitted to SCU	**12.51 (9.23, 16.97)**	**<.0001**	<.0001
Not Admitted to SCU but Low Birth Weight/Preterm	**20.87 (15.15, 28.75)**	**<.0001**	
Not Admitted to SCU and not Low Birth Weight/Preterm but Apgar of Less Than or Equal to 7	**8.79 (4.72, 16.35)**	**<.0001**	

Bold indicates statistically significant at p<0.05

* Individual parameter estimates are only provided when the type III analysis of effects is significant

Source: Manitoba Centre for Health Policy, 2012

Glossary

Aboriginal and Northern Affairs Development Canada (AANDC)

"A federal government department that is responsible for meeting the obligations and commitments of the Government of Canada to First Nations, Inuit and Métis, and for fulfilling the constitutional responsibilities of the federal government in the North. Programs [coordinated by Aboriginal and Northern Affairs Development Canada] are delivered through partnerships with aboriginal communities and federal–provincial or federal–territorial agreements. [This department] often works with Aboriginal people, Métis and Non–Status Indians" (Aboriginal Affairs and Northern Development Canada, 2010). AANDC was previously referred to as Indian and Northern Affairs Canada.

Abortion

"Loss of pregnancy before the fetus is viable outside the uterus; miscarriage."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Abruptio Placenta

"Partial or total premature separation of a normally implanted **placenta**."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Adequate Prenatal Care – see **Revised–Graduated Prenatal Care Utilization Index (R–GINDEX)**

Administrative Data

Information collected "usually by government, for some administrative purpose (e.g., keeping track of the population eligible for certain benefits, paying doctors or hospitals), but not primarily for research or surveillance purposes" (Spasoff, 1999). **MCHP**'s research uses administrative data from hospital abstracts, physician billing claims, claims for prescription drugs, and other health related data. Using these data, researchers can study the utilization of health resources over time and the variations in rates within and across the provinces.
Spasoff, RA. *Epidemiologic Methods for Health Policy*. New York, NY: Oxford University Press; 1999.

Administrative Databases – see **Administrative Data**

Administrative Health Data – see **Administrative Data**

Age–Adjusted

Adjusted for age to allow populations with different age profiles to be compared (see **Rate Adjustment**).

Antenatal Hospitalization

An admission to hospital for physical or psychological conditions resulting from, or aggravated by, pregnancy which does not lead to delivery. It is an indicator of maternal **morbidity**.

Antepartum

"Time between conception and the onset of labor; usually used to describe the period during which a woman is pregnant."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Antepartum Hemorrhage

A significant amount of bleeding from the uterus occurring prior to childbirth.
Magann, E.F., Cummings, J., Niederhauser, A., Rodriguez–Thomspon, D., McCormack, R., Chauhan, S.P. Antepartum Bleeding of Unknown Origin in the Second Half of Pregnancy: A Review. Obstetrical & Gynecological Survey, 60(11), 741–745, 2005.

Antidepressant

A type of medication used to help people who have **depression**, **anxiety disorders**, and other health problems.

Anxiety Disorders

Mental health disorders that include excessive feelings of apprehension or fear that persist to the point that they interfere with daily life for an extended period of time.

Apgar Score

A measure of the physiological well–being of newborn babies; they are recorded for virtually all births in hospital. A score of 0, 1, or 2 is given for each of five vital signs (appearance, pulse, reflex, muscle tone, and breathing pattern) that are assessed at one and five minutes after birth. These five scores are added up to give a total score between 0 and 10 with higher scores representing optimal extrauterine adjustment.

Appropriate–for–Gestational–Age (AGA)

A birth was considered to be appropriate for **gestational age** if the birth weight was between the 10th and 90th percentiles for the infant's gestational age and sex.

Assisted Reproductive Technology (ART)

"Term used to describe the highly technologic approaches used to product pregnancy."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Assisted Vaginal Birth

Vaginal births that were assisted by the means of **forceps** or **vacuum extraction**.

Average Household Income

The average household income is the mean income of households at the neighbourhood level from the Canadian **Census**. In the census, a household refers to all persons who live within the same dwelling, regardless of their relationship to each other. Household income is the sum of the incomes of all persons in the household. Individual level household income values are not available, so residents are assigned the average household income of the neighbourhood in which they reside. Values were assigned at the dissemination area (DA) where available. **Statistics Canada** suppresses average household income values for DAs with populations less than 250 persons. In these cases, the average household income value at the Census Subdivision (CSD) level was imputed. A further imputation was required for some First Nations communities: northern and southern First Nations communities (north or south of the 60th parallel, respectively) with **suppressed** average household income at both the DA and CSD level were assigned the weighted mean value of average household income of the northern or southern First Nations communities with non–missing average household income.

BabyFirst Screening Form – see **Families First Screening Form**

Boarder Babies

Newborn babies who are readmitted to hospital not because they are ill themselves, but because their mother is hospitalized and an effort is being made to keep the mother and newborn together.

Bonferroni Adjustment– see **Bonferroni Method**

Bonferroni Method

A statistical method that adjusts the significance level when multiple comparisons are made

Breastfeeding Initiation

Breastfeeding initiation starts when a mother begins to feed her infant milk from her breast. In this report, breastfeeding initiation was identified as any newborn (live birth) hospitalization that indicates partial or exclusive breastfeeding initiation on the hospital discharge abstract.

Breech Birth

The birth of a baby from a breech presentation. See also **Breech Presentation**.

Breech Presentation

"A birth in which the buttocks and/or feet are presented instead of the head."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Calendar Year

A year that runs from January 1 to December 31 inclusive, in the same year.

Canadian Classification of Health Interventions (CCI)

A classification system for coding healthcare procedures in Canada, used in companion with the International Classification of Diseases, Version 10 with Canadian Enhancements (ICD–10–CA).

Canadian Institute of Health Information (CIHI)

An independent, not–for–profit organization that provides essential data and analysis on Canada's health system and the health of Canadians.
CIHI website: http://secure.cihi.ca/cihiweb/splash.html.

Census

Official count of a population, often including demographic information such as age, sex, employment, and income. **Statistics Canada** conducts a Census every five years. It takes account of all persons living in Canada, including any individuals residing in Canada on a temporary basis. The Census also includes Canadians abroad on military missions or on merchant vessels that are registered in Canada.
Statistics Canada. 2006 Census. http://www12.statcan.gc.ca/census–recensement/2006/index–eng.cfm. Accessed February 22, 2011.

Cephalic Presentation

"Birth in which the fetal head is presenting against the cervix."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Cephalopelvic Disproportion (CPD)

"A condition in which the fetal head is of such a shape or size, or in such a position, that it cannot pass through the maternal pelvis."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Cervical Incompetence – see **Incompetent Cervix**

Cesarean Birth

"Birth of fetus accomplished by performing a surgical incision through the maternal abdomen and uterus."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Chi–Square Test

A test used to measure how well a statistical model fits the data.

Cochran–Armitage Trend Test –– A statistical method of directing chi–squared tests toward a narrower alternative. The test is sensitive to the linearity between a response variable and an explanatory variable and detects trends that would not be noticed by cruder methods.

Community Areas – see **Winnipeg Community Areas**

Confidence Intervals (CI)
The computed interval with a given probability that the true value of a variable (e.g., a mean or rate) is contained within the interval. For example, a 95% CI would have a 95% probability of containing the true population value.

Confidence Limits (CL)
The lower and upper boundaries of a confidence interval or the values that define the range of a confidence interval.

Congenital Anomaly
An abnormality of structure, function, or body metabolism that is present at birth (even if not diagnosed until later in life) and results in physical or mental disability or is fatal (March of Dimes Foundation, 1998.)

Controlled Ovarian Hyperstimulation
Use of medications to stimulate the ovaries to release multiple eggs.

Covariate
A secondary variable that can have an effect on the dependent variable.

Crude Rate
The number of people with a given condition or procedure divided by the number of people living in that area. Crude rates are helpful in figuring out the burden of disease and/or number of residents with that condition or procedure. This is in contrast to adjusted rates, which statistically adjust the crude rates, to arrive at an estimate of what an area's rate might have been if the local population's age and sex distribution was the same as that for the entire province. See also **Adjusted Rate**.

Data Suppression
Data are suppressed when the number of persons or events involved is five or less in order to avoid potential identification of individuals in an area. Data are not suppressed when the actual event count is zero. This process of suppressing data is conducted to protect the anonymity of study participants.

De–Identified Data – see **De–Identified Individual Level Information**

De–Identified Individual Level Information
"De–identified Individual Level Information means information about an individual that has been modified or from which identifying or potentially identifying information has been removed in a way that minimizes the likelihood that an individual's identity can be determined by any reasonably foreseeable method. Methods of de–identifying information can include scrambling or encrypting identifying or potentially identifying information." (from section 1.01 (d) within *An Agreement Respecting Access to Manitoba Health Information at the Manitoba Centre for Health Policy (University of Manitoba)*

for Research Being Conducted by University Researchers Within The Secure Data Environment of MCHP. http://umanitoba.ca/admin/vp_admin/ofp/legal/media/MCHP_UofM_Researchers_2010.doc. Accessed December 8, 2010)

Depression

A mood disorder characterized by feelings of sadness, anger, frustration, and a lack of interest in activities that persist to the point that they interfere with daily life for an extended period of time.

Diabetes

A chronic condition in which the pancreas no longer produces enough insulin (Type 1 Diabetes) or when cells stop responding to the insulin that is produced (Type 2 Diabetes), so that glucose in the blood cannot be absorbed into the cells of the body. The most common endocrine disorder, Diabetes Mellitus, affects many organs and body functions, especially those involved in metabolism, and can cause serious health complications including renal failure, heart disease, stroke, and blindness. Symptoms include frequent urination, fatigue, excessive thirst, and hunger. Also called insulin–dependent diabetes, Type I diabetes begins most commonly in childhood or adolescence and is controlled by regular insulin injections. The more common form of diabetes, Type 2, can usually be controlled with diet and oral medication. Another form of diabetes called **gestational diabetes** can develop during pregnancy and generally resolves after the baby is delivered.

Disproportion – see **Cephalopelvic Disproportion (CPD)**

Dissemination Area

A small, relatively stable geographic unit composed of one or more blocks. It is the smallest standard geographic area for which all **Census** data are disseminated. Dissemination areas cover all the territory of Canada.

Drug Programs Information Network (DPIN)

An electronic, on–line, point–of–sale drug database. It links all community pharmacies (but not pharmacies in hospitals or nursing homes/personal care homes) and captures information about all Manitoba residents, including most prescriptions dispensed to status First Nations. DPIN contains information such as unique patient identification, age, birthdate, sex, medication history, over–the–counter (OTC) medication history, patient postal code, new drugs prescribed, date dispensed, and unique pharmacy identification number. DPIN is maintained by the Government of Manitoba's Ministry of Health.

Early Preterm Birth

A birth where the **gestational age** of the infant is less than 34 weeks. A further categorization of **preterm birth**.

Early Term Birth

A birth where the **gestational age** of the infant between 37 to 38 weeks.

Eclampsia

"A major complication of pregnancy. Its cause is unknown; it occurs more often in the **primigravida** and is accompanied by elevated blood pressure, albuminurla, oliguria, tonic and clonic convulsions and coma. It may occur during pregnancy (usually after the 20th week of **gestation**) or within 48 hours of childbirth."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Ectopic Pregnancy

"Implantation of the fertilized ovum outside the uterine cavity; common sites are the abdomen, fallopian tubes, and ovaries. Also called oocyesis."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Epidural Anesthesia

Injection of a local anesthetic into the peridural space of the spinal cord beneath the ligamentum flavum. Often given during labour to provide pain relief.
Modified from http://www.merriam–webster.com/medical/epidural%20anesthesia.

Episode of Care

The continuous time in a hospital irrespective of direct transfers between hospitals.

Families First Screen – see **Families First Screening Form**

Families First Screening Form

A brief measure of biological, social, and demographic **risk factors**. **Public Health Nurses** in Manitoba attempt to assess all families with newborns within a week of discharge from the hospital. Three or more risk factors indicate that a family may require additional supports such as intensive home visiting, financial support, parenting programs, mental health services, or child care. The Families First (previously known as BabyFirst) screening form is the first of two screening stages for Manitoba's Families First program.

Fetal Alcohol Spectrum Disorder (FASD)

A term that describes a wide range of effects that can occur in an individual who was exposed to alcohol during pregnancy (Chudley et al. 2005). Some of these effects last a lifetime and may include physical, mental, behavioural, and cognitive disabilities.
Chudley A, Conry J, Cook J, et al. Fetal Alcohol Spectrum Disorder: Canadian Guidelines for Diagnosis. *Canadian Medical Association Journal.* 2005;172(Suppl 5):S1–S21.

Fetal Distress

"Evidence that the fetus is in jeopardy, such as a change in fetal activity or heart rate"
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Fetal Malpresentation

Presenting of the fetus to the lower pole of the uterus during childbirth in a position other than cephalic (head end of the body). Malpresentations strictly include breech and shoulder presentation (transverse lie), but can also incorporate face and brow presentations
Simm A. Fetal malpresentation. *Obstetrics, Gynaecology & Reproductive Medicine*. 2007;17(10):283–288.

First Nations Community

A legal list of First Nations communities maintained by **Aboriginal and Northern Affairs Development Canada** (AANADC), which includes the following **census** sub–division types: Indian Government Districts, Reserves, Indian Settlements, Terre Reservées, Nisga'a Lands, Nisga'a Villages, and Teslin Lands. By definition, the complete list of First Nations communities includes:
a) Land reserved under the Indian Act
b) Land set aside for the use and benefit of Indian people
c) Areas where activities on the land are paid or administered by INAC or
d) Areas listed in the Indian Lands Registry System held by Lands and Trust Services at the Indian and Northern Affairs Canada.

This broader definition of a First Nation community includes a selection of the following census sub–division types: Chartered Community, Hamlet, Northern Hamlet, Northern Village, Settlement, Town, and Village.

Fiscal Year

For most Canadian government agencies and healthcare institutions, the fiscal year is defined as starting April 1 and ending the following year at March 31. For example, the 2005/06 fiscal year would be April 1, 2005 to March 31, 2006, inclusive.

Forceps

"Obstetric instrument occasionally used to aid in childbirth."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

General Practitioner/Family Physician

A physician who operates a general or family practice and is not certified in another specialty in Manitoba.

Gestation

"Period of intrauterine development from conception through birth; pregnancy." Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Gestational Age

Approximated age of a newborn infant calculated from the first day of the woman's last menstrual period to birth. It is often reported in weeks of **gestation**.

Gestational Diabetes

"A form of **diabetes** of variable severity with onset or first recognition during pregnancy."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Gravida

"Any pregnancy, regardless of duration, including present pregnancy. The terms gravida and para refer to pregnancies, not to the fetus. Thus twins, triplets and other multiple fetuses count as one pregnancy and one birth."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Health Status

An indication of the risk of death of patients based on the type and number of comorbid conditions or on a number of socioeconomic indicators.

Healthy Baby Community Support Program

A set of programs available to all women from the prenatal period through to an infant's first birthday. Led by the Province of Manitoba, community support programs offer social support and informal learning opportunities to encourage early, regular **prenatal care** and promote healthy infant development. These programs aim to build women's confidence and awareness of health and parenting choices, foster awareness of babies' nurturing needs, offer and encourage healthy eating through cooking and nutrition activities.

Healthy Baby Prenatal Benefit Program

A program run by the Province of Manitoba that offers income supplement for pregnant women who live in Manitoba and have a net family income of less than $32,000. Benefits start in the second **trimester** of pregnancy and end in the month the baby is due. A sliding scale, based on income, is used to calculate the monthly benefits. It ranges from $10.00 to $81.41 per month.

Healthy Child Manitoba Office (HCMO)

The Government of Manitoba's long–term, cross–departmental prevention strategy for children and families. Led by the Healthy Child Committee of Cabinet, Healthy Child Manitoba bridges departments and governments and, together with the community, works to improve the well–being of Manitoba's children and youth. HCMO focuses on child–centred public policy through the integration of financial and community–based family supports. HCMO researches best practices and models and adapts these to Manitoba's unique situation. It works to strengthen provincial policies and programs for healthy child and adolescent development from the prenatal period to adulthood. HCMO evaluates programs and services in an attempt to find the most effective ways to achieve the best possible outcomes for Manitoba children, families, and communities.

Hospital Abstract

A form/computerized record filled out upon a patient's discharge (separation) from an acute care hospital. The abstract contains information from the patient's medical record based on their stay in hospital, such as gender, residence (postal code), diagnoses and procedure codes, admission and discharge dates, **length of stay**, and service type (**inpatient/**day surgery/ **outpatient**). Abstract records are stored in the Hospital Abstracts Database.

Hospital Discharge Abstract – see **Hospital Abstract**

Hospital Separation – see **Separations**

Hypertension

Primary hypertension is often referred to as high blood pressure. The "tension" in hypertension describes the vascular tone of the smooth muscles in the artery and arteriole walls. Hypertension is a major health problem, especially because it often has no symptoms. If left untreated, hypertension can lead to heart attack, stroke, enlarged heart, or kidney damage.

ICD–10–CA

Acronym for International Classification of Diseases, 10th Revision with Canadian Enhancements, which is based on the 10th version of the ICD (International Classification of Disease) coding system. It is developed by the World Health Organization and is used to classify diseases and related health problems (**morbidity**), but includes enhancements developed by Canadian Institute for Health Information (CIHI) for use in Canadian hospitals and other medical facilities. The **Canadian Classification of Health Interventions (CCI)** is the companion classification system to ICD–10–CA for coding procedures in Canada. ICD–10–CA and CCI are being used on Manitoba **hospital abstracts** beginning April 1, 2004.

ICD–9–CM

Acronym for International Classification of Diseases, 9th Revision with Clinical Modifications, which is the 9th version of the ICD (International Classification of Disease) coding system (with Clinical Modifications). It is developed by the World Health Organization and is used to classify diseases, health conditions, and procedures. This version was used extensively in Canadian hospitals. As of April 1, 2004, Manitoba hospitals replaced ICD–9–CM with ICD–10–CA for coding diagnoses and the Canadian Classification of Health Interventions for coding procedures.

Illicit Drug Use

The use of substances that are considered illegal and punishable within the criminal code. In this study illicit drug use was derived from the **Families First Screen** and is self–reported by the mother as being any illicit drug used during her pregnancy.

In Vitro Fertilization (IVF)

"Procedure during which oocytes are removed from the ovary, mixed with spermatozoa, fertilized and incubated in a glass petri dish; then up to four viable embryos are placed in the woman's uterus."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Inadequate Prenatal Care – see **Revised–Graduated Prenatal Care Utilization Index (R–GINDEX)**

Income Assistance

A provincial program of last resort for people who need help to meet basic personal and family needs. Wherever possible, the program is aimed at helping people find a job or get back to work. Eligibility for income assistance is determined by a test of need. The total financial resources of the household are compared to the total cost of basic necessities as defined in the Employment and Income Assistance Act and Regulation. Applicants must be in financial need for the monthly cost of basic needs such as food, clothing, personal needs and household supplies; some medical costs; housing (rent) and utilities; and some special costs for adults with disabilities. In this report, a mother is identified as having been on income assistance if she received income assistance any time during the period of 7 months prior to the month of the baby's delivery to one month after the baby's delivery.

Income Quintile

A method to measure the average (mean) household income of residents, ranking them from poorest to wealthiest and then grouping them into five income quintiles (one being poorest and five being wealthiest). Each quintile contains approximately 20% of the population. The income quintile measure is derived from **Statistics Canada Census** data by aggregating household income to the dissemination area and then ranking neighbourhoods by income quintile. Income quintiles are available for both urban and rural populations.

Incompetent Cervix

"The premature dilation of the cervix, usually in the second **trimester** of pregnancy."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Induction of Labour

The act of stimulating labour contractions to begin the birthing process through either physical or medical means. Physical methods of induction include the artificial rupture of the membranes to break the water. Medical methods include the intravenous administration of the chemical oxytocin to initiate labour. Note that induction of labour is akin to the term augmentation of labour in method, but induction is only carried out before the onset of labour.

Infant Mortality Rate

The number of deaths of infants aged 0 to 364 days per 1,000 live births in a given time and place.

Infertility Treatment

Medical treatment for women who have difficulty becoming pregnant. Infertility medications are used for **ovulation induction** or **controlled ovarian hyperstimulation**, while assisted reproductive technologies (ART) such as ***in vitro* fertilization (IVF)** are more complex and invasive in that they involve techniques to manipulate and fertilize the egg outside the body (Hrometz & Gates, 2009).
Hrometz SL, Gates VA. Review of available infertility treatments. *Drugs of Today.* 2009;45(4):275-291.

Inpatient

Hospital stays in which patients are admitted to a hospital for at least one day.

Intensive Care Unit (ICU)

A hospital unit which specifically provides medical care to seriously ill patients.

Intensive Prenatal Care – see **Revised–Graduated Prenatal Care Utilization Index (R–GINDEX)**

International Classification of Diseases (ICD)

A classification system of diseases, health conditions, and procedures developed by the World Health Organization (WHO), which represents the international standard for the labeling and numeric coding of diseases and health related problems. Within this system, all diseases/conditions are assigned numbers in hierarchical order. There are several versions of the ICD coding system, including ICD–8, ICD–9, **ICD–9–CM** (Clinical Modifications), ICD–O (Oncology), ICD–10, and **ICD–10–CA** (Canadian Enhancements).

Interpregnancy Interval (IPI)

Also known as birth spacing. The time between the last delivery and conception of the current pregnancy. In this report, a short IPI was considered to be less than 12 months between pregnancies.

Intrapartum

"The time from the onset of true labor until the birth of the infant and expulsion of the **placenta**."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Intrauterine Growth Restriction (IUGR)

"The occurrence of poor fetal growth which may happen through a number of mechanisms" (Public Health Agency of Canada, 2008). IUGR is different than Small–for–Gestational–Age as Small–for–Gestational–Age refers to size after a baby is born.
Public Health Agency of Canada. Canadian Perinatal Health Report, 2008 Edition. PHAC. 2008. http://www.phac–aspc.gc.ca/publicat/2008/cphr–rspc/pdf/cphr–rspc08–eng.pdf. Accessed August 8, 2011.

Jaundice

"Yellow pigmentation of body tissues caused by the presence of bile pigments."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Large–for–Gestational–Age (LGA)

Infants that are above the 90th percentile in birth weight from an infant population of the same sex and **gestational age**.

Late Initiation of Prenatal Care

Prenatal care that begins after the first **trimester** of pregnancy.

Late Preterm Birth

Birth where the **gestational age** of the infant is between 34 and 36 weeks. A further categorization of **preterm birth**.

Length of Stay (LOS)

The duration of care counted from admission to separation (discharge) for residents within a healthcare facility. In this report, it was calculated for the entire **episode of care**.

Logistic Regression

The regression technique used when the outcome is a binary, or dichotomous, variable. Logistic regression models the probability of an event as a function of other factors. Note that these models are only able to state that there is a relationship (association) between the explanatory and the outcome variables. This is not necessarily a causal relationship, since it is based on observational data for the most recent time period. The explanatory variable may be associated with an increase or decrease (not that it caused the increase or decrease).

Lone Parent

A family in which there is only one parent. Also known as single parent. In this report, it is derived from the **Families First Screen** and refers to a mother who identifies herself as the sole primary care giver for the child (includes unmarried, separated, widowed, divorced, common–law relationship of less than one year).

Macrosomia

"A condition seen in newborns of large body size and high birth weight (more than 4000 to 4500 grams as those born of prediabetic and diabetic mothers."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Malpresentation – see **Fetal Malpresentation**

Manitoba Centre for Health Policy (MCHP)

A unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. MCHP is active in health services research, evaluation, and policy analysis, concentrating on using the Manitoba **Population Health Research Data Repository (Repository)** to describe and explain patterns of care and profiles of health and illness.

Manitoba Health

A provincial government department responsible for providing healthcare services in Manitoba.

Manitoba Health Insurance Registry

Also known as the Master Registry and the **Manitoba Health Services Insurance Plan** (MHSIP) Registration File. It is a longitudinal population–based registry of all individuals who have been registered with **Manitoba Health** at some point since 1970. It includes date fields for registration, birth, entry into province, migration in/out of province, and death. It provides the needed follow–up information to track residents for longitudinal and intergenerational analyses. Primary identification is achieved by two numbers: every family in Manitoba is assigned a family registration number and every individual is assigned a unique **Personal Health Identification Number (PHIN)** by the Ministry of Health.

Manitoba Health Services Insurance Plan

The health insurance plan provided by **Manitoba Health**. It is financed from general revenues of the Province of Manitoba and with funds provided by the Government of Canada.

Marital Status

Relationship status of an individual. In this report marital status can be classified into three groups: married/partnered, lone parent, and unknown.

Maternal Diabetes

A composite variable created for this report that includes a diagnosis of Type 1 or Type 2 diabetes or **gestational diabetes** See Appendix Table A.4 for technical definition.

Maternal Hypertension

A composite variable created for this report that includes primary **hypertension** as well as hypertensive disorders in pregnancy occurring in the one year prior to birth. See Appendix Table A.4.

Midwife – see **Midwifery**

Midwifery

"Midwife means 'with woman.' Midwives in Manitoba are trained specialists who care for women throughout pregnancy and birth, and for mothers and babies in the first weeks after birth." (from the Manitoba Health Primary Health Care Collaborative Practice.
Midwifery Services web site. http://www.gov.mb.ca/health/phc/init/cp/midwifery.html. Accessed January 12, 2011.

Midwifery Discharge Summary Report Database

A database of administrative health data from the Midwifery Program in Manitoba for all Manitoba women receiving prenatal, **intrapartum**, and/or **postpartum** care from a **midwife**. Information on demographics, maternal outcomes, birth outcomes, consultations, transfer of care, and transport are provided from discharge summary forms completed by the primary midwife for each client upon discharge from care and submitted to **Manitoba Health**.

Miscarriage – see **Spontaneous Abortion**

Morbidity

Any departure, subjective or objective, from a state of physiological or psychological well–being (i.e., sickness or illness).

Multigravida

"A woman who is in her second or any subsequent pregnancy." Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Multipara

"A woman who has had two or more births at more than 20 weeks' **gestation**."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Multiparous – see **Multipara**

Multivariable Analysis

A statistical analysis that uses more than one independent (explanatory) variable. The effect of each independent variable on a single study outcome is provided uniquely from the influence of all other independent variables.
Katz MH. *Multivariable analysis: a practical guide for clinical and public health researchers*. 3rd ed. Cambridge, UK: Cambridge University Press, 2011.

Multivariable Logistic Regression

Also referred to as multivariate logistic regression, or a **logistic regression** based on multivariable analysis.

Neonatal Hospital Readmission

A hospital readmission of a newborn that occurs more than one day after the discharge from the birth hospital stay and within 28 days of birth.

Neonatal Morbidity

"The risk of death during the newborn period – the first 28 days of life."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Neonatal Mortality Rate

The number of deaths of babies aged 0 to 27 days old per 1,000 live births in a given time and place.

North

An aggregate geography which includes all of the **Regional Health Authorities (RHAs)** in northern Manitoba: Burntwood, NOR–MAN, and Churchill.

Nullipara

"A woman who has not given birth at more than 20 week's **gestation**."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Obstetrician/Gynecologist

A medical specialist that deals with the female reproductive system and pregnancy.

Odds Ratio

The ratio of the odds of an event occurring in one group to the odds of it occurring in another group or to a data–based estimate of that ratio. These groups might be men and women, an experimental group and a control group, or any other dichotomous classification.

Oligohydramnios Diagnosis

A pregnancy condition characterized by a low level of amniotic fluid.
CVS Pharmacy Health Information Center. http://health.cvs.com/GetContent.aspx?token=f75979d3-9c7c-4b16-af56-3e122a3f19e3&chunkiid=101285. Accessed August 8, 2011.

Outpatient

A patient who receives treatment or surgery from a hospital, but who is not admitted as an **inpatient**.

Ovulation

"Normal process of discharging a mature ovum from an ovary approximately 14 days prior to the onset of menses."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Ovulation Induction

Ovulation induction is the stimulation of **ovulation** by medication.

Para

"Birth after 20 weeks' **gestation**, regardless of whether the infant is born alive or dead." The terms **gravida** and para refer to pregnancies, not to the fetus. Thus twins, triplets and other multiple fetuses count as one pregnancy and one birth."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Parity

The number of times a woman has given birth after 20 weeks' **gestation**. A multiple birth is counted as one birth and **stillbirth**s are included.

Personal Health Identification Number (PHIN)

A unique numeric identifier assigned by **Manitoba Health** to every person registered for health insurance in Manitoba and to non–residents who are treated at facilities that submit claims electronically. Introduced as a linkage key in 1984, it was issued to the public in 1994 as the basic access identifier for the Pharmacare/Drug Programs Information Network (DPIN). At **MCHP,** PHIN is either a scrambled version of the **Manitoba Health** PHIN or an alphanumeric identifier assigned via the Research Registry to individuals who do not have scrambled numeric PHINs.

Physician Claims

The claims (billings) for payment that are submitted to the provincial government by individual physicians for services they provide. Fee–for–service physicians receive payment based on these claims, while those submitted by physicians on alternate payment plans (APP) are for administrative purposes only. The physician claims are collected and stored in the Medical Services Database, which is part of the **Population Health Research Data Repository**.

Placenta

"Specialized disk–shaped organ that connects the fetus to the uterine wall for gas and nutrient exchange. Also called afterbirth."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Placenta Previa

A condition of pregnancy where a "**placenta** implanted in the lower segment of the uterus, presenting ahead of the leading pole of the fetus".
Society of Obstetricians and Gynaecologists of Canada. Diagnosis and Management of Placenta Previa. http://www.sogc.org/guidelines/documents/189E-CPG-March2007.pdf. Accessed August 8, 2011.

Population Health

Measuring and reporting the **health status** of the population.

Population Health Research Data Repository (Repository)

A comprehensive collection of administrative, registry, survey, and other databases primarily comprised of residents of Manitoba. This repository is housed at the **Manitoba Centre for Health Policy (MCHP)**. It was developed to describe and explain patterns of healthcare and profiles of health and illness, facilitating inter–sectoral research in areas such as healthcare, education, and social services. The administrative health database, for example, holds records for virtually all contacts with the provincial healthcare system, the **Manitoba Health Services Insurance Plan** (including physicians, hospitals, personal care homes, home care, and pharmaceutical prescriptions) of all registered individuals. MCHP acts as a trustee or steward of the information in the Repository for agencies such as **Manitoba Health**.

Postneonatal Mortality Rate

The number of deaths of babies aged 28–364 days old per 1,000 live births in a given time and place.

Postpartum

The period of time after childbirth and/or delivery.

Postpartum Hospital Readmission

Maternal re–hospitalization during the **postpartum** period. Includes hospital admissions which occur in a defined period following childbirth (in this report, 90 days) and may involve either complications related to pregnancy and/or delivery or unrelated medical conditions.

Postpartum Psychological Distress

Any form of psychological distress (e.g., anxiety and/or **depression**) occurring between birth and one–year **postpartum**.

Postterm Birth

A birth where the **gestational age** of the infant is 42 or more weeks.

Preeclampsia

"Toxemia of pregnancy, characterized by hypertension, albuminuria, and edoma." See also **Eclampsia**. Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Premature Mortality Rate (PMR)

The rate of deaths of residents aged 0 to 74 years. It is generally reported per 1,000 residents aged 0 to 74 years. The values are generally standardized to account for age/sex differences in populations. The rate is usually expressed as a number per 1,000, in order to provide an indicator that is comparable among different areas or regions. PMRs are often used as an overall indicator of population health and are correlated with other commonly used measures. The PMR is an important indicator of the general health of a population; high PMR indicates poor **health status**.

Premature Rupture of Membranes (PROM)

When the amniotic sac breaks or leaks before labour begins. Preterm PROM is when this occurs before 37 weeks of **gestation**.

Society of Obstetricians and Gynaecologists of Canada. Women's Health Information, Pregnancy, Preterm Labour. http://www.sogc.org/health/pregnancy–preterm_e.asp. Accessed August 8, 2011.

Prenatal Care (PNC)

A series of regular contacts between a healthcare provider, typically a physician and a pregnant woman, which take place at scheduled intervals between the confirmation of pregnancy and the initiation of labour. The primary function of this care is to monitor the progress of pregnancy to identify complications, to provide information to the women on beneficial practices, and to co–ordinate the involvement of other providers in the mother's labour and the delivery of the newborn.

Prenatal Psychological Distress

Any form of diagnosed psychological distress (e.g., anxiety and/or **depression**) occurring during the eight months prior to giving birth.

Preterm Birth

A birth where the **gestational age** of the infant is less than 37 weeks. **Preterm birth**s are frequently categorized as early preterm and late preterm.

Primigravida

"A woman who is pregnant for the first time"

Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Primipara

"A woman who has had one birth at more than 20 weeks' **gestation**, regardless of whether the infant is born alive or dead."

Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Primiparous – see **Primipara**

Public Health Agency of Canada (PHAC)

The Government of Canada agency responsible for public health, whose primary goal is to strengthen Canada's capacity to protect and improve the health of Canadians and to help reduce pressures on the health–care system.

Public Health Nurses

Nurses with expertise in areas such as communicable diseases, maternal–child, and school health. Public Health Nurses deliver services within communities using a community–based model whereby services are driven by the needs and resources of a defined community.

Rate Adjustment

These rates mathematically remove the effects of different population structures that influence overall rates. Also called Rate Standardization or Standardized Rates. Adjusted rates are estimates of what an area's rate might have been if that area's age and sex distribution was the same as that for the province overall. This adjustment is done to ensure that rates for different areas can be fairly compared—knowing that the demographic profile of the two areas is not affecting the comparison. Adjusted rates allow comparisons of rates across areas by removing the effects of demographic differences. In this report, rates were not adjusted and are presented as **crude rates**.

Reference Group

In statistics, this group is used for comparisons with other groups that are subjected to a treatment or are influenced by a factor. A reference group should have a large sample size and small standard error. Meyers LS, Gamst G, Guarino AJ. *Applied multivariate research: design and interpretation*. Thousand Oaks, CA: Sage Publications Inc., 2006.

Regional Health Authority (RHA)

Regional governance structure set up by the province to be responsible for the delivery and administration of health services in specified areas. Prior to April 2012, there were 11 RHAs: Winnipeg, Brandon, South Eastman, Assiniboine, Central, Parkland, North Eastman, Interlake, Burntwood, NOR–MAN, and Churchill. As of this date, these RHAs were combined to form five RHAs: Western, Winnipeg, Southern, Interlake–Eastern, and Northern.

Relative Risk (RR)

The ratio of two risk estimates.

Repository – see **Population Health Research Data Repository (Repository)**

Revised Graduated Prenatal Care Utilization Index (R–GINDEX)

A measure of the adequacy of **prenatal care** by a health provider. Knowledge of three birth–related outcomes are required to calculate R–GINDEX: a) the **gestational age** of the infant, b) the **trimester** during which prenatal care began, and c) the total number of prenatal visits during pregnancy.
The index yields six major categories of prenatal care:

1. **Inadequate prenatal care** utilization
2. Intermediate prenatal care utilization
3. **Adequate prenatal care** utilization
4. **Intensive care**
5. No care
6. Missing information on prenatal care

Risk Factors

A range of health–related behaviours and social and environmental conditions that can have a negative impact on the health of an individual by increasing the risk of ill health. Data about risk factors can assist in explaining trends in the **health status** of a population and can provide insight into why some people or groups have better or worse health than others.

Rural South

An aggregate geography which includes all of the **Regional Health Authorities (RHAs)** in the south and the middle of the province of Manitoba except the two urban centres of Winnipeg and Brandon. The RHAs included are: South Eastman, Central, and Assiniboine.

Separations

A separation from a healthcare facility occurs anytime a patient (or resident) leaves because of death, discharge, sign–out against medical advice, or transfer. The number of separations is the most commonly used measure of the utilization of hospital services. Separations, rather than admissions, are used because **hospital abstracts** for **inpatient** care are based on information gathered at the time of discharge. In some cases, both inpatient and surgical **outpatient** records are included. In addition, hospital separations may not include newborn separations, since this would essentially result in a double counting (the mother and the baby being discharged). The terms "separation", "discharge", "hospital discharge", "hospital separation", and "stay" are used interchangeably.

Service Codes

A numeric field identifying the hospital service to which the patient was admitted. For example, neonatal intensive care is coded as 54.90. Codes must correspond to the Patient Service codes in Appendix E of the Hospital Abstract User Manual (HAUM).

Size for Gestational Age

Size for **gestational age** is a measure of fetal growth. **Small–for–gestational–age (SGA)** is considered an indicator of fetal growth restriction and a marker for increased fetal and infant mortality and **morbidity** risk. **Large–for–gestational–age (LGA)** is considered an indicator of accelerated fetal growth and a marker for increased risk of birth complications and infant morbidity.

Small–for–Gestational Age (SGA)

Infants that are below the 10th percentile in birth weight from an infant population of the same sex and **gestational age**.

Social Assistance Management Information Network (SAMIN) Data Set

The SAMIN Research Data set combines variables from the various tables in the SAMIN database into a single SAS data set. The data set contains one record per person (client) for each month that they are present in the SAMIN database by fiscal year. Some variables are recorded on a person basis (client) and others on a family basis (case). This data set includes information on income/employment assistance recipients in Manitoba.

Social Isolation

Inadequate social support. In this report, it describes women who lack social support and/or are experiencing seclusion in terms of culture, language, or geography as assessed by the public health nurse on the **Families First Screening Form**.

Socioeconomic Status (SES)

Characteristics of economic, social, and physical environments in which individuals live and work, as well as, their demographic and genetic characteristics. As done in this study, it is often ranked from 1 (poor) to 5 (wealthy), based on **income quintiles** that measure mean household income, and grouped into five income quintiles, each quintile assigned to 20% of the population.

Special Care Unit (SCU)

Inpatient units specifically designed, staffed and equipped for the continuous observation and treatment of critically ill patients, including all types of **intensive care units**, as well as intermediate care or step–down units.

Spontaneous Abortion

"**Abortion** that occurs naturally. Also called miscarriage."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Spontaneous Vaginal Birth

A vaginal birth that is not assisted by **forceps** or **vacuum extraction**.

Statistical Analysis Software (SAS®)

A statistical software package for analyzing data.

Statistics Canada

The federal government agency commissioned with producing statistics to help better understand Canada's population, resources, economy, society, and culture. See their website: http://www.statcan.gc.ca.

Stillbirth/Stillborn

Death of a baby before delivery. Also referred to as a fetal death.

Substance Abuse

The excess use of and reliance on a drug, alcohol, or other chemical that leads to severe negative effects on the individual's health and well–being or to the welfare of others.

Suppressed – see **Data Suppression**

Tariff Code

A specific code used to identify each service provided by a physician or a nurse practitioner as defined in the Tariff Manual.

Term Birth

Birth where the **gestational age** of the infant is 37 to 41 weeks. Can be further divided to capture early term (37 to 39 weeks) births.

Trimester

"Three months, or one third of the gestational time for pregnancy."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Type I Error

A statistical error that produces a false positive result, whereby the test statistic predicts incorrectly a significant difference or correlation between groups. The likelihood of Type I errors can be reduced by using more conservative alpha level (thresholds of significance), such as 0.01 rather than 0.05.
Meyers LS, Gamst G, Guarino AJ. *Applied multivariate research: design and interpretation*. Thousand Oaks, CA: Sage Publications Inc., 2006.

Type III Analysis of Effects Test

An unweighted analysis based on the average of centre–specific estimates of test groups in the presence of an interaction (influence) effect between the independent (explanatory) variables. Type III analyses are often used when the effect of one explanatory variable is influenced by the effect of another explanatory variable.
Dmitrienko A, Molenberghs G, Chuang–Stein C, Offen W. *Analysis of clinical trials using SAS®: a practical guide.* Cary, NC: SAS Institute Inc., 2005.

Vacuum Extraction

"An obstetric procedure used to assist in the birth of a fetus by applying suction to the fetal head with a soft suction cup attached to a suction bottle (pump) by tubing and placing the device against the occiput of the fetal head."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Vaginal Birth after Cesarean (VBAC)

Women with a prior cesarean birth who subsequently delivered vaginally.

Vaginal Breech Birth/Delivery

The birth of a baby from a **breech presentation** through the vagina. See also **Breech Presentation**.

Version

"Turning of the fetus in utero."
Olds SB, London ML, Wieland PA, Davidson MR. *Maternal–Newborn Nursing and Women's Health Care*. 7th ed. Upper Saddle River, NJ: Pearson Education Inc.; 2004.

Vital Statistics

The Manitoba government department responsible for keeping records and registries of all births, deaths, marriages, and **stillbirths** that take place in Manitoba.

Winnipeg Community Areas (CAs)

The 12 planning districts within the Winnipeg **Regional Health Authority** (WRHA), which have similar populations to the rural and northern Regional Health Authorities (RHAs). The 12 CAs are: St. James–Assiniboia, Assiniboine South, Fort Garry, St. Vital, St. Boniface, Transcona, River East (includes East St. Paul), Seven Oaks (includes West St. Paul), Inkster, Point Douglas, Downtown, and River Heights.

Appendix

Further information on birth outcomes can be found in Chapter 2, section 2.1 Introduction.

Appendix Table A.1: Congenital Anomalies Diagnosed at Birth, 2001/02–2009/10 Categorized (separately) by ICD-9-CM/ICD-10-CA codes

Total Number of Births = 128,956		Total Number of Congenital Anomalies = 1,546	
Other congenital malformations of cardiac septa	169	Coarctation of aorta	11
Downs syndrome, unspecified	103	Congenital absence of hand and finger(s)	11
Ventricular septal defect	88	Complete transposition of great vessels	11
Hypospadias and epispadias and other penile anomalies	79	Congenital pulmonary valve stenosis	10
Hypospadias, unspecified	77	Other congenital malformations of penis	10
Cleft palate with cleft lip	72	Hypoplastic left heart syndrome	10
Downs syndrome	59	Atresia and stenosis of large intestine, rectum, and anal canal	9
Gastroschisis	61	Hypoplastic left heart syndrome	9
Tetralogy of Fallot	52	Potters syndrome	9
Cleft palate, unspecified	39	Atresia of foramina of Magendie and Luschka	9
Anomalies of pulmonary artery	35	Spina bifida without hydrocephalus	8
Cleft lip	34	Transposition of great vessels	8
Anomalies of abdominal wall	32	Anomalies of pulmonary valve	8
Cleft soft palate	27	Cleft lip	8
Congenital diapragmatic hernia	25	Hypoplasia of penis	8
Exomphalos	25	Other congenital hydrocephalus	8
Hypospadias, balanic	24	Anencephaly	8
Cleft palate	23	Tracheoesophageal fistula, esophageal atresia and stenosis	7
Congenital hydrocephalus	22	Reduction deformities of upper limb	7
Congenital hydrocephalus, unspecified	19	Reduction deformities of lower limb	7
Congenital absence, atresia and stenosis of anus without fistula	18	Congenital absence of foot and toe(s)	7
Hypospadias, penile	16	Cleft hard palate with cleft soft palate	7
Renal agenesis, unilateral	16	Spina bifida, unspecified	7
Renal agenesis and dysgenesis	15	Malformations of aqueduct of Sylvius	6
Atresia of oesophagus with tracheo-oesophageal fistula	14	Congenital absence, atresia and stenosis of anus with fistula	6
Congenital diapragmatic hernia	14	Endocardial cushion defects	6
Atrioventricular septal defect	13	Other anomalies of aorta	6
Anencephalus and similar anomalies	11	Congenital absence, atresia and stenosis of anus with fistula	6
Congenital chordee	11	Double outlet right ventricle	6

These Congenital Anomalies were suppressed due to small numbers: Spina bifida with hydrocephalus; Encephalocele; Common truncus; Tricuspid atresia and stenosis, congenital; Ebsteins anomaly; Congenital stenosis aortic valve; Coarctation of aorta; Anomalies of great veins; Frontal encephalocele; Occipital encephalocele; Encephalocele, unspecified; Lumbar spina bifida with hydrocephalus; Sacral spina bifida with hydrocephalus; Unspecified spina bifida with hydrocephalus; Thoracic spina bifida without hydrocephalus; Lumbar spina bifida without hydrocephalus; Sacral spina bifida without hydrocephalus; Arnold-Chiari syndrome; Common arterial trunk; Dextratransposition of aorta; Other transposition of great vessels not elsewhere classified; Double inlet ventricle; Aortopulmonary septal defect; Pulmonary valve atresia; Congenital tricuspid atresia; Ebsteins anomaly; Hypoplastic right heart syndrome; Congenital stenosis of aortic valve; Atresia of aorta; Other congenital malformations of aorta; Atresia of pulmonary artery; Total anomalous pulmonary venous connection; Partial anomalous pulmonary venous connection; Cleft hard palate; Cleft uvula; Atresia of oesophagus without fistula; Congenital tracheo-oesophageal fistula without atresia; Congenital stenosis and stricutre of oesophagus; Congenital absenc, atresia and stenosis of other parts of the large intestine; Hypospadias, penoscrotal; Other hypospadias; Renal agenesis, bilateral; Renal agenesis, unspecified; Renal hypoplasia, unspecified; Epispadias; Congenital complete absence of upper limb(s); Congenital absence of both forearm and hand; Other reduction defects of upper limb(s); Reduction defect of upper limb, unspecified; Other reduction defects of lower limb(s); Other congenital malformations of abdominal wall; Trisomy 21, mosaicism (mitotic nondisjunction); Trisomy 21, translocation

Source: Manitoba Centre for Health Policy, 2012

Further information on age distributions can be found in Chapter 2, section 2.1 Introduction.

Appendix Table A.2: Percent of Manitoban Women Who Gave Birth by RHA and Age Group

RHA	Aged 12-19	Aged 20-24	Aged 25-29	Aged 30-34	Aged 35-39	Aged 40+
South Eastman	4.65%*	23.97%	36.34%*	24.32%	8.36%*	2.35%
Central	7.91%	25.77%*	32.35%*	22.49%*	9.34%*	2.15%
Assiniboine	7.63%	23.74%	33.75%*	24.65%	8.96%*	1.26%
Brandon	6.98%*	24.77%	32.66%	24.32%	9.53%	1.73%
Winnipeg	6.71%*	17.57%*	28.51%*	30.50%*	14.21%*	2.50%*
Interlake	9.87%	23.06%	29.80%	23.78%	10.90%	2.59%
North Eastman	15.19%*	22.73%	30.79%	20.87%*	8.68%	1.76%
Parkland	15.14%*	29.15%*	28.84%	18.43%*	7.00%*	1.44%
Churchill	0.00%	s	40.00%	40.00%	s	0.00%
Nor-Man	19.26%*	28.89%*	25.41%*	17.75%*	7.08%*	1.62%
Burntwood	20.50%*	32.46%*	25.05%*	16.00%*	5.19%*	0.80%*
Manitoba	9.05%	21.95%	29.65%	25.98%	11.24%	2.13%

's' indicated data suppressed due to small numbers

'*' indicates that the RHA level proportion is significantly different (p=.01) from the Manitoba level proportion

Source: Manitoba Centre for Health Policy, 2012

Appendix Table A.3: Percent of Manitoban Women Who Gave Birth by Winnipeg CA and Age Group

Winnipeg CA	Aged 12-19	Aged 20-24	Aged 25-29	Aged 30-34	Aged 35-39	Aged 40+
Fort Garry	2.49%*	11.99%*	24.92%*	37.15%*	20.25%*	3.19%
Assiniboine South	3.04%*	10.55%*	21.11%*	42.22%*	20.21%*	2.86%
St. Boniface	2.75%*	11.07%*	27.99%	39.24%*	16.03%	2.92%
St. Vital	2.69%*	11.44%*	30.41%	35.56%*	17.51%*	2.38%
Transcona	4.35%	15.82%	34.54%*	31.20%	11.18%	2.90%
River Heights	2.60%*	11.63%*	25.40%	38.42%*	19.07%*	2.88%
River East	6.50%	18.94%	30.83%	29.20%	12.65%	1.88%
Seven Oaks	3.60%*	15.43%	32.99%*	31.45%	14.62%	1.91%
St. James- Assiniboia	5.10%	16.64%	29.40%	31.10%	14.84%	2.93%
Inkster	10.61%*	23.12%*	29.32%	23.24%*	10.85%*	2.86%
Downtown	13.47%*	23.78%*	26.31%	22.49%*	11.13%*	2.82%
Point Douglas	15.28%*	29.93%*	27.32%	18.52%*	7.54%*	1.41%*
Winnipeg	6.71%	17.57%	28.51%	30.50%	14.21%	2.50%

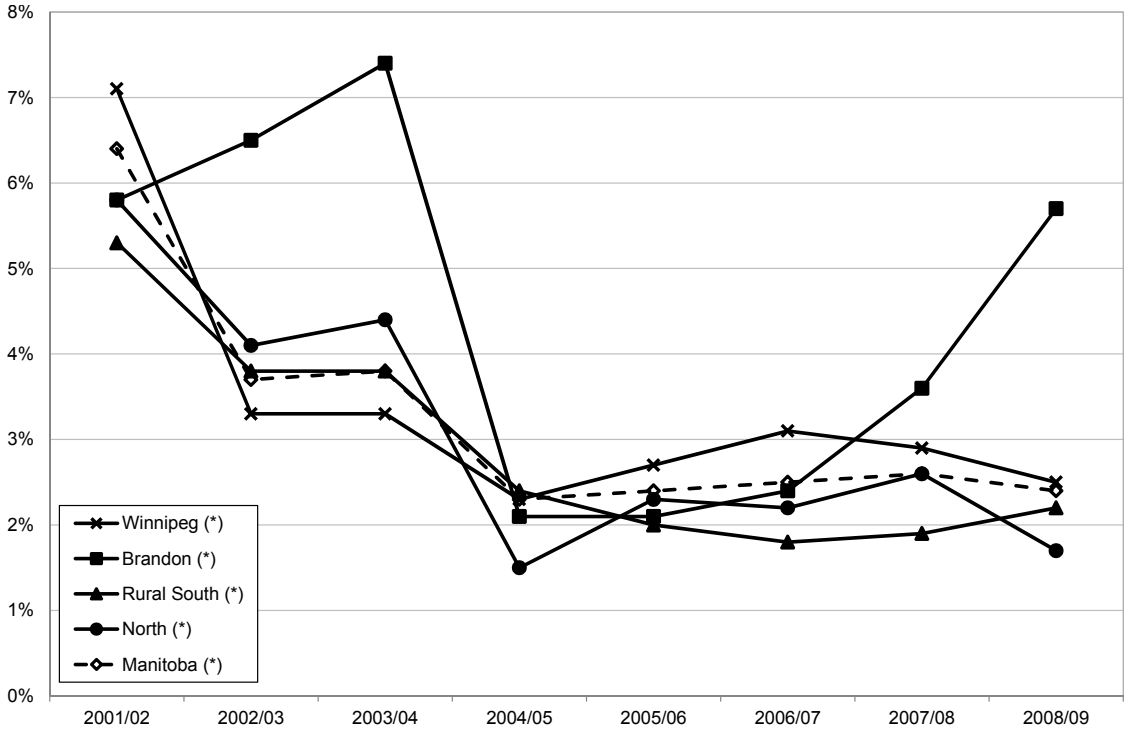
's' indicated data suppressed due to small numbers

'*' indicates that the Winnipeg area level proportion is significantly different (p=.01) from the Winnipeg RHA level proportion

Source: Manitoba Centre for Health Policy, 2012

Further information on neonatal readmissions can be found in Chapter 6, section 6.10 Neonatal Readmission.

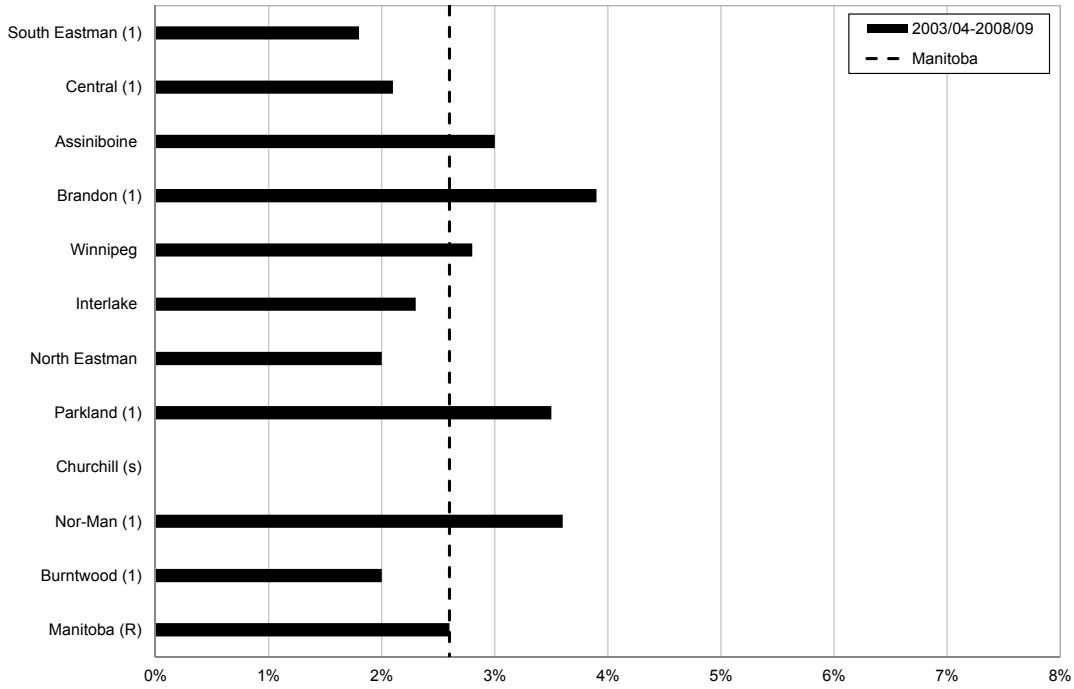
Appendix Figure A.1: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (includes Boarder Babies) by Region and Year, 2001/02-2008/09



* indicates that the linear trend over time is significant at p<0.05

Source: Manitoba Centre for Health Policy, 2012

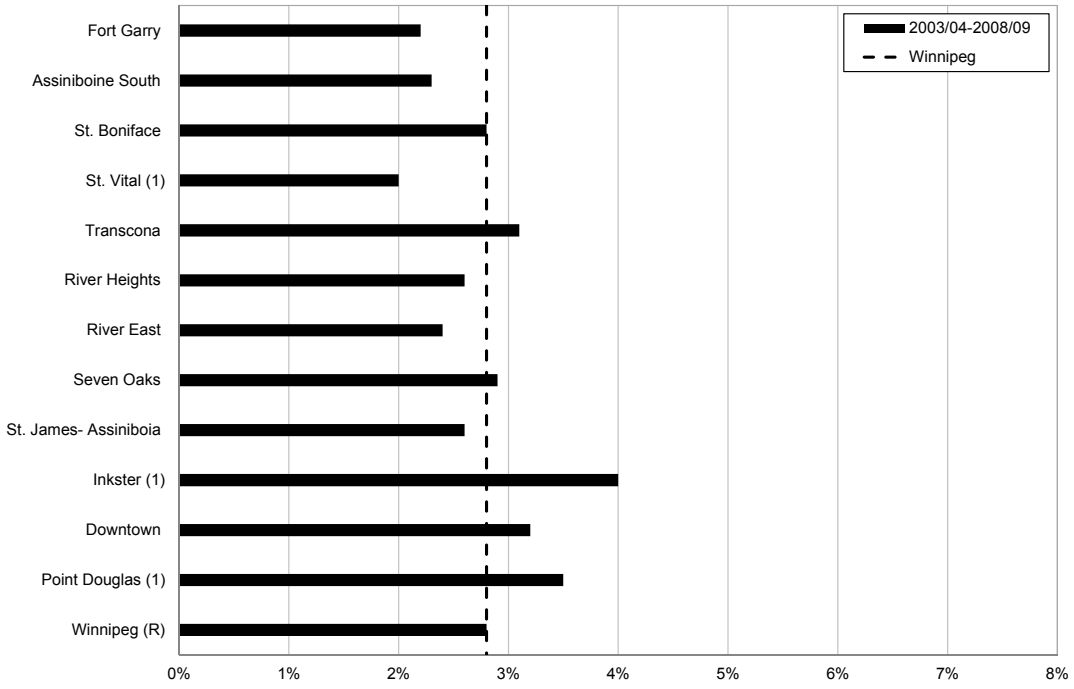
Appendix Figure A.2: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (includes Boarder Babies) by RHA, 2003/04-2008/09



'1' indicates the area's rate was statistically different from the Manitoba rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

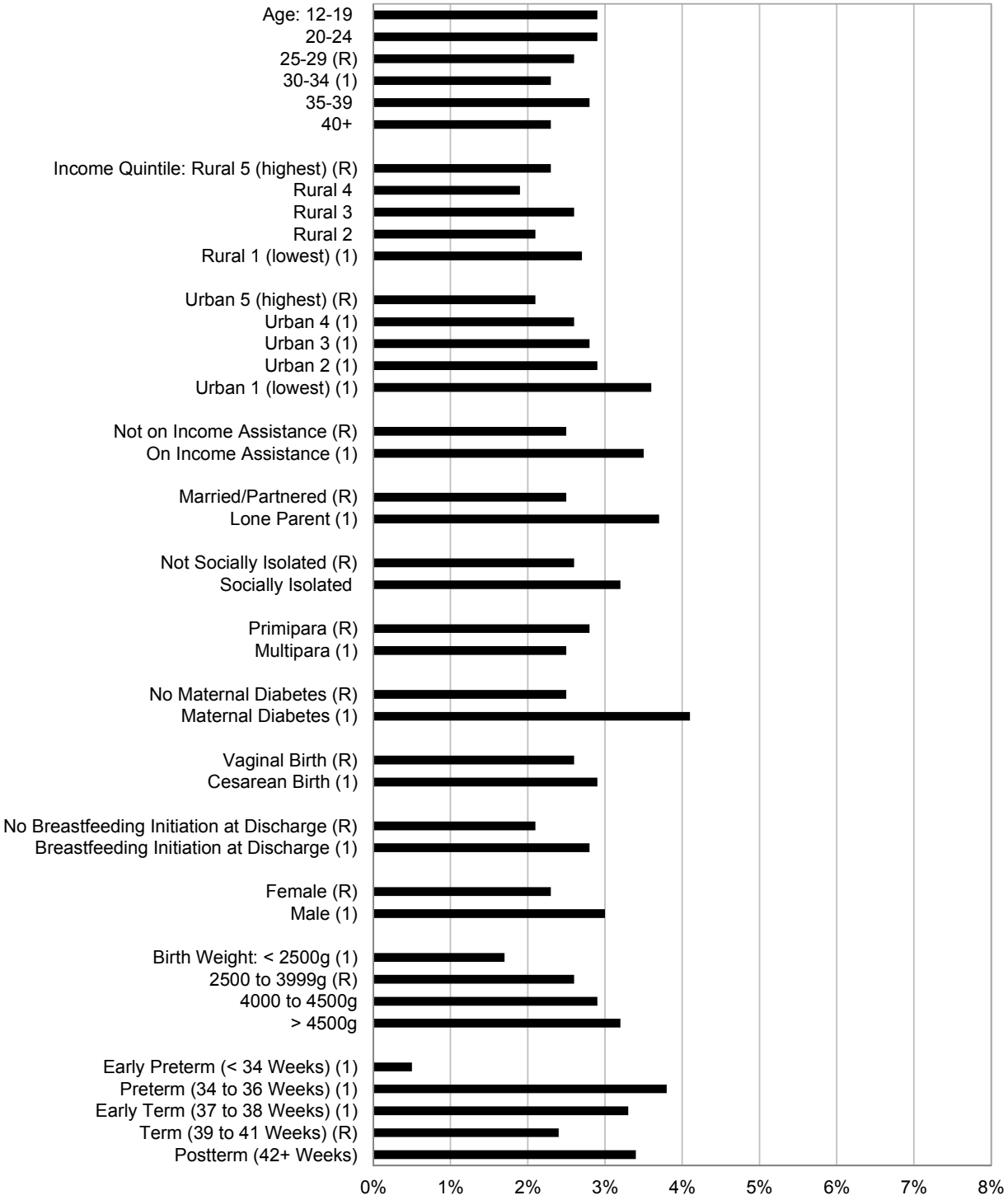
Appendix Figure A.3: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (includes Boarder Babies) by Winnipeg CA, 2003/04-2008/09



'1' indicates the area's rate was statistically different from the Winnipeg rate (p<0.01)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Appendix Figure A.4: Proportion of Newborns Readmitted to the Hospital Within 28 Days of Birth (includes Boarder Babies) by Sociodemographic and Other Characteristics, 2003/04-2008/09



'1' indicates the group's rate was statistically different from the reference (R) category ($p<0.01$)
's' indicates data suppressed due to small numbers

Source: Manitoba Centre for Health Policy, 2012

Appendix Table A.4: Table of Codes

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Adequate Prenatal Care	Determined using the R–GINDEX (Revised–Graduated Prenatal Care Utilization Index) by dividing the number of women with adequate prenatal care indicated by the R–GINDEX by the total number of women giving birth in a given place and time. See Inadequate Prenatal Care for further information regarding the R–GINDEX.	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Home births attended by a midwife, Cases with missing prenatal care values	Hospital Abstracts, Medical Services (physician claims)
3	Antenatal Hospitalization – Reasons	Using the primary diagnosis code list for each of the antenatal hospitalizations (see Antenatal Hospitalizations for complete description), the reasons were aggregated into the following reasons. Threatened preterm labour: O47.003, O47.103, O47.903 Antenatal hemorrhage: O46.9, O20.0, O44.1, O44.0, O45.9, O46.8, O20.9, O45.8, O20.8, O67.9 Diabetes: O24.803, O24.603, O24.503, O24.703 Hypertensive disorders: O13.003, O14.003, O16.003, O10.0, O11.033, O10.4, O15.0, O10.2M O13.001 Genitourinary complications:23.0, O23.4, O23.9, O23.5, N12, O23.3, O23.1, N19, N20.0, N13.2, N39.0 Vomiting: O21.0, O21.1, 021.2, 021.9, 021.8 Premature rupture of membranes: O42, O75.6 Mental disorders: O99.3, F43.2, F20.9, F29, F32.2, F33.2, F25.2, F31.2, F31.9, F32.9, F33.9 Known and suspected fetal problems: O35, O36, O37, O43, O68 Cervical incompetence: O34.3 Abdominal pain: R10.4, R10.30, R10.39, R10.10, R10.12, R10.2 Disorders of intestine, liver, and gallbladder: K52.9, K80.0, K80.1, K80.2, K80.4, K80.5, K81.0, K82.4 Other hospitalizations: If antenatal hospitalization does not includes any of the above diagnoses.	2007/08–2008/09		Hospital Discharge Abstracts
3	Antenatal Hospitalizations	The ratio of antenatal hospitalized episodes per 100 women giving birth. An episode was defined as a single, continuous stay in the hospital system, irrespective of transfers between hospitals. These episodes included all hospitalizations in which thewoman was pregnant but did not deliver during the hospitalization of interest (i.e., all hospitalizations between initial date of pregnancy up to, but not including, hospitalizations resulting in a delivery). Each episode in the antenatal period that a woman had was included in the count.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09		Hospital Abstracts
SDO	Antepartum Hemorrhage	A woman was considered to have had an antepartum hemorrhage by the presence of: 1) One or more hospitalizations (ICD–9–CM 641, 641.0, 641.1, 641.2, 641.3, 641.8, 641.9; ICD 10– CA O44,O45, O46) in the gestation period indicating antepartum hemorrhage **OR** 2) One or more physician visits (ICD–9–CM 641, 641.0, 641.1, 641.2, 641.3, 641.8, 641.9) in the gestation period indicating antepartum hemorrhage	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Appropriate–for–Gestational Age (AGA)	A birth was considered to be appropriate for gestational age if the birth weight was between the 10th and 90th percentiles for their gestational age and sex using a Canadian standard (Kramer et al., 2001).	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Multiple births, Newborns with a gestation of less than 20 weeks, Newborns with missing birth weights	Midwifery Discharge Summary Reports, Hospital Abstracts
4	Assisted Vaginal Births	The number of assisted vaginal births was divided by the total number of vaginal births. A birth was considered a vaginal birth by the absence of a code indicating a cesarean birth (see cesarean birth for more details). A birth was considered to be assisted if one or more of the following codes were present: ICD–9–CM: 72.0, 72.1, 72.2, 72.3, 72.472.71, 72.7, or 72.79; ICD–10–CA: 5.MD.53.KL, 5.MD.53.KK, 5.MD.53.KN, 5.MD.53.KM, 5.MD.53.KJ, 5.MD.53.KH, 5.MD.55.^^, 5.MD.54.^^, 5.MD.53.KS, 5.MD.53.KP, 5.MD.53.JE, 5.MD.53.JD. All homebirths attended by a midwife were coded as vaginal births that were not assisted. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09		Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Birth Weight	Captured from the newborn's birth hospitalization abstract or midwifery summary report	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
7	Birth Weight – High Birth Weight	Captured from the newborn's birth hospitalization abstract or midwifery summary report. A baby was considered to have a high birth weight if the weight was greater than 4,500 grams.	2007/08–2008/09		Midwifery Discharge Summary Reports, Hospital Abstracts
5	Breastfeeding Initiation	The number of live born Newborns who were exclusively or partially breastfed was divided by the total number of live born Newborns in Manitoba. A baby was considered to be breastfeed at hospital discharge if the field NBFEEDNG (2001/02–2003/04), was equal to 1 or 3 (0 was excluded and 2 was coded as not breastfeeding at discharge) or if the field nwb_feed (2004/05–2008/09) was equal to 1 or 2 (3 and 4 were coded as not breastfeeding at discharge, 5 was excluded). Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Birth records with missing breastfeeding fields	Midwifery Discharge Summary Reports, Hospital Abstracts
4	Breech Birth	The proportion of women who had a breech birth was determined by dividing the number of women with a breech birth by the total number of women giving birth in a given time and place. All breech births were included in this analysis, regardless of the delivery method. A breech birth was defined by the presence of one or more of the following codes in the hospital birth abstract: ICD–10–CA O32.1, and O64.1 or the birth being coded as a breech birth in the Midwifery Discharge Summary Reports. Note: When this was used as an SDO factor, it was used as a classification variable	As an indicator Time trends: 2004/05–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Breech Malpresentation at Birth	See Breech Birth	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
6	Causes of Neonatal and Postneonatal Death	The primary reason for neonatal death (see Neonatal Mortality) was grouped into the following categories: Congenital Anomalies, Short Gestation/Low Birth Weight, Complications of Labour, Maternal Conditions/Complications, Infectious/Parasitic, Respiratory System, Fetal Hemorrhage, Other (includes all reasons not elsewhere classified) and Missing Reason for Death. See below for the ICD-10-CA codes included in these categories. The primary reason for postneonatal death (see Postneonatal Mortality) was grouped into the following categories: Congenital Anomalies, Sudden Infant Death Syndrome, Injury, Respiratory System, Infectious/Parasitic, Nervous System, Endocrine/Metabolic, Digestive, Other (includes all reasons not elsewhere classified) and Ill Defined/Unknown. See below for the ICD-10-CA codes included in these categories. Complications of Labour: P02.0, P02.1, P02.2, P02.3, P02.4, P02.5, P02.6, P02.7, P02.8, P02.9, P03.0, P03.1, P03.2, P03.3, P03.4, P03.5, P03.6, P03.8, P03.9, P04.0, P10.0, P10.1, P10.4, P10.8, P10.9, P11.0, P11.1, P11.2, P11.3, P11.4, P11.5, P11.9, P12.0, P12.1, P12.2, P12.3, P12.4, P12.8, P12.9, P13.00, P13.01, P13.08, P13.09, P13.1, P13.2, P13.30, P13.38, P13.4, P13.8, P13.9, P14.0, P14.1, P14.2, P14.3, P14.8, P14.9, P15.0, P15.1, P15.2, P15.3, P15.4, P15.5, P15.8, P15.9, P20.0, P20.1, P20.9, P21.9, and P52.8 Congenital Anomalies: G90.1, P29.3, Q00.0, Q00.1, Q00.2, Q01.0, Q01.1, Q01.2, Q01.8, Q01.9, Q02, Q03.0, Q03.1, Q03.8, Q03.9, Q04.0, Q04.1, Q04.2, Q04.3, Q04.4, Q04.5, Q04.6, Q04.8, Q04.9, Q05.0, Q05.1, Q05.2, Q05.3, Q05.4, Q05.5, Q05.6, Q05.7, Q05.8, Q05.9, Q06.0, Q06.1, Q06.2, Q06.3, Q06.4, Q06.8, Q06.9, Q07.0, Q07.8, Q07.9, Q10.0, Q10.1, Q10.2, Q10.3, Q10.4, Q10.5, Q10.6, Q10.7, Q11.0, Q11.1, Q11.2, Q11.3, Q12.0, Q12.1, Q12.2, Q12.3, Q12.4, Q12.8, Q12.9, Q13.0, Q13.1, Q13.2, Q13.3, Q13.4, Q13.5, Q13.8, Q13.9, Q14.0, Q14.1, Q14.2, Q14.3, Q14.8, Q14.9, Q15.8, Q15.9, Q16.0, Q16.1, Q16.2, Q16.3, Q16.4, Q16.5, Q16.9, Q17.0, Q17.1, Q17.2, Q17.3, Q17.4, Q17.5, Q17.8, Q17.9, Q18.0, Q18.1, Q18.2, Q18.3, Q18.4, Q18.5, Q18.6, Q18.7, Q18.8, Q18.9, Q20.0, Q20.1, Q20.2, Q20.30, Q20.31, Q20.32, Q20.38, Q20.4, Q20.50, Q20.58, Q20.6, Q20.8, Q20.9, Q21.0, Q21.1, Q21.2, Q21.3, Q21.4, Q21.8, Q21.9, Q22.0, Q22.1, Q22.2, Q22.3, Q22.4, Q22.5, Q22.6, Q22.8, Q22.9, Q23.0, Q23.1, Q23.2, Q23.3, Q23.4, Q23.8, Q23.9, Q24.0, Q24.1, Q24.2, Q24.3, Q24.4, Q24.5, Q24.6, Q24.8, Q24.9, Q25.0, Q25.1, Q25.2, Q25.3, Q25.4, Q25.5, Q25.6, Q25.7, Q25.8, Q25.9, Q26.0, Q26.1, Q26.2, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	Q26.3, Q26.4, Q26.5, Q26.6, Q26.8, Q26.9, Q27.0, Q27.1, Q27.2, Q27.3, Q27.30, Q27.31, Q27.32, Q27.33, Q27.38, Q27.4, Q27.8, Q27.9, Q28.0, Q28.1, Q28.2, Q28.3, Q28.8, Q28.9, Q30.0, Q30.1, Q30.2, Q30.3, Q30.8, Q30.9, Q30.0, Q30.1, Q30.2, Q30.3, Q30.8, Q30.9, Q30.0, Q30.1, Q30.2, Q30.3, Q30.8, Q30.9, Q31.0, Q31.1, Q31.2, Q31.3, Q31.5, Q31.8, Q31.9, Q32.0, Q32.10, Q32.11, Q32.12, Q32.13, Q32.18, Q32.2, Q32.3, Q32.4, Q33.0, Q33.1, Q33.2, Q33.3, Q33.4, Q33.5, Q33.6, Q33.8, Q33.9, Q34.0, Q34.1, Q34.8, Q34.9, Q35.1, Q35.3, Q35.5, Q35.7, Q35.9, Q36, Q37, Q38.0, Q38.1, Q38.2, Q38.3, Q38.4, Q38.5, Q38.6, Q38.7, Q38.8, Q39.0, Q39.1, Q39.2, Q39.3, Q39.4, Q39.5, Q39.6, Q39.8, Q39.9, Q40.0, Q40.1, Q40.2, Q40.3, Q40.8, Q40.9, Q41.0, Q41.1, Q41.2, Q41.8, Q41.9, Q42.0, Q42.1, Q42.2, Q42.3, Q42.8, Q42.9, Q43.0, Q43.1, Q43.2, Q43.3, Q43.4, Q43.5, Q43.6, Q43.7, Q43.8, Q43.9, Q44.0, Q44.1, Q44.2, Q44.3, Q44.4, Q44.5, Q44.6, Q44.7, Q45.0, Q45.1, Q45.2, Q45.3, Q45.8, Q45.9, Q50.0, Q50.1, Q50.2, Q50.30, Q50.31, Q50.38, Q50.4, Q50.5, Q50.6, Q51.0, Q51.1, Q51.2, Q51.3, Q51.4, Q51.5, Q51.6, Q51.7, Q51.8, Q51.9, Q52.0, Q52.1, Q52.2, Q52.3, Q52.4, Q52.5, Q52.6, Q52.7, Q52.8, Q52.9, Q53.0, Q53.1, Q53.2, Q53.9, Q54.0, Q54.1, Q54.2, Q54.3, Q54.4, Q54.8, Q54.9, Q55.0, Q55.1, Q55.2, Q55.3, Q55.4, Q55.5, Q55.60, Q55.68, Q55.8, Q55.9, Q56.0, Q56.1, Q56.2, Q56.3, Q56.4, Q60.0, Q60.1, Q60.2, Q60.3, Q60.4, Q60.5, Q60.6, Q61.0, Q61.1, Q61.2, Q61.3, Q61.4, Q61.5, Q61.8, Q61.9, Q62.0, Q62.10, Q62.11, Q62.18, Q62.2, Q62.3, Q62.4, Q62.5, Q62.6, Q62.7, Q62.8, Q63.0, Q63.1, Q63.2, Q63.3, Q63.8, Q63.9, Q64.0, Q64.10, Q64.18, Q64.2, Q64.30, Q64.31, Q64.32, Q64.38, Q64.4, Q64.5, Q64.6, Q64.70, Q64.71, Q64.78, Q64.8, Q64.9, Q65.0, Q65.1, Q65.2, Q65.3, Q65.4, Q65.5, Q65.6, Q65.8, Q65.9, Q66.0, Q66.1, Q66.2, Q66.3, Q66.4, Q66.5, Q66.6, Q66.7, Q66.8, Q66.9, Q67.0, Q67.1, Q67.2, Q67.3, Q67.4, Q67.5, Q67.6, Q67.7, Q67.8, Q68.0, Q68.1, Q68.2, Q68.3, Q68.4, Q68.5, Q68.8, Q69.0, Q69.1, Q69.2, Q69.9, Q70.0, Q70.1, Q70.2, Q70.3, Q70.4, Q70.9, Q71.0, Q71.1, Q71.2, Q71.3, Q71.4, Q71.5, Q71.6, Q71.8, Q71.9, Q72.0, Q72.1, Q72.2, Q72.3, Q72.4, Q72.5, Q72.6, Q72.7, Q72.8, Q72.9, Q73.0, Q73.1, Q73.8, Q74.0, Q74.1, Q74.2, Q74.3, Q74.8, Q74.9, Q75.0, Q75.1, Q75.2, Q75.3, Q75.4, Q75.5, Q75.8, Q75.9, Q76.0, Q76.1, Q76.20, Q76.21, Q76.3, Q76.4, Q76.5, Q76.6, Q76.7, Q76.8, Q76.9, Q77.0, Q77.1, Q77.2, Q77.3, Q77.4, Q77.5, Q77.6, Q77.7, Q77.8, Q77.9, Q78.0, Q78.1, Q78.2, Q78.3, Q78.4, Q78.5, Q78.6, Q78.8, Q78.9, Q79.0, Q79.1, Q79.2, Q79.3, Q79.4, Q79.5, Q79.6, Q79.8, Q79.9, Q80.0, Q80.1, Q80.2, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	Q82.2, Q82.3, Q82.4, Q82.5, Q82.8, Q82.9, Q83.0, Q83.1, Q83.2, Q83.3, Q83.8, Q83.9, Q84.0, Q84.1, Q84.2, Q84.3, Q84.4, Q84.5, Q84.6, Q84.8, Q84.9, Q85.1, Q85.8, Q85.9, Q86.1, Q86.2, Q86.8, Q87.0, Q87.1, Q87.2, Q87.3, Q87.4, Q87.5, Q87.8, Q89.0, Q89.1, Q89.2, Q89.3, Q89.4, Q89.7, Q89.8, Q89.9, Q90.0, Q90.1, Q90.2, Q90.9, Q91.0, Q91.1, Q91.2, Q91.3, Q91.4, Q91.5, Q91.6, Q91.7, Q92.0, Q92.1, Q92.2, Q92.3, Q92.4, Q92.5, Q92.6, Q92.7, Q92.8, Q92.9, Q93.0, Q93.1, Q93.2, Q93.3, Q93.4, Q93.5, Q93.6, Q93.7, Q93.8, Q93.9, Q95.0, Q95.1, Q95.2, Q95.3, Q95.4, Q95.5, Q95.8, Q95.9, Q96.0, Q96.1, Q96.2, Q96.3, Q96.4, Q96.8, Q96.9, Q97.0, Q97.1, Q97.2, Q97.3, Q97.8, Q97.9, Q98.0, Q98.1, Q98.2, Q98.3, Q98.4, Q98.5, Q98.6, Q98.7, Q98.8, Q98.9, Q99.0, Q99.1, Q99.2, Q99.8, and Q99.9. Digestive System: K00.0, K00.1, K00.2, K00.3, K00.4, K00.5, K00.6, K00.7, K00.8, K00.9, K01.0, K01.1, K02.0, K02.1, K02.2, K02.3, K02.4, K02.8, K02.9, K03.0, K03.1, K03.2, K03.3, K03.4, K03.5, K03.6, K03.7, K03.8, K03.9, K04.0, K04.1, K04.2, K04.3, K04.4, K04.5, K04.6, K04.7, K04.8, K04.9, K05.0, K05.1, K05.2, K05.3, K05.4, K05.5, K05.6, K06.0, K06.1, K06.2, K06.8, K06.9, K07.00, K07.01, K07.02, K07.03, K07.04, K07.05, K07.08, K07.09, K07.11, K07.12, K07.13, K07.14, K07.18, K07.19, K07.2, K07.3, K07.4, K07.5, K07.60, K07.61, K07.62, K07.63, K07.64, K07.68, K07.69, K07.8, K07.9, K08.0, K08.1, K08.2, K08.3, K08.80, K08.81, K08.82, K08.83, K08.87, K08.88, K08.9, K09.0, K09.1, K09.2, K09.8, K09.9, K10.0, K10.1, K10.2, K10.3, K10.8, K10.9, K11.0, K11.1, K11.2, K11.3, K11.4, K11.5, K11.6, K11.7, K11.8, K11.9, K12.0, K12.1, K12.2, K13.0, K13.1, K13.2, K13.3, K13.4, K13.5, K13.6, K13.7, K14.0, K14.1, K14.2, K14.3, K14.4, K14.5, K14.6, K14.8, K14.9, K20, K21.0, K21.9, K22.0, K22.1, K22.2, K22.3, K22.4, K22.5, K22.6, K22.8, K22.9, K23.0, K23.1, K23.8, K25.0, K25.1, K25.2, K25.3, K25.4, K25.5, K25.6, K25.7, K25.9, K26.0, K26.1, K26.2, K26.3, K26.4, K26.5, K26.6, K26.7, K26.9, K27.0, K27.1, K27.2, K27.3, K27.4, K27.5, K27.6, K27.7, K27.9, K28.0, K28.1, K28.2, K28.3, K28.4, K28.5, K28.6, K28.7, K28.9, K29.0, K29.1, K29.2, K29.3, K29.4, K29.5, K29.6, K29.7, K29.8, K29.9, K30, K31.0, K31.1, K31.2, K31.3, K31.4, K31.5, K31.6, K31.8, K31.9, K35.0, K35.1, K35.9, K36, K37, K38.0, K38.1, K38.2, K38.3, K38.8, K38.9, K40.0, K40.1, K40.2, K40.3, K40.4, K40.9, K41.0, K41.1, K41.2, K41.3, K41.4, K41.9, K42.0, K42.1, K42.9, K43.0, K43.1, K43.9, K44.0, K44.1, K44.9, K45.0, K45.1, K45.8, K46.0, K46.1, K46.9, K50.0, K50.1, K50.8, K50.9, K51.0, K51.1, K51.2, K51.3, K51.4, K51.5, K51.8, K51.9, K52.0, K52.1, K52.2, K52.8, K52.9, K55.0, K55.1, K55.2, K55.8, K55.9, K56.0, K56.1, K56.2, K56.3, K56.4, K56.5, K56.6, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	K59.1, K59.2, K59.3, K59.4, K59.8, K59.9, K60.0, K60.1, K60.2, K60.3, K60.4, K60.5, K61.0, K61.1, K61.2, K61.3, K61.4, K62.0, K62.1, K62.2, K62.3, K62.4, K62.5, K62.6, K62.7, K62.8, K62.9, K63.0, K63.1, K63.2, K63.3, K63.4, K63.8, K63.9, K65.0, K65.8, K65.9, K66.0, K66.1, K66.8, K66.9, K67.0, K67.1, K67.2, K67.3, K67.8, K70.0, K70.1, K70.2, K70.3, K70.4, K70.9, K71.0, K71.1, K71.2, K71.3, K71.4, K71.5, K71.6, K71.7, K71.8, K71.9, K72.0, K72.1, K72.9, K73.0, K73.1, K73.2, K73.8, K73.9, K74.0, K74.1, K74.2, K74.3, K74.4, K74.5, K74.6, K75.0, K75.1, K75.2, K75.3, K75.4, K75.8, K75.9, K76.0, K76.1, K76.2, K76.3, K76.4, K76.5, K76.6, K76.7, K76.8, K76.9, K77.0, K77.8, K80.00, K80.01, K80.10, K80.11, K80.20, K80.21, K80.30, K80.31, K80.40, K80.41, K80.50, K80.51, K80.80, K80.81, K81.0, K81.1, K81.8, K81.9, K82.0, K82.1, K82.2, K82.3, K82.4, K82.8, K82.9, K83.0, K83.1, K83.2, K83.3, K83.4, K83.5, K83.8, K83.9, K85, K86.0, K86.1, K86.2, K86.3, K86.8, K86.9, K87.0, K87.1, K90.0, K90.1, K90.2, K90.3, K90.4, K90.8, K90.9, K91.0, K91.1, K91.2, K91.40, K91.41, K91.42, K91.43, K91.44, K91.45, K91.5, K91.60, K91.61, K91.62, K92.0, K92.1, K92.2, K92.8, K92.9, K93.0, K93.1, K93.8, P75, P76.0, P76.1, P76.2, P76.8, P76.9, P77, P78.0, P78.1, P78.2, P78.3, P78.80, P78.88, P78.9, and R38.2. Endocrine/Metabolic: C88.00, D47.2, D76.0, D76.1, D76.2, D76.3, D80.0, D80.1, D80.2, D80.3, D80.4, D80.5, D80.6, D80.7, D80.8, D80.9, D81.0, D81.1, D81.2, D81.3, D81.4, D81.5, D81.6, D81.7, D81.8, D81.9, D82.0, D82.1, D82.2, D82.3, D82.4, D82.8, D82.9, D83.0, D83.1, D83.2, D83.8, D83.9, D84.0, D84.1, D84.8, D84.9, D89.0, D89.1, D89.8, D89.9, E00.0, E00.1, E00.2, E00.9, E01.0, E01.1, E01.2, E01.8, E02, E03.0, E03.1, E03.2, E03.3, E03.4, E03.5, E03.8, E03.9, E04.0, E04.1, E04.2, E04.8, E04.9, E05.0, E05.1, E05.2, E05.3, E05.4, E05.5, E05.8, E05.9, E06.0, E06.1, E06.2, E06.3, E06.4, E06.5, E06.9, E07.0, E07.1, E07.81, E07.88, E07.9, E11.00, E11.01, E13.00, E13.01, E14.00, E14.01, E15, E16.0, E16.1, E16.2, E16.3, E16.4, E16.8, E16.9, E20.0, E20.1, E20.8, E20.9, E21.0, E21.1, E21.2, E21.3, E21.4, E21.5, E22.0, E22.1, E22.2, E22.8, E22.9, E23.0, E23.1, E23.2, E23.3, E23.6, E23.7, E24.0, E24.1, E24.2, E24.3, E24.4, E24.8, E24.9, E25.0, E25.8, E25.9, E26.0, E26.1, E26.8, E26.9, E27.0, E27.1, E27.2, E27.3, E27.4, E27.5, E27.8, E27.9, E28.0, E28.1, E28.2, E28.3, E28.8, E28.9, E29.0, E29.1, E29.8, E29.9, E30.0, E30.1, E30.8, E30.9, E31.0, E31.1, E31.8, E31.9, E32.0, E32.1, E32.8, E32.9, E34.0, E34.1, E34.2, E34.4, E34.5, E34.8, E34.9, E35.0, E35.1, E35.8, E40, E41, E42, E43, E44.0, E44.1, E45, E46, E50.0, E50.1, E50.2, E50.3, E50.4, E50.5, E50.6, E50.7, E50.8, E50.9, E51.1, E51.2, E51.8, E51.9, E52, E53.0, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	E61.0, E61.1, E61.2, E61.3, E61.4, E61.5, E61.6, E61.7, E61.8, E61.9, E63.0, E63.1, E63.8, E63.9, E64.0, E64.1, E64.2, E64.3, E64.8, E64.9, E65, E66.0, E66.1, E66.2, E66.8, E66.9, E67.0, E67.1, E67.2, E67.3, E67.8, E68, E70.0, E70.1, E70.2, E70.3, E70.8, E70.9, E71.0, E71.1, E71.2, E71.3, E72.0, E72.1, E72.2, E72.3, E72.4, E72.5, E72.8, E72.9, E73.0, E73.1, E73.8, E73.9, E74.0, E74.1, E74.2, E74.3, E74.4, E74.8, E74.9, E75.2, E75.3, E75.5, E75.6, E76.0, E76.1, E76.2, E76.3, E76.8, E76.9, E77.0, E77.1, E77.8, E77.9, E78.0, E78.1, E78.2, E78.3, E78.4, E78.5, E78.6, E78.8, E78.9, E79.1, E79.8, E79.9, E80.0, E80.1, E80.2, E80.3, E80.4, E80.5, E80.6, E80.7, E83.0, E83.10, E83.18, E83.19, E83.2, E83.3, E83.4, E83.5, E83.8, E83.9, E84.0, E84.1, E84.8, E84.9, E85.0, E85.1, E85.2, E85.3, E85.4, E85.8, E85.9, E86.0, E86.8, E87.0, E87.1, E87.2, E87.3, E87.4, E87.5, E87.6, E87.7, E87.8, E88.0, E88.1, E88.2, E88.8, E88.9, E89.0, E89.1, E89.2, E89.3, E89.4, E89.5, E89.6, E89.8, E89.9, E90, H02.6, M10.00, M10.01, M10.02, M10.03, M10.04, M10.05, M10.06, M10.07, M10.08, M10.09, M10.20, M10.21, M10.22, M10.23, M10.24, M10.25, M10.26, M10.27, M10.28, M10.29, M10.30, M10.31, M10.32, M10.33, M10.34, M10.35, M10.36, M10.37, M10.38, M10.39, M10.40, M10.41, M10.42, M10.43, M10.44, M10.45, M10.46, M10.47, M10.48, M10.49, M10.90, M10.91, M10.92, M10.93, M10.94, M10.95, M10.96, M10.97, M10.98, M10.99, M11.00, M11.01, M11.02, M11.03, M11.04, M11.05, M11.06, M11.07, M11.08, M11.09, M11.10, M11.11, M11.12, M11.13, M11.14, M11.15, M11.16, M11.17, M11.18, M11.19, M11.20, M11.21, M11.22, M11.23, M11.24, M11.25, M11.26, M11.27, M11.28, M11.29, M83.0, M83.1, M83.2, M83.3, M83.5, M83.8, M83.9, P70.0, P70.1, P70.2, P70.3, P70.4, P70.8, P70.9, P71.0, P71.1, P71.2, P71.3, P71.4, P71.8, P71.9, P72.0, P72.1, P72.2, P72.8, P72.9, P74.0, P74.1, P74.20, P74.21, P74.29, P74.30, P74.31, P74.39, P74.4, P74.5, P74.8, P74.9, P94.0, and R77.1. Fetal Hemorrhage: P10.2, P10.3, P50.0, P50.1, P50.2, P50.3, P50.4, P50.5, P50.8, P50.9, P52.0, P52.1, P52.2, P52.3, P52.4, P52.5, P52.6, P52.9, P54.0, P54.1, P54.2, P54.3, P54.4, P54.5, P54.6, P54.8, and P54.9. Ill-defined/Unknown: R09.0, R09.2, R45.0, R45.1, R45.2, R45.3, R45.4, R45.5, R45.6, R45.7, R45.8, R46.0, R46.1, R46.2, R46.3, R46.5, R46.6, R46.7, R64, R68.1, R69, and R99. Infectious/Parasitic: A00.0, A00.1, A00.9, A01.0, A01.1, A01.2, A01.3, A01.4, A02.0, A02.1, A02.2, A02.8, A02.9, A03.0, A03.1, A03.2, A03.3, A03.8, A03.9, A04.0, A04.1, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	A05.4, A05.80, A05.88, A05.9, A06.0, A06.1, A06.2, A06.3, A06.4, A06.5, A06.6, A06.7, A06.8, A06.9, A07.0, A07.1, A07.2, A07.3, A07.8, A07.9, A08.0, A08.1, A08.2, A08.3, A08.4, A08.5, A09, A15.0, A15.1, A15.2, A15.3, A15.4, A15.5, A15.6, A15.7, A15.8, A15.9, A16.0, A16.1, A16.2, A16.3, A16.4, A16.5, A16.7, A16.8, A16.9, A17.0, A17.1, A17.8, A17.9, A18.0, A18.1, A18.2, A18.3, A18.4, A18.5, A18.6, A18.7, A18.8, A19.0, A19.1, A19.2, A19.8, A19.9, A20.0, A20.1, A20.2, A20.3, A20.7, A20.8, A20.9, A21.0, A21.1, A21.2, A21.3, A21.7, A21.8, A21.9, A22.0, A22.1, A22.2, A22.7, A22.8, A22.9, A23.0, A23.1, A23.2, A23.3, A23.8, A23.9, A24.0, A24.1, A24.2, A24.3, A24.4, A25.0, A25.1, A25.9, A26.0, A26.7, A26.8, A26.9, A27.0, A27.8, A27.9, A28.0, A28.1, A28.2, A28.8, A28.9, A30.0, A30.1, A30.2, A30.3, A30.4, A30.5, A30.8, A30.9, A31.0, A31.1, A31.2, A31.8, A31.9, A32.0, A32.1, A32.7, A32.8, A32.9, A33, A35, A36.0, A36.1, A36.2, A36.3, A36.8, A36.9, A37.0, A37.1, A37.8, A37.9, A38, A39.0, A39.1, A39.2, A39.3, A39.4, A39.5, A39.8, A39.9, A40.0, A40.1, A40.2, A40.3, A40.8, A40.9, A41.0, A41.1, A41.2, A41.3, A41.4, A41.50, A41.51, A41.52, A41.58, A41.80, A41.88, A41.9, A42.0, A42.1, A42.2, A42.7, A42.8, A42.9, A43.0, A43.1, A43.8, A43.9, A44.0, A44.1, A44.8, A44.9, A46, A48.0, A48.2, A48.3, A48.4, A48.8, A49.0, A49.1, A49.2, A49.3, A49.8, A49.9, A50.0, A50.1, A50.2, A50.3, A50.4, A50.5, A50.6, A50.7, A50.9, A51.0, A51.1, A51.2, A51.3, A51.4, A51.5, A51.9, A52.0, A52.1, A52.2, A52.3, A52.7, A52.8, A52.9, A53.0, A53.9, A54.0, A54.1, A54.2, A54.3, A54.4, A54.5, A54.6, A54.8, A54.9, A55, A56.0, A56.1, A56.2, A56.3, A56.4, A56.8, A57, A58, A59.0, A59.8, A59.9, A60.0, A60.1, A60.9, A63.0, A63.8, A64, A65, A66.0, A66.1, A66.2, A66.3, A66.4, A66.5, A66.6, A66.7, A66.8, A66.9, A67.0, A67.1, A67.2, A67.3, A67.9, A68.0, A68.1, A68.9, A69.0, A69.1, A69.2, A69.8, A69.9, A70, A71.0, A71.1, A71.9, A74.0, A74.8, A74.9, A75.0, A75.1, A75.2, A75.3, A75.9, A77.0, A77.1, A77.2, A77.3, A77.8, A77.9, A78, A79.0, A79.1, A79.8, A79.9, A80.0, A80.1, A80.2, A80.3, A80.4, A80.9, A81.0, A81.1, A81.2, A81.8, A81.9, A82.0, A82.1, A82.9, A83.0, A83.1, A83.2, A83.3, A83.4, A83.5, A83.6, A83.8, A83.9, A84.0, A84.1, A84.8, A84.9, A85.0, A85.1, A85.2, A85.8, A86, A87.0, A87.1, A87.2, A87.8, A87.9, A88.0, A88.1, A88.8, A89, A90, A91, A92.0, A92.1, A92.2, A92.3, A92.4, A92.8, A92.9, A93.0, A93.1, A93.2, A93.8, A94, A95.0, A95.1, A95.9, A96.0, A96.1, A96.2, A96.8, A96.9, A98.0, A98.1, A98.2, A98.3, A98.4, A98.5, A98.8, A99, B00.0, B00.1, B00.2, B00.3, B00.4, B00.5, B00.7, B00.8, B00.9, B01.0, B01.1, B01.2, B01.8, B01.9, B02.0, B02.1, B02.2, B02.3, B02.7, B02.8, B02.9, B03, B04, B05.0, B05.1, B05.2, B05.3, B05.4, B05.8, B05.9, B06.0, B06.8, B06.9, B07, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	B16.2, B16.9, B17.0, B17.1, B17.2, B17.8, B18.0, B18.1, B18.2, B18.8, B18.9, B19.0, B19.9, B24, B25.0, B25.1, B25.2, B25.8, B25.9, B26.0, B26.1, B26.2, B26.3, B26.8, B26.9, B27.0, B27.1, B27.8, B27.9, B30.0, B30.1, B30.2, B30.3, B30.8, B30.9, B33.0, B33.1, B33.3, B33.8, B34.0, B34.1, B34.2, B34.3, B34.4, B34.8, B34.9, B35.0, B35.1, B35.2, B35.3, B35.4, B35.5, B35.6, B35.8, B35.9, B36.0, B36.1, B36.2, B36.3, B36.8, B36.9, B37.0, B37.1, B37.2, B37.3, B37.4, B37.5, B37.6, B37.7, B37.80, B37.81, B37.82, B37.83, B37.88, B37.9, B38.0, B38.1, B38.2, B38.3, B38.4, B38.7, B38.8, B38.9, B39.0, B39.1, B39.2, B39.3, B39.4, B39.5, B39.9, B40.0, B40.1, B40.2, B40.3, B40.7, B40.8, B40.9, B41.0, B41.7, B41.8, B41.9, B42.0, B42.1, B42.7, B42.8, B42.9, B43.0, B43.8, B43.9, B44.0, B44.1, B44.2, B44.7, B44.8, B44.9, B45.0, B45.1, B45.2, B45.3, B45.7, B45.8, B45.9, B46.0, B46.1, B46.2, B46.3, B46.4, B46.5, B46.8, B46.9, B47.0, B47.1, B47.9, B48.0, B48.1, B48.2, B48.3, B48.4, B48.7, B48.8, B49, B50.0, B50.8, B50.9, B51.0, B51.8, B51.9, B52.0, B52.8, B52.9, B53.0, B53.1, B53.8, B54, B55.0, B55.1, B55.2, B55.9, B56.0, B56.1, B56.9, B57.0, B57.1, B57.2, B57.3, B57.4, B57.5, B58.0, B58.1, B58.2, B58.3, B58.8, B58.9, B59, B60.0, B60.1, B60.2, B60.8, B64, B65.0, B65.1, B65.2, B65.3, B65.8, B65.9, B66.0, B66.1, B66.2, B66.3, B66.4, B66.5, B66.8, B66.9, B67.0, B67.1, B67.2, B67.3, B67.4, B67.5, B67.6, B67.7, B67.8, B67.9, B68.0, B68.1, B68.9, B69.0, B69.1, B69.8, B69.9, B70.0, B70.1, B71.0, B71.1, B71.8, B71.9, B72, B73, B74.0, B74.1, B74.2, B74.3, B74.4, B74.8, B74.9, B75, B76.0, B76.1, B76.8, B76.9, B77.0, B77.8, B77.9, B78.0, B78.1, B78.7, B78.9, B79, B80, B81.0, B81.1, B81.2, B81.3, B81.4, B81.8, B82.0, B82.9, B83.0, B83.1, B83.2, B83.3, B83.4, B83.8, B83.9, B85.0, B85.1, B85.2, B85.3, B85.4, B86, B87.0, B87.1, B87.2, B87.3, B87.4, B87.8, B87.9, B88.0, B88.1, B88.2, B88.3, B88.8, B88.9, B89, B90.0, B90.1, B90.2, B90.8, B90.9, B91, B92, B94.0, B94.1, B94.2, B94.8, B94.9, B95.0, B95.1, B95.2, B95.3, B95.40, B95.48, B95.5, B95.6, B95.7, B95.8, B96.0, B96.1, B96.2, B96.3, B96.4, B96.5, B96.6, B96.7, B96.80, B96.88, B97.0, B97.1, B97.2, B97.3, B97.4, B97.5, B97.6, B97.7, B97.8, B99, D86.0, D86.1, D86.2, D86.3, D86.8, D86.9, G36.1, I79.0, I79.1, J02.0, J03.0, J67.90, L08.1, L94.6, M02.30, M02.31, M02.32, M02.33, M02.34, M02.35, M02.36, M02.37, M02.38, M02.39, M35.2, N34.1, P35.0, P35.1, P35.2, P35.3, P35.8, P35.9, P36.0, P36.1, P36.2, P36.3, P36.4, P36.5, P36.8, P36.9, P37.0, P37.1, P37.2, P37.3, P37.4, P37.5, P37.8, P37.9, P38, P39.0, P39.1, P39.2, P39.3, P39.4, P39.8, P39.9, U04.90, and U04.91. Injury: G97.2, G97.8, G97.9, H59.0, H59.80, H59.88, H59.9, I97.8, I97.9, J95.4, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	M02.25, M02.26, M02.27, M02.28, M02.29, M10.10, M10.11, M10.12, M10.13, M10.14, M10.15, M10.16, M10.17, M10.18, M10.19, M96.6, M96.8, M96.9, N98.0, N98.1, N98.2, N98.3, N98.8, N98.9, N99.0, N99.50, N99.51, N99.52, N99.59, N99.8, N99.9, S00.0, S00.1, S00.2, S00.3, S00.4, S00.5, S00.7, S00.8, S00.9, S03.0, S03.1, S03.3, S03.4, S03.5, S04.00, S04.08, S04.10, S04.18, S04.20, S04.28, S04.30, S04.38, S04.40, S04.48, S04.50, S04.58, S04.60, S04.68, S04.70, S04.78, S04.80, S04.88, S04.90, S04.98, S05.0, S05.1, S05.8, S05.9, S07.0, S07.1, S07.8, S07.9, S09.0, S09.10, S09.18, S09.7, S09.8, S09.9, S10.0, S10.1, S10.7, S10.8, S10.9, S13.0, S13.1, S13.2, S13.3, S13.40, S13.41, S13.42, S13.48, S13.5, S13.6, S14.0, S14.10, S14.11, S14.12, S14.13, S14.18, S14.19, S14.20, S14.28, S14.30, S14.38, S14.40, S14.48, S14.50, S14.58, S14.60, S14.68, S15.0, S15.1, S15.2, S15.3, S15.7, S15.8, S15.9, S16.0, S16.8, S17.0, S17.8, S17.9, S19.7, S19.8, S19.9, S20.0, S20.1, S20.2, S20.3, S20.4, S20.7, S20.8, S23.0, S23.1, S23.2, S23.3, S23.4, S23.5, S24.0, S24.10, S24.11, S24.12, S24.13, S24.18, S24.19, S24.20, S24.28, S24.30, S24.38, S24.40, S24.48, S24.50, S24.58, S24.60, S24.68, S25.0, S25.1, S25.2, S25.3, S25.4, S25.5, S25.7, S25.8, S25.9, S28.0, S28.1, S29.00, S29.08, S29.7, S29.8, S29.9, S30.0, S30.1, S30.20, S30.21, S30.22, S30.28, S30.29, S30.7, S30.80, S30.81, S30.82, S30.83, S30.84, S30.85, S30.88, S30.9, S33.0, S33.1, S33.2, S33.3, S33.4, S33.5, S33.6, S33.7, S34.0, S34.10, S34.11, S34.12, S34.13, S34.18, S34.19, S34.20, S34.28, S34.30, S34.38, S34.40, S34.48, S34.50, S34.58, S34.60, S34.68, S34.80, S34.88, S35.0, S35.1, S35.2, S35.3, S35.4, S35.5, S35.7, S35.8, S35.9, S38.0, S38.1, S39.00, S39.08, S39.6, S39.7, S39.8, S39.9, S40.0, S40.7, S40.8, S40.9, S41.00, S41.01, S41.10, S41.11, S41.70, S41.71, S41.80, S41.81, S43.5, S43.6, S43.70, S43.71, S43.72, S43.73, S43.78, S43.79, S44.00, S44.08, S44.10, S44.18, S44.20, S44.28, S44.30, S44.38, S44.40, S44.48, S44.50, S44.58, S44.70, S44.78, S44.80, S44.88, S44.90, S44.98, S45.0, S45.1, S45.2, S45.3, S45.7, S45.8, S45.9, S46.00, S46.08, S46.10, S46.18, S46.20, S46.28, S46.30, S46.38, S46.70, S46.78, S46.80, S46.88, S46.90, S46.98, S47.0, S47.1, S47.2, S47.3, S47.7, S47.8, S48.0, S48.1, S48.9, S49.7, S49.8, S49.9, S50.0, S50.1, S50.7, S50.8, S50.9, S51.00, S51.01, S51.70, S51.71, S51.80, S51.81, S51.90, S51.91, S53.0, S53.2, S53.3, S53.40, S53.41, S53.42, S53.43, S53.48, S53.49, S54.00, S54.08, S54.10, S54.18, S54.20, S54.28, S54.30, S54.38, S54.70, S54.78, S54.80, S54.88, S54.90, S54.98, S55.0, S55.1, S55.2, S55.7, S55.8, S55.9, S56.00, S56.08, S56.10, S56.18, S56.20, S56.28, S56.30, S56.38, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	S58.1, S58.9, S59.7, S59.8, S59.9, S60.0, S60.1, S60.2, S60.7, S60.8, S60.9, S61.00, S61.01, S61.10, S61.11, S61.2, S61.70, S61.71, S61.80, S61.81, S61.90, S61.91, S63.3, S63.4, S63.50, S63.51, S63.58, S63.59, S63.60, S63.61, S63.68, S63.69, S63.70, S63.71, S63.72, S63.78, S63.79, S64.00, S64.08, S64.10, S64.18, S64.20, S64.28, S64.30, S64.38, S64.40, S64.48, S64.70, S64.78, S64.80, S64.88, S64.90, S64.98, S65.0, S65.1, S65.2, S65.3, S65.4, S65.5, S65.7, S65.8, S65.9, S66.00, S66.08, S66.10, S66.18, S66.20, S66.28, S66.30, S66.38, S66.40, S66.48, S66.50, S66.58, S66.60, S66.68, S66.70, S66.78, S66.80, S66.88, S66.90, S66.98, S67.0, S67.8, S68.0, S68.1, S68.2, S68.3, S68.4, S68.8, S68.9, S69.7, S69.8, S69.9, S70.0, S70.1, S70.7, S70.8, S70.9, S71.00, S71.01, S71.10, S71.11, S71.70, S71.71, S71.80, S71.81, S73.10, S73.11, S73.18, S73.19, S74.00, S74.08, S74.10, S74.18, S74.20, S74.28, S74.70, S74.78, S74.80, S74.88, S74.90, S74.98, S75.0, S75.1, S75.2, S75.7, S75.8, S75.9, S76.00, S76.08, S76.10, S76.18, S76.20, S76.28, S76.30, S76.38, S76.40, S76.48, S76.70, S76.78, S77.0, S77.1, S77.2, S78.0, S78.1, S78.9, S79.7, S79.8, S79.9, S80.0, S80.1, S80.7, S80.8, S80.9, S81.00, S81.01, S81.70, S81.71, S81.80, S81.81, S81.90, S81.91, S83.20, S83.21, S83.3, S83.6, S83.7, S84.00, S84.08, S84.10, S84.18, S84.20, S84.28, S84.70, S84.78, S84.80, S84.88, S84.90, S84.98, S85.0, S85.1, S85.2, S85.3, S85.4, S85.5, S85.7, S85.8, S85.9, S86.00, S86.08, S86.10, S86.18, S86.20, S86.28, S86.30, S86.38, S86.70, S86.78, S86.80, S86.88, S86.90, S86.98, S87.0, S87.8, S88.0, S88.1, S88.9, S89.7, S89.8, S89.9, S90.0, S90.1, S90.2, S90.3, S90.7, S90.8, S90.9, S91.00, S91.01, S91.10, S91.11, S91.20, S91.21, S91.30, S91.31, S91.70, S91.71, S91.72, S93.2, S93.40, S93.41, S93.42, S93.48, S93.49, S93.50, S93.51, S93.6, S94.00, S94.08, S94.10, S94.18, S94.20, S94.28, S94.30, S94.38, S94.70, S94.78, S94.80, S94.88, S94.90, S94.98, S95.0, S95.1, S95.2, S95.7, S95.8, S95.9, S96.00, S96.08, S96.10, S96.18, S96.20, S96.28, S96.70, S96.78, S96.80, S96.88, S96.90, S96.98, S97.0, S97.1, S97.8, S98.0, S98.1, S98.2, S98.3, S98.4, S99.7, S99.8, S99.9, T00.0, T00.1, T00.2, T00.3, T00.6, T00.8, T00.9, T01.20, T01.21, T01.30, T01.31, T01.60, T01.61, T02.00, T02.01, T02.10, T02.11, T02.20, T02.21, T02.30, T02.31, T02.40, T02.41, T02.50, T02.51, T02.60, T02.61, T02.70, T02.71, T02.80, T02.81, T02.90, T02.91, T03.0, T03.1, T03.2, T03.3, T03.4, T03.8, T03.9, T04.0, T04.1, T04.2, T04.3, T04.4, T04.7, T04.8, T04.9, T05.0, T05.1, T05.2, T05.3, T05.4, T05.5, T05.6, T06.0, T06.1, T06.2, T06.3, T06.4, T06.5 T06.8, T07, T08.0, T08.1, T09.0, T09.5, T09.8, T09.9, T10.0, T10.1, T11.0, T11.1, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	T13.6, T13.8, T13.9, T14.0, T14.20, T14.21, T14.3, T14.4, T14.5, T14.6, T14.7, T14.8, T14.9, T33.0, T33.1, T33.2, T33.3, T33.4, T33.5, T33.6, T33.7, T33.8, T33.9, T34.0, T34.1, T34.2, T34.3, T34.4, T34.5, T34.6, T34.7, T34.8, T34.9, T35.0, T35.1, T35.2, T35.3, T35.4, T35.5, T35.6, T35.7, T36.0, T36.1, T36.2, T36.3, T36.4, T36.5, T36.6, T36.7, T36.8, T36.9, T37.0, T37.1, T37.2, T37.3, T37.4, T37.5, T37.8, T37.9, T38.0, T38.1, T38.2, T38.3, T38.4, T38.5, T38.6, T38.7, T38.8, T38.9, T39.0, T39.1, T39.2, T39.3, T39.4, T39.8, T39.9, T40.0, T40.1, T40.2, T40.3, T40.4, T40.5, T40.6, T40.7, T40.8, T40.9, T41.0, T41.1, T41.2, T41.3, T41.4, T41.5, T42.0, T42.1, T42.2, T42.3, T42.4, T42.5, T42.6, T42.7, T42.8, T43.0, T43.1, T43.2, T43.3, T43.4, T43.5, T43.6, T43.8, T43.9, T44.0, T44.1, T44.2, T44.3, T44.4, T44.5, T44.6, T44.7, T44.8, T44.9, T45.0, T45.1, T45.2, T45.3, T45.4, T45.5, T45.6, T45.7, T45.8, T45.9, T46.0, T46.1, T46.2, T46.3, T46.4, T46.5, T46.6, T46.7, T46.8, T46.9, T47.0, T47.1, T47.2, T47.3, T47.4, T47.5, T47.6, T47.7, T47.8, T47.9, T48.0, T48.1, T48.2, T48.3, T48.4, T48.5, T48.6, T48.7, T49.0, T49.1, T49.2, T49.3, T49.4, T49.5, T49.6, T49.7, T49.8, T49.9, T50.0, T50.1, T50.2, T50.3, T50.4, T50.5, T50.6, T50.7, T50.8, T50.9, T51.0, T51.1, T51.2, T51.3, T51.8, T51.9, T52.0, T52.1, T52.2, T52.3, T52.4, T52.8, T52.9, T53.0, T53.1, T53.2, T53.3, T53.4, T53.5, T53.6, T53.7, T53.9, T54.0, T54.1, T54.2, T54.3, T54.9, T55, T56.0, T56.1, T56.2, T56.3, T56.4, T56.5, T56.6, T56.7, T56.8, T56.9, T57.0, T57.1, T57.2, T57.3, T57.8, T57.9, T58, T59.0, T59.1, T59.2, T59.3, T59.4, T59.5, T59.6, T59.7, T59.8, T59.9, T60.0, T60.1, T60.2, T60.3, T60.4, T60.8, T60.9, T61.0, T61.1, T61.2, T61.8, T61.9, T62.0, T62.1, T62.2, T62.8, T62.9, T63.0, T63.1, T63.2, T63.3, T63.4, T63.5, T63.6, T63.8, T63.9, T64, T65.0, T65.1, T65.2, T65.3, T65.4, T65.5, T65.6, T65.8, T65.9, T66, T67.0, T67.1, T67.2, T67.3, T67.4, T67.5, T67.6, T67.7, T67.8, T67.9, T68, T69.0, T69.1, T69.8, T69.9, T70.0, T70.1, T70.2, T70.3, T70.4, T70.8, T70.9, T71, T73.0, T73.1, T73.2, T73.3, T73.8, T73.9, T74.0, T74.1, T74.2, T74.3, T74.8, T74.9, T75.0, T75.1, T75.20, T75.21, T75.22, T75.28, T75.29, T75.3, T75.4, T75.80, T75.81, T75.88, T78.00, T78.01, T78.02, T78.03, T78.04, T78.05, T78.06, T78.07, T78.08, T78.09, T78.1, T78.2, T78.3, T78.4, T78.8, T78.9, T79.0, T79.1, T79.2, T79.3, T79.4, T79.5, T79.6, T79.7, T79.8, T79.9, T80.0, T80.1, T80.2, T80.3, T80.4, T80.5, T80.6, T80.8, T80.9, T81.0, T81.1, T81.2, T81.3, T81.4, T81.50, T81.51, T81.52, T81.58, T81.59, T81.6, T81.7, T81.80, T81.81, T81.82, T81.88, T81.9, T82.0, T82.1, T82.2, T82.3, T82.4, T82.5, T82.6, T82.7, T82.8, T82.9, T83.0, T83.1, T83.2, T83.3, T83.4, T83.5, T83.6, T83.8, T83.9, T84.00, T84.01, T84.02, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	T84.15, T84.19, T84.20, T84.21, T84.22, T84.23, T84.24, T84.28, T84.3, T84.4, T84.50, T84.51, T84.52, T84.53, T84.54, T84.55, T84.58, T84.59, T84.60, T84.61, T84.62, T84.63, T84.64, T84.65, T84.68, T84.69, T84.7, T84.8, T84.9, T85.0, T85.1, T85.2, T85.3, T85.4, T85.5, T85.6, T85.7, T85.8, T85.9, T86.9, T87.30, T87.31, T87.32, T87.35, T87.36, T87.37, T87.38, T87.39, T87.40, T87.41, T87.42, T87.45, T87.46, T87.47, T87.48, T87.49, T87.50, T87.51, T87.52, T87.55, T87.56, T87.57, T87.58, T87.59, T87.60, T87.61, T87.62, T87.65, T87.66, T87.67, T87.68, T87.69, T88.0, T88.1, T88.2, T88.3, T88.4,T88.5, T88.6, T88.7, T88.8, T88.9, T90.0, T90.1, T90.2, T90.3, T90.4, T90.5, T90.8, T90.9, T91.0, T91.1, T91.2, T91.3, T91.4, T91.5, T91.8, T91.9, T92.0, T92.1, T92.2, T92.3, T92.4, T92.5, T92.6, T92.8, T92.9, T93.0, T93.1, T93.2, T93.3, T93.4, T93.5, T93.6, T93.8, T93.9, T94.0, T94.1, T95.0, T95.1, T95.2, T95.3, T95.4, T95.8, T95.9, T96.0, T96.1, T96.2, T96.9, T97.0, T97.1, T97.2, T97.9, T98.0, T98.1, T98.2, T98.3, U98.0, U98.1, U98.2, U98.3, U98.4, U98.5, U98.6, U98.7, U98.8, U98.9, V01.0, V01.1, V01.9, V02.0, V02.1, V02.9, V03.0, V03.1, V03.9, V04.0, V04.1, V04.9, V05.0, V05.1, V05.9, V06.0, V06.1, V06.9, V09.0, V09.1, V09.2, V09.3, V09.9, V10.0, V10.1, V10.2, V10.3, V10.4, V10.5, V10.9, V11.0, V11.1, V11.2, V11.3, V11.4, V11.5, V11.9, V12.0, V12.1, V12.2, V12.3, V12.4, V12.5, V12.9, V13.0, V13.1, V13.2, V13.3, V13.4, V13.5, V13.9, V14.0, V14.1, V14.2, V14.3, V14.4, V14.5, V14.9, V15.0, V15.1, V15.2, V15.3, V15.4, V15.5, V15.9, V16.0, V16.1, V16.2, V16.3, V16.4, V16.5, V16.9, V17.0, V17.1, V17.2, V17.3, V17.4, V17.5, V17.9, V18.0, V18.1, V18.2, V18.3, V18.4, V18.5, V18.9, V19.0, V19.1, V19.2, V19.3, V19.4, V19.5, V19.6, V19.8, V19.9, V20.0, V20.1, V20.2, V20.3, V20.4, V20.5, V20.9, V21.0, V21.1, V21.2, V21.3, V21.4, V21.5, V21.9, V22.0, V22.1, V22.2, V22.3, V22.4, V22.5, V22.9, V23.0, V23.1, V23.2, V23.3, V23.4, V23.5, V23.9, V24.0, V24.1, V24.2, V24.3, V24.4, V24.5, V24.9, V25.0, V25.1, V25.2, V25.3, V25.4, V25.5, V25.9, V26.0, V26.1, V26.2, V26.3, V26.4, V26.5, V26.9, V27.0, V27.1, V27.2, V27.3, V27.4, V27.5, V27.9, V28.0, V28.1, V28.2, V28.3, V28.4, V28.5, V28.9, V29.0, V29.1, V29.2, V29.3, V29.4, V29.5, V29.6, V29.8, V29.9, V30.0, V30.1, V30.2, V30.3, V30.4, V30.5, V30.6, V30.7, V30.9, V31.0, V31.1, V31.2, V31.3, V31.4, V31.5, V31.6, V31.7, V31.9, V32.0, V32.1, V32.2, V32.3, V32.4, V32.5, V32.6, V32.7, V32.9, V33.0, V33.1, V33.2, V33.3, V33.4, V33.5, V33.6, V33.7, V33.9, V34.0, V34.1, V34.2, V34.3, V34.4, V34.5, V34.6, V34.7, V34.9, V35.0, V35.1, V35.2, V35.3, V35.4, V35.5, V35.6, V35.7, V35.9, V36.0, V36.1, V36.2, V36.3, V36.4, V36.5, V36.6, V36.7, V36.9, V37.0, V37.1, V37.2, V37.3, V37.4, V37.5, V37.6, V37.7, V37.9, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	V39.3, V39.4, V39.5, V39.6, V39.8, V39.9, V40.0, V40.1, V40.2, V40.3, V40.4, V40.5, V40.6, V40.7, V40.9, V41.0, V41.1, V41.2, V41.3, V41.4, V41.5, V41.6, V41.7, V41.9, V42.0, V42.1, V42.2, V42.3, V42.4, V42.5, V42.6, V42.7, V42.9, V43.0, V43.1, V43.2, V43.3, V43.4, V43.5, V43.6, V43.7, V43.9, V44.0, V44.1, V44.2, V44.3, V44.4, V44.5, V44.6, V44.7, V44.9, V45.0, V45.1, V45.2, V45.3, V45.4, V45.5, V45.6, V45.7, V45.9, V46.0, V46.1, V46.2, V46.3, V46.4, V46.5, V46.6, V46.7, V46.9, V47.0, V47.1, V47.2, V47.3, V47.4, V47.5, V47.6, V47.7, V47.9, V48.0, V48.1, V48.2, V48.3, V48.4, V48.5, V48.6, V48.7, V48.9, V49.0, V49.1, V49.2, V49.3, V49.4, V49.5, V49.6, V49.8, V49.9, V50.0, V50.1, V50.2, V50.3, V50.4, V50.5, V50.6, V50.7, V50.9, V51.0, V51.1, V51.2, V51.3, V51.4, V51.5, V51.6, V51.7, V51.9, V52.0, V52.1, V52.2, V52.3, V52.4, V52.5, V52.6, V52.7, V52.9, V53.0, V53.1, V53.2, V53.3, V53.4, V53.5, V53.6, V53.7, V53.9, V54.0, V54.1, V54.2, V54.3, V54.4, V54.5, V54.6, V54.7, V54.9, V55.0, V55.1, V55.2, V55.3, V55.4, V55.5, V55.6, V55.7, V55.9, V56.0, V56.1, V56.2, V56.3, V56.4, V56.5, V56.6, V56.7, V56.9, V57.0, V57.1, V57.2, V57.3, V57.4, V57.5, V57.6, V57.7, V57.9, V58.0, V58.1, V58.2, V58.3, V58.4, V58.5, V58.6, V58.7, V58.9, V59.0, V59.1, V59.2, V59.3, V59.4, V59.5, V59.6, V59.8, V59.9, V60.0, V60.1, V60.2, V60.3, V60.4, V60.5, V60.6, V60.7, V60.9, V61.0, V61.1, V61.2, V61.3, V61.4, V61.5, V61.6, V61.7, V61.9, V62.0, V62.1, V62.2, V62.3, V62.4, V62.5, V62.6, V62.7, V62.9, V63.0, V63.1, V63.2, V63.3, V63.4, V63.5, V63.6, V63.7, V63.9, V64.0, V64.1, V64.2, V64.3, V64.4, V64.5, V64.6, V64.7, V64.9, V65.0, V65.1, V65.2, V65.3, V65.4, V65.5, V65.6, V65.7, V65.9, V66.0, V66.1, V66.2, V66.3, V66.4, V66.5, V66.6, V66.7, V66.9, V67.0, V67.1, V67.2, V67.3, V67.4, V67.5, V67.6, V67.7, V67.9, V68.0, V68.1, V68.2, V68.3, V68.4, V68.5, V68.6, V68.7, V68.9, V69.0, V69.1, V69.2, V69.3, V69.4, V69.5, V69.6, V69.8, V69.9, V70.0, V70.1, V70.2, V70.3, V70.4, V70.5, V70.6, V70.7, V70.9, V71.0, V71.1, V71.2, V71.3, V71.4, V71.5, V71.6, V71.7, V71.9, V72.0, V72.1, V72.2, V72.3, V72.4, V72.5, V72.6, V72.7, V72.9, V73.0, V73.1, V73.2, V73.3, V73.4, V73.5, V73.6, V73.7, V73.9, V74.0, V74.1, V74.2, V74.3, V74.4, V74.5, V74.6, V74.7, V74.9, V75.0, V75.1, V75.2, V75.3, V75.4, V75.5, V75.6, V75.7, V75.9, V76.0, V76.1, V76.2, V76.3, V76.4, V76.5, V76.6, V76.7, V76.9, V77.0, V77.1, V77.2, V77.3, V77.4, V77.5, V77.6, V77.7, V77.9, V78.0, V78.1, V78.2, V78.3, V78.4, V78.5, V78.6, V78.7, V78.9, V79.0, V79.1, V79.2, V79.3, V79.4, V79.5, V79.6, V79.8, V79.9, V80.0, V80.1, V80.2, V80.3, V80.4, V80.5, V80.6, V80.7, V80.8, V80.9, V81.0, V81.1, V81.2, V81.3, V81.4, V81.5, V81.6, V81.7, V81.8, V81.9, V82.0, V82.1, V82.2, V82.3, V82.4, V82.5, V82.6, V82.7, V82.8, V82.9, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

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Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	V84.3, V84.4, V84.5, V84.6, V84.7, V84.9, V85.0, V85.1, V85.2, V85.3, V85.4, V85.5, V85.6, V85.7, V85.9, V86.00, V86.08, V86.10, V86.18, V86.2, V86.30, V86.38, V86.4, V86.50, V86.51, V86.58, V86.60, V86.61, V86.68, V86.7, V86.90, V86.91, V86.98, V87.0, V87.1, V87.2, V87.3, V87.4, V87.5, V87.6, V87.7, V87.8, V87.9, V88.0, V88.1, V88.2, V88.3, V88.4, V88.5, V88.6, V88.7, V88.8, V88.9, V89.1, V89.2, V89.3, V89.9, V90.0, V90.1, V90.2, V90.3, V90.4, V90.5, V90.6, V90.7, V90.8, V90.9, V91.0, V91.1, V91.2, V91.3, V91.4, V91.5, V91.6, V91.7, V91.8, V91.9, V92.0, V92.1, V92.2, V92.3, V92.4, V92.5, V92.6, V92.7, V92.8, V92.9, V92.8, V92.9, V93.0, V93.1, V93.2, V93.3, V93.4, V93.5, V93.6, V93.7, V93.8, V93.9, V94.0, V94.1, V94.2, V94.3, V94.4, V94.5, V94.6, V94.7, V94.8, V94.9, V95.0, V95.1, V95.2, V95.3, V95.4, V95.8, V95.9, V96.0, V96.1, V96.2, V96.8, V96.9, V97.0, V97.1, V97.2, V97.3, V97.8, V98, V99, W00, W01, W02.00, W02.01, W02.02, W02.03, W02.04, W02.08, W03, W04, W05.00, W05.01, W05.02, W05.03, W05.08, W05.09, W06, W07, W08, W09, W10, W11, W12.W13, W14, W15, W16, W17, W18, W19, W20, W21.00, W21.01, W21.02, W21.03, W21.08, W21.09, W22.00, W22.01, W22.02, W22.03, W22.04, W22.05, W22.07, W22.08, W22.09, W23, W24, W25, W26, W27, W28, W29, W30, W31, W32, W33, W34.00, W34.01, W34.08, W34.09, W35, W36, W37, W38, W39, W40, W41, W42, W43, W44, W45, W49, W50, W51.00, W51.01, W51.02, W51.03, W51.04, W51.05, W51.07, W51.08, W51.09, W52, W53, W54, W55, W56, W57, W58, W59, W60, W64, W65, W66, W67, W68, W69, W70, W73, W74, W75, W76, W77, W78, W79, W80, W81, W83, W84, W85, W86, W87, W88, W89, W90, W91, W92, W93, W94, W99, X00, X01, X02, X03, X04, X05, X06, X08, X09, X10, X11, X12, X13, X14, X15, X16, X17, X18, X19, X20, X21, X22, X23, X24, X25, X26, X27, X28, X29, X30, X31, X32, X33, X34, X35, X36, X37.00, X37.01, X37.02, X37.08, X37.09, X38, X39, X40, X41, X42, X43, X44, X45, X46, X47, X48, X49, X50, X51, X52, X53, X54, X57, X58, X59, X60, X61, X62, X63, X64, X65, X66, X67, X68, X69, X70, X71, X72, X73, X74.00, X74.01, X74.08, X74.09, X75, X76, X77, X78, X79, X80, X81, X82, X83, X84, X85, X86, X87, X88, X89, X90, X91, X92, X93, X94, X95.00, X95.01, X95.08, X95.09, X96, X97, X98, X99, Y00, Y01, Y02, Y03, Y04, Y05, Y06.0, Y06.1, Y06.2, Y06.8, Y06.9, Y07.0, Y07.1, Y07.2, Y07.3, Y07.8, Y07.9, Y08, Y09, Y10, Y11, Y12, Y13, Y14, Y15, Y16, Y17, Y18, Y19, Y20, Y21, Y22, Y23, Y24.00, Y24.01, Y24.08, Y24.09, Y25, Y26, Y27, Y28, Y29, Y30, Y31, Y32, Y33, Y34, Y35.0, Y35.1, Y35.2, Y35.3, Y35.4, Y35.5, Y35.6, Y35.7, Y36.0, Y36.1, Y36.2, Y36.3, Y36.4, Y36.5, Y36.6, Y36.7, Y36.8, Y36.9, Y85.0, Y85.9, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	Y90.5, Y90.6, Y90.7, Y90.8, Y90.9, Y91.0, Y91.1, Y91.2, Y91.3, Y91.9, Y95, Y96, Y97, and Y98. Maternal Conditions/Complications: P00.0, P00.1, P00.2, P00.3, P00.4, P00.5, P00.6, P00.7, P00.8, P00.9, P01.0, P01.1, P01.2, P01.3, P01.4, P01.5, P01.6, P01.7, P01.8, P01.9, P04.1, P04.2, P04.3, P04.4, P04.5, P04.6, P04.8, P04.9, and Q86.0. Nervous System: B43.1, E75.0, E75.1, E75.4, F84.2, G00.0, G00.1, G00.2, G00.3, G00.8, G00.9, G01, G02.0, G02.1, G02.8, G03.0, G03.1, G03.2, G03.8, G03.9, G04.0, G04.1, G04.2, G04.8, G04.9, G05.0, G05.1, G05.2, G05.8, G06.0, G06.1, G06.2, G07, G08, G09, G10, G11.0, G11.1, G11.2, G11.3, G11.4, G11.8, G11.9, G12.0, G12.1, G12.2, G12.8, G12.9, G13.0, G13.1, G13.2, G13.8, G20, G21.0, G21.1, G21.2, G21.3, G21.8, G21.9, G22, G23.0, G23.1, G23.2, G23.8, G23.9, G24.0, G24.1, G24.2, G24.3, G24.4, G24.5, G24.8, G24.9, G25.0, G25.1, G25.2, G25.3, G25.4, G25.5, G25.6, G25.8, G25.9, G26, G30.0, G30.1, G30.8, G30.9, G31.0, G31.1, G31.8, G31.9, G32.0, G32.8, G35, G36.0, G36.8, G36.9, G37.0, G37.1, G37.2, G37.3, G37.4, G37.5, G37.8, G37.9, G40.0, G40.1, G40.2, G40.3, G40.4, G40.5, G40.6, G40.7, G40.8, G40.9, G41.0, G41.1, G41.2, G41.8, G41.9, G43.0, G43.1, G43.2, G43.3, G43.8, G43.9, G44.0, G45.3, G46.3, G46.8, G47.4, G50.0, G50.1, G50.8, G50.9, G51.0, G51.1, G51.2, G51.3, G51.4, G51.8, G51.9, G52.0, G52.1, G52.2, G52.3, G52.7, G52.8, G52.9, G53.0, G53.1, G53.2, G53.3, G53.8, G54.0, G54.1, G54.2, G54.3, G54.4, G54.5, G54.6, G54.7, G54.8, G54.9, G55.0, G55.1, G55.2, G55.3, G55.8, G56.0, G56.1, G56.2, G56.3, G56.4, G56.8, G56.9, G57.0, G57.1, G57.2, G57.3, G57.4, G57.5, G57.6, G57.7, G57.8, G57.9, G58.0, G58.7, G58.8, G58.9, G59.0, G59.8, G60.0, G60.1, G60.2, G60.3, G60.8, G60.9, G61.0, G61.1, G61.8, G61.9, G62.0, G62.1, G62.2, G62.8, G62.9, G63.0, G63.1, G63.2, G63.3, G63.4, G63.5, G63.6, G63.8, G64, G70.0, G70.1, G70.2, G70.8, G70.9, G71.0, G71.1, G71.2, G71.3, G71.8, G71.9, G72.0, G72.1, G72.2, G72.3, G72.4, G72.8, G72.9, G73.0, G73.1, G73.2, G73.3, G73.4, G73.5, G73.6, G73.7, G80.0, G80.1, G80.2, G80.3, G80.4, G80.8, G80.9, G81.00, G81.01, G81.09, G81.10, G81.11, G81.19, G81.90, G81.91, G81.99, G83.0, G83.1, G83.20, G83.21, G83.22, G83.3, G83.4, G83.5, G83.8, G83.9, G90.0, G90.2, G90.3, G90.8, G90.9, G91.0, G91.1, G91.2, G91.3, G91.8, G91.9, G92, G93.0, G93.1, G93.2, G93.4, G93.5, G93.6, G93.7, G93.81, G93.88, G93.9, G94.0, G94.1, G94.2, G94.8, G95.0, G95.1, G95.2, G95.8, G95.9, G96.00, G96.01, G96.02, G96.08, G96.09, G96.1, G96.8, G96.9, G97.1, G98, G99.0, G99.1, G99.2, G99.8, H00.0, H00.1, H01.0, H01.1, H01.8, H01.9, H02.0, H02.1, H02.2, H02.3, H02.4, H02.5, H02.7, H02.8, H02.9, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	H05.0, H05.1, H05.2, H05.3, H05.4, H05.5, H05.8, H05.9, H06.0, H06.1, H06.2, H06.3, H10.0, H10.1, H10.2, H10.3, H10.4, H10.5, H10.8, H10.9, H11.0, H11.1, H11.2, H11.3, H11.4, H11.8, H11.9, H13.0, H13.1, H13.2, H13.3, H13.8, H15.0, H15.1, H15.8, H15.9, H16.0, H16.1, H16.2, H16.3, H16.4, H16.8, H16.9, H17.0, H17.1, H17.8, H17.9, H18.0, H18.1, H18.2, H18.3, H18.4, H18.5, H18.6, H18.7, H18.8, H18.9, H19.0, H19.1, H19.2, H19.3, H19.8, H20.0, H20.1, H20.2, H20.8, H20.9, H21.0, H21.1, H21.2, H21.3, H21.4, H21.5, H21.8, H21.9, H22.0, H22.1, H22.8, H25.0, H25.1, H25.2, H25.8, H25.9, H26.0, H26.1, H26.2, H26.3, H26.4, H26.8, H26.9, H27.0, H27.1, H27.8, H27.9, H28.0, H28.1, H28.2, H28.8, H30.0, H30.1, H30.2, H30.8, H30.9, H31.0, H31.1, H31.2, H31.3, H31.4, H31.8, H31.9, H32.0, H32.8, H33.0, H33.1, H33.2, H33.3, H33.4, H33.5, H34.0, H34.1, H34.2, H34.8, H34.9, H35.0, H35.1, H35.2, H35.3, H35.4, H35.5, H35.6, H35.7, H35.8, H35.9, H36.0, H36.8, H40.0, H40.1, H40.2, H40.3, H40.4, H40.5, H40.6, H40.8, H40.9, H42.0, H42.8, H43.0, H43.1, H43.2, H43.3, H43.8, H43.9, H44.0, H44.1, H44.2, H44.3, H44.4, H44.5, H44.6, H44.7, H44.8, H44.9, H45.0, H45.1, H45.8, H46, H47.0, H47.1, H47.20, H47.28, H47.3, H47.4, H47.5, H47.6, H47.7, H48.0, H48.1, H48.8, H49.0, H49.1, H49.2, H49.3, H49.4, H49.8, H49.9, H50.0, H50.1, H50.2, H50.3, H50.4, H50.5, H50.6, H50.8, H50.9, H51.0, H51.1, H51.2, H51.8, H51.9, H52.0, H52.1, H52.2, H52.3, H52.4, H52.5, H52.6, H52.7, H53.0, H53.1, H53.2, H53.3, H53.4, H53.5, H53.6, H53.8, H53.9, H54.0, H54.1, H54.2, H54.3, H54.4, H54.5, H54.6, H54.7, H55, H57.0, H57.1, H57.8, H57.9, H58.0, H58.1, H58.8, H59.81, H60.0, H60.1, H60.2, H60.3, H60.4, H60.5, H60.8, H60.9, H61.0, H61.1, H61.2, H61.3, H61.8, H61.9, H62.0, H62.1, H62.2, H62.3, H62.4, H62.8, H65.0, H65.1, H65.2, H65.3, H65.4, H65.9, H66.0, H66.1, H66.2, H66.3, H66.4, H66.9, H67.0, H67.1, H67.8, H68.0, H68.1, H69.0, H69.8, H69.9, H70.0, H70.1, H70.2, H70.8, H70.9, H71, H72.0, H72.1, H72.2, H72.8, H72.9, H73.0, H73.1, H73.8, H73.9, H74.0, H74.1, H74.2, H74.3, H74.4, H74.8, H74.9, H75.0, H75.8, H80.0, H80.1, H80.2, H80.8, H80.9, H81.0, H81.1, H81.2, H81.3, H81.4, H81.8, H81.9, H82, H83.0, H83.1, H83.2, H83.3, H83.8, H83.9, H90.0, H90.1, H90.2, H90.3, H90.4, H90.5, H90.6, H90.7, H90.8, H91.0, H91.1, H91.2, H91.3, H91.8, H91.9, H92.0, H92.1, H92.2, H93.0, H93.1, H93.2, H93.3, H93.8, H93.9, H94.0, H94.8, H95.0, H95.1, H95.8, H95.9, Q15.0, and R44.1. Respiratory System: A48.1, J00, J01.0, J01.1, J01.2, J01.3, J01.4, J01.8, J01.9, J02.8, J02.9, J03.8, J03.9, J04.0, J04.1, J04.2, J05.0, J05.1, J06.0, J06.8, J06.9, J10.0, J10.1, J10.8, J11.0, J11.1, J11.8, J12.0, J12.1, J12.2, J12.8, J12.9, J13, J14, J15.0, *	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics

* Continued

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Causes of Neonatal and Postneonatal Death	J17.1, J17.2, J17.3, J17.8, J18.0, J18.1, J18.2, J18.8, J18.9, J20.0, J20.1, J20.2, J20.3, J20.4, J20.5, J20.6, J20.7, J20.8, J20.9, J21.0, J21.8, J21.9, J22, J30.0, J30.1, J30.2, J30.3, J30.4, J31.0, J31.1, J31.2, J32.0, J32.1, J32.2, J32.3, J32.4, J32.8, J32.9, J33.0, J33.1, J33.8, J33.9, J34.0, J34.1, J34.2, J34.3, J34.8, J35.0, J35.1, J35.2, J35.3, J35.8, J35.9, J36, J37.0, J37.1, J38.01, J38.02, J38.09, J38.1, J38.2, J38.3, J38.4, J38.5, J38.6, J38.7, J39.0, J39.1, J39.2, J39.3, J39.8, J39.9, J40, J41.0, J41.1, J41.8, J42, J43.0, J43.1, J43.2, J43.8, J43.9, J44.0, J44.1, J44.8, J44.9, J45.00, J45.01, J45.10, J45.11, J45.80, J45.81, J45.90, J45.91, J47, J60, J61, J62.0, J62.8, J63.0, J63.1, J63.2, J63.3, J63.4, J63.5, J63.8, J64, J65, J66.0, J66.1, J66.2, J66.8, J67.0, J67.1, J67.2, J67.3, J67.4, J67.5, J67.6, J67.7, J67.8, J67.99, J68.0, J68.1, J68.2, J68.3, J68.4, J68.8, J68.9, J69.0, J69.1, J69.8, J70.0, J70.1, J70.2, J70.3, J70.4, J70.8, J70.9, J80, J81, J82, J84.0, J84.1, J84.8, J84.9, J85.0, J85.1, J85.2, J85.3, J86.0, J86.9, J90, J91, J92.0, J92.9, J93.0, J93.1, J93.8, J93.9, J94.0, J94.1, J94.2, J94.8, J94.9, J95.00, J95.01, J95.02, J95.03, J95.08, J95.1, J95.2, J95.3, J95.5, J95.80, J96.0, J96.1, J96.9, J98.0, J98.10, J98.18, J98.2, J98.3, J98.4, J98.5, J98.6, J98.8, J98.9, J99.0, J99.1, J99.8, P22.1, P22.8, P22.9, P23.0, P23.1, P23.2, P23.3, P23.4, P23.5, P23.6, P23.8, P23.9, P24.0, P24.1, P24.2, P24.3, P24.8, P24.9, P25.0, P25.1, P25.2, P25.3, P25.8, P26.0, P26.8, P27.0, P27.1, P27.8, P27.9, P28.0, P28.1, P28.2, P28.3, P28.4, P28.5, P28.8, P28.9, R09.1, and Z90.2. Short Gestation/Low Birth Weight: P07.0, P07.1, P07.2, P07.3, and P22.0. Sudden Infant Death Syndrome: R95, R96.0, R96.1, and R98.	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics
4	Cesarean Births	The proportion of women who had a cesarean delivery was determined by dividing the number of women giving birth via a cesarean delivery by the total number of women giving birth. A woman was considered to have had a cesarean delivery if one or more codes were present. Until March 31, 2004, a positive value entered in the OBCSECT field and/or the presence ICD–9–CM procedure code of 74.0, 74.1, 74.2, 74.4, or 74.9. Starting April 1, 2004, the presence of a CCI code 5MD60. All homebirths were coded as vaginal births. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
2	Delayed Childbearing	The number of the live births to primiparous women, aged 35 and older, was divided by the total number of live births in a given time and place. Age was calculated at the time of admission for birth. For homebirths, age was determined from the Midwifery Discharge Summary Reports. For hospital births, the field obpara (with 0 being primipara and 1 being multipara) was used to determine parity. For homebirths, parity was determined from the Midwifery Discharge Summary Reports.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Stillbirths, Births occurring at less than 20 weeks gestation	Midwifery Discharge Summary Reports, Hospital Abstracts
6	Early Preterm Birth	The number of live births with a gestation of less than 34 weeks was divided by the total number of live births in a given time and place. Early Preterm is defined as a gestation of less than 34 weeks. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator RHA and Winnipeg CA: 2005/06–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Early Term Birth	Defined as a gestation of between 37 and 38 weeks	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Newborns with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts
3	Ectopic Pregnancies	The number of the women diagnosed with an ectopic pregnancy was divided by the total number of pregnancies (the total of ectopic pregnancies, induced abortions, and live and stillborn deliveries). A woman was considered to have had an ectopic pregnancy if she had an ICD–9–CM diagnosis of 633.1–633.2, 633.8–633.9 or an ICD–10–CA diagnosis of O000–O002, O008, O009.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09		Hospital Abstracts
SDO	Fetal Distress	A woman was considered to have had a newborn with fetal distress if the ICD–10–CA code of O68 was present.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
6	Five–Minute Apgar Score of 7 or Less	The number of Newborns with a five–minute Apgar score of 7 or less was divided by the total number of live births. Apgar scores measure the physiological well–being of newborn Newborns and are recorded for virtually all births in hospital. A score of 0, 1, or 2 is given for each of five vital signs (appearance, pulse, reflex, muscle tone, and breathing pattern) that are assessed at one and five minutes after birth. These five scores are added up to give a total score between 0 and 10. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Births weighing less than 500 grams, Newborns with a gestation of less than 20 weeks	Midwifery Discharge Summary Reports, Hospital Abstracts
4	Health Care Provider for Delivery	The proportion of women who received their delivery care from one of four provider types (General or Family Practitioner, Obstetrician or Gynecologist, Midwife, or a Mix of Providers) was calculated by dividing the number of women receiving care by that provider by the total number of women giving birth in a given time and place. The provider type for delivery was determined from the maternal delivery record or, in the case of home births attended by a midwife, from the Midwifery Discharge Summary Reports.	Time trends: 2001/02–2008/09; RHA and Winnipeg CA: 2001/02–2002/03 and 2007/08–2008/09		Hospital Abstracts, Midwifery Discharge Summary Reports
3	Health Care Provider for Prenatal Care	The proportion of women who received their delivery care from one of four provider types was calculated by dividing the number of women receiving care by that provider by the total number of women giving birth in a given time and place. The provider of a women's prenatal care was assigned to one of four groups: a General Practitioner or Family Physician, an Obstetrician or Gynecologist, a Midwife, or a Mix of Providers, which was based on the Maternal Delivery Record or the Midwifery Summary. As a woman may see a few different providers her pregnancy, we assigned provider type based on which provider type was responsible for two–thirds or more of the prenatal care. If no provider type provided two–thirds or more of the care, then the Mix of Providers was assigned to that woman.	Time trends: 2001/02–2008/09; RHA and Winnipeg CA: 2001/02–2002/03 and 2007/08–2008/09		Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
2	Healthy Baby Community Support Program	The number of women who participated a Community Support Program was divided by the total number of women giving birth in a given place and time. A woman was considered to have participated if she attended a Community Support Program in either the prenatal or postnatal period.	Time trends: 2001/02–2007/08; RHA, Winnipeg CA, and SDO: 2006/07–2007/08		Midwifery Discharge Summary Reports, Hospital Abstracts, Healthy Baby Community Support Program dataset
2	Healthy Baby Prenatal Benefit	The number of women who received the benefit was divided by the total number of women giving birth in a given place and time. A woman was considered to have received the prenatal benefit if at any time during the eligibility period (14 weeks until delivery) she received the benefit as coded in the Healthy Baby Prenatal Benefit Dataset.	Time trends: 2001/02–2007/08; RHA, Winnipeg CA, and SDO: 2006/07–2007/08		Midwifery Discharge Summary Reports, Hospital Abstracts, Healthy Baby Prenatal Benefit dataset
2	Income Assistance	The number of women with live births who received income assistance was divided the total number of live births in a given time and place. A woman was considered to have received income assistance if she was coded as having received income assistance anytime during the period of seven months prior to the month of the baby's delivery to one month after the baby's delivery. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Stillbirths, Out of province births	Social Assistance Management Information Network, Hospital Abstracts, Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO and Chapter 7	Income Quintiles	A method to measure the average (mean) household income of residents, ranking them from poorest to wealthiest, and then grouping them into five income quintiles (1 being poorest and 5 being wealthiest). Each quintile contains approximately 20% of the population. The income quintile measure is derived from the 2006 Statistics Canada Census data by aggregating household income to the dissemination area and then ranking neighbourhoods by income quintile. Income quintiles are available for both urban and rural populations. Income quintiles are often used as a proxy measure of socio–economic status. For Sociodemographic and Other graphs, rural and urban quintiles are reported separately; while for the multivariate analysis (chapter 7), these are reported together.	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Those for which income quintile cannot be calculated: 1) The postal code is not present on the postal code conversion file 2) The census household income value for that Dissemination Area is suppressed 3)The postal code does not indicate residence 4) The postal code is that of a PCH 5) The postal code is that of another institution 6) Missing	Manitoba Health Insurance Registry, Census Data
SDO	Indication for Previous Cesarean Birth	Categorized into three groups: 1) Breech Malpresentation (see Breech Birth) 2) Other Malpresentation (see Other Malpresentation) 3) No Malpresentation (those births without a breech or other malpresentation code)	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Those whose previous cesarean was not in Manitoba or before 1999/2000	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health Insurance Registry
2	Induced Abortions	The number of women who had an induced abortion was divided by the total number of pregnancies in a given year. An induced abortion was determined by the ICD–9–CM code of 635 or 636 or the ICD–10–CA code of O04 or O05. The total number of pregnancies was the sum of the molar pregnancies, ectopic pregnancies, spontaneous abortions, induced abortions, live births, and stillbirths in a given year.	2001/02–2009/10		Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
4	Induction of Labour	The number of women giving birth whose labour was induced (medical, surgical, and combined methods) was divided by the number of women giving birth (in a given time and place). A women was considered to have received an induction of labour by the presence of the CCI code of 5.AC.30.^ ^ . Specifically in our data the following codes appeared: 5AC.30.AL–12, 5.AC.30.CA–12, 5.AC.30.CK–12, 5.AC.30.GU–12, 5.AC.30.HA–12, 5.AC.30.YA–12, 5.AC.30.YB–12, 5.AC.30.ZZ–12, 5.AC.30.AN, 5.AC.30.AZ, 5.AC.30.CA–Z9, 5.AC.30.CK, 5.AC.30.CK–A2, 5.AC.30.CK–BD, 5.AC.30.CK–W6, and 5.AC.30.AP. Due to coding changes that occurred in 2004, this indicator was limited to 2004/05 onwards. All home births were coded as not having received an induction of labour. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2004/05–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
6	Infant Mortality	The number of live births weighing 500 grams or more that die within 0–364 days of birth was divided by the total number of live births. This indicator is reported as a rate per 1,000 live births	RHA, Winnipeg CA, and SDO: 2001/02–2008/09	Births with a gestation of less than 20 week, Newborns+E55 with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health Insurance Registry
6	Large–for–Gestational Age (LGA)	The number of births categorized as large for gestational age was divided by the total number of live births. A birth was considered to be large–for–gestational–age if the birth weight was above the standard 90th percentile for their gestational age and sex using a Canadian standard (Kramer et al., 2001). Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Multiple births, Newborns with a gestation of less than 20 weeks, Newborns with missing birth weights	Midwifery Discharge Summary Reports, Hospital Abstracts
3	Late initiation of Prenatal Care	The number of women who began care after the first trimester of pregnancy was divided by the total number of women giving birth in a given place and time. This analysis was limited to in province hospital births as the prenatal care was not well recorded on the midwifery data forms. Only medical claims data were used to identify prenatal care visits (i.e., no laboratory claims were included). The ICD–9–CM tariffs that were included are: 8400, 8401, 8501, 8507, 8509, 8529, 8540, and 8550.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Women receiving prenatal care from a midwife, Cases with missing prenatal care or trimester of first prenatal visit values	Hospital Abstracts, Medical Services (physician claims)
6	Late Preterm Birth	The number of live births with a gestation of 34–36 weeks was divided by the total number of live births in a given time and place. Late Preterm is defined as a gestation of between 34 and 36 weeks. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator RHA and Winnipeg CA: 2005/06–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
2	Live Births to Teen Mothers	The number of the live births to females aged 19 and younger was divided by the total number of live births in a given time and place. Age was calculated at the time of admission for birth. For homebirths, age was determined from the Midwifery Discharge Summary Reports.	Time trends: 2001/02– 2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts
2	Live Births to Women Aged 35 and Older	The number of the live births to females aged 35 and older was divided by the total number of live births in a given time and place. Age was calculated at the time of admission for birth. For homebirths, age was determined from the Midwifery Discharge Summary Reports.	Time trends: 2001/02– 2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts
3	Low Number of Prenatal Visits	The number of women with less than five prenatal care visits(as recorded on the maternal delivery record) prior to delivery was divided by the total number of women giving birth in a given place and time.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Home births attended by a midwife, Cases with missing prenatal care values	Hospital Abstracts, Medical Services (physician claims)
2	Marital Status – Lone Parent	The number of women with live births who were lone parents was divided by the total number of women with live births in a given time and place. A woman was considered a lone parent if according to the Families First screen (variable lone_parent indicates lone parent), she was a single parent. If the single parent variable was missing in the Families First Screen and no marriage was reported to Manitoba Health, the cases were excluded. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	Time Trends: 2003/04–2008/09; Other Analyses: 2007/08–2008/09	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths, Out of province births	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
SDO	Marital Status – Married Partnered	A woman giving birth was considered married/partnered if either a marriage was reported to Manitoba Health OR if according to the Families First screen (variable lone_parent indicated not a lone parent), she was not a single parent.	Varies depending on indicator.	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths, Out of province births	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
7	Marital Status – Unknown	A woman giving birth was considered to have the marital status of unknown if there was no marital status reported on the Families First Screen (i.e., variable was missing) or no Families First Screen was done and there was no marriage was reported to Manitoba Health.	Varies depending on indicator.		Families First, Hospital Abstracts, Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Maternal Age	The maternal age was determined at the time of birth and grouped into one of the six categories: 12–19; 20–24; 25–29; 30–34; 35–39; 40 and older. The reference group for statistical testing was the 25–29 age group.	Varies depending on indicator.		Midwifery Discharge Summary Reports, Hospital Abstracts
3	Maternal Alcohol Consumption During Pregnancy	The number of women with live births who reported consuming alcohol during pregnancy (from the Families First Screening Form, question B6) was divided by the total number of women with live births in a given time and place. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2003/04–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
SDO	Maternal Diabetes	A woman was considered to have diabetes if she had: 1) one or more hospitalizations with diagnosis code 250 (ICD–9–CM) or E10–E14 (ICD–10–CA) in any diagnosis field over three years of data **OR** 2) two or more physician claims with diagnosis code 250 over three years of data **OR** 3) one or more prescriptions for diabetic drugs – Insulins and Analogues (A10A); Blood Glucose Lowering Drugs excluding Insulin (A10BA02, A10BB01, A10BB02, A10BB03, A10BB09, A10BB12, A10BB31, A10BD03, A10BF01, A10BG02, A10BG03, A10BX02, A10BX03) over three years of data **OR** 4) one or more hospitalizations with gestational diabetes code in the gestation period (ICD–9–CM: 648.8, ICD–10–CA: O24)	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Hospital Abstracts, Physician Claims, DPIN
SDO	Maternal Education – Grade 12 Education or Higher	A woman giving birth was considered to have a Grade 12 education or higher if on the Families First Screening Data form, the variable gr_12_mom indicated Grade 12 and up.	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
2	Maternal Education – Less than a Grade 12 education	The number of women with live births who had less than a Grade 12 education was divided by the total number of women who had a live births in a given time and place. A woman was a considered to have less than a Grade 12 education if according to the Families First Screening form, the variable gr_12_mom indicated less than Grade 12. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Maternal Hospital Readmission	The number of women giving birth who are readmitted to hospital within 90 days of the initial birth hospitalization was divided by the total number of women giving birth in a given time and place.	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Outpatient procedures, Inter–hospital transfers occurring within the birth hospitalization, Maternal hospitalization for delivery with a length of stay greater than 20 days	Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Maternal Hypertension	A woman was considered to have hypertension if in the one year prior to giving birth she had: 1) at least one physician visit or one hospitalization (ICD–9–CM codes 401–405 or ICD–10–CA codes I10–I13, I15) **OR** 2) two or more prescriptions for hypertension drugs – Antihypertensives (C02AB01, C02AB02, C02AC01, C02CA04, C02CA05, C02DB02, C02DC01, C02KX01, C02LA01, C02LB01, G04CA03); Diuretics (C03AA03, C03BA04, C03BA11, C03CA01, C03CA02, C03CC01, C03DA01, C03DB01, C03DB02, C03EA01); Beta Blocking Agents (C07AA02, C07AA03, C07AA05, C07AA06, C07AA12, C07AB02, C07AB03, C07AB04, C07AB07, C07AG01, C07BA05, C07BA06, C07CA03, C07CB03); Calcium Channel Blockers (C08CA01, C08CA02, C08CA04, C08CA05, C08CA06, C08DA01, C08DB01); Agents Acting on the Renin–Angiotensin System (C09AA01, C09AA02, C09AA03, C09AA04, C09AA05, C09AA06, C09AA07, C09AA08, C09AA09, C09AA10, C09BA02, C09BA03, C09BA04, C09BA06, C09BA08, C09CA01, C09CA02, C09CA03, C09CA04, C09CA06, C09CA07, C09DA01, C09DA02, C09DA03, C09DA04, C09DA06, C09DA07) **OR** 3) At least on physician visit or one hospitalization in the gestation period (ICD–9–CM code 642 or ICD–10–CA codes O10–O16)	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Hospital Abstracts, Physician Claims, DPIN
3	Maternal Illicit Drug Use During Pregnancy	The number of women with live births who reported using illicit drugs during pregnancy (from the Families First Screening Form, question B7) was divided by the total number of women with live births in a given time and place. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2003/04–2008/09 RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
SDO	Maternal Length of Stay	The total number of days of care for an inpatient hospitalization episode 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. Direct transfers between hospitals are included in the calculation of length of stay.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
5	Maternal Postpartum Hospital Readmission	The number of women giving birth who are readmitted to hospital within 90 days of the initial birth hospitalization was divided by the total number of women giving birth in a given time and place.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; To find all possible hospital readmissions data from 2009/10 were also used	Outpatient procedures, Inter–hospital transfers occurring within the birth hospitalization, Maternal hospitalization for delivery with a length of stay greater than 20 days	Midwifery Discharge Summary Reports, Hospital Abstracts
5	Maternal Postpartum Hospital Readmission – Reasons	The primary diagnosis for readmission for women readmitted to hospital within 90 days of the initial birth hospitalization (see Maternal Hospital Readmission) was grouped into the following categories by ICD–10–CA codes: Complications of pregnancy not elsewhere classified: O12.0–O12.2, O23.0–O23.9, O26–O26.4, O26.6–O26.9, O31.0–O31.2, O86.0–O86.4, O95 Postpartum hemorrhage: O72.0–O72.3 Major puerperal infection: A34, O85, O86.8 Cholelithiasis: K80.0–K80.8 Other current conditions in the mother classifiable elsewhere, but complicating pregnancy, childbirth, or the puerperium: O24.0–O25, O99.0–O99.8, O87.1, O89.4 Person seeking consultation without complaint of sickness, postpartum care and examination: F68.1, Z58.0–Z58.9 Infection of the breast/nipple associated with childbirth: O91.0–O91.2, O92.2, N61 Hypertension complicating pregnancy, childbirth, puerperium: O10.0–O11, O13–O16 Other unspecified complication of puerperium, not elsewhere classified: O88.2, O90.0–090.5, 090.8, 090.9 Depression disorder and mood/affective psychoses: F30–F31.9, F32.2–F32.9, F33.1, F33.2, F33.4, F33.8–F34.9, F38.0–F39, F53.0, F53.1 Acute appendicitis: K35.0–K35.9, K65.0, K65.8 Acute pancreatitis: K85, K87.1 Symptoms involving abdomen and pelvis: R10.0–R10.4, R16.0–R16.1, R18, R19.0, R19.3, R19.8 Complications of procedures,not elsewhere classified: T81.0–T81.6, T81.8–T81.9, T88.4, T88.9 Retained placenta: O73.0, O73.1, N93.9 Calculus of kidney and ureter: N20–N20.9, N22.0, N22.8 Other diagnoses: Any code not mentioned above	2007/08–2008/09; To find all possible hospital readmissions data from 2009/10 were also used	Outpatient procedures, Inter–hospital transfers occurring within the birth hospitalization, Maternal hospitalization for delivery with a length of stay greater than 20 days	Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
5	Maternal Postpartum Psychological Distress	The proportion of women who were diagnosed with psychological distress in the 12 months after giving birth was calculated by dividing those with such as diagnosis by all women giving birth in given time or Place. A woman was considered to have postnatal psychological distress if in the 12 months after giving birth (or hospital discharge in case of a stillbirth) she had: 1) one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression, or adjustment reaction (ICD–9–CM codes 296.2–296.8, 300.4, 309, 311; ICD–10–CA codes F31, F32, F33, F341, F38.0, F38.1, F41.2, F43.1, F43.2, F43.8,F53.0, F93.0) **OR** 2) one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction (ICD–9–CM codes 296, 309 or 311) **OR** 3) one or more hospitalizations with a diagnosis for anxiety disorders (ICD–9–CM code 300; ICD–10–CA codes F32.0, F34.1, F40, F41, F42, F44, F45.0, F451, F452, F48, F68.0, F99) **OR** 4) one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 5) one or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300) and one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 6) one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders (ICD–9–CM codes 300.0, 300.2, 300.3; ICD–10–CA codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42) **OR** 7) two or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300)	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; To find all possible hospital readmissions data from 2009/10 were also used		Midwifery Discharge Summary Reports, Hospital Abstracts, DPIN

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
3	Maternal Prenatal Psychological Distress	The proportion of women who were diagnosed with psychological distress in the eight months prior to giving birth was calculated by dividing those with such as diagnosis by all women giving birth in given time or place. A woman was considered to have prenatal psychological distress if in the eight months prior to giving birth (or hospital discharge in case of a stillbirth) she had: 1) one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression, or adjustment reaction (ICD–9–CM codes 296.2–296.8, 300.4, 309, 311; ICD–10–CA codes F31, F32, F33, F341, F38.0, F38.1, F41.2, F43.1, F43.2, F43.8,F53.0, F93.0) **OR** 2) one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction (ICD–9–CM codes 296, 309 or 311) **OR** 3) one or more hospitalizations with a diagnosis for anxiety disorders (ICD–9–CM code 300; ICD–10–CA codes F32.0, F34.1, F40, F41, F42, F44, F45.0, F451, F452, F48, F68.0, F99) **OR** 4) one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 5) one or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300) and one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 6) one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders (ICD–9–CM codes 300.0, 300.2, 300.3; ICD–10–CA codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42) **OR** 7) two or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300)	Time trends: 2001/02–2008/09 RHA, Winnipeg CA, and SDO: 2007/08–2008/09		Midwifery Discharge Summary Reports, Hospital Abstracts, DPIN
SDO	Maternal Psychological Distress	This definition requires at least three medical claims with dx=300 in two years prior to birth. The definition is as follows: 1) one or more hospitalizations with a diagnosis for depressive disorder, affective psychoses, neurotic depression, or adjustment reaction (ICD–9–CM codes 296.2–296.8, 300.4, 309, 311; ICD–10–CA codes F31, F32, F33, F341, F38.0, F38.1, F41.2, F43.1, F43.2, F43.8, F53.0, F93.0) **OR** 2) one or more physician visits with a diagnosis for depressive disorder, affective psychoses, or adjustment reaction (ICD–9–CM codes 296, 309, or 311) **OR** 3) one or more hospitalizations with a diagnosis for anxiety disorders (ICD–9–CM code 300; ICD–10–CA codes F32.0, F34.1, F40, F41, F42, F44, F45.0, F451, F452, F48, F68.0, F99) **OR** 4) one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 5) one or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300) and one or more prescriptions for an antidepressant or mood stabilizer (ATC codes N03AB02, N03AB52, N03AF01, N05AN01, N06A) **OR** 6) one or more hospitalizations with a diagnosis for anxiety states, phobic disorders, or obsessive–compulsive disorders (ICD–9–CM codes 300.0, 300.2, 300.3; ICD–10–CA codes F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42) **OR** 7) three or more physician visits with a diagnosis for anxiety disorders (ICD–9–CM code 300)	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts, DPIN

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
3	Maternal Smoking During Pregnancy	The number of women with live births who reported smoking during pregnancy (from the Families First Screening Form, question B12) was divided by the total number of women with live births in a given time and place. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2003/04–2008/09 RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
7	Maternal Substance Abuse	If according to the Families First Screen, the mother reported smoking, consuming alcohol, or illicit drug use during pregnancy, she was considered as having substance abuse during pregnancy.	2007/08–2008/09	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports
2	Molar Pregnancy	The number of women who had a molar pregnancy was divided by the total number of pregnancies in a given year. A molar pregnancy was determined by the ICD–9–CM code of 630, 631, or 632 or the ICD–10–CA code of D39.2, O001, or O02. The total number of pregnancies was the sum of the molar pregnancies, ectopic pregnancies, spontaneous abortions, induced abortions, live births, and stillbirths in a given year.	2001/02–2009/10		Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports
6	Multiple Births	The number of multiple births was divided by the number of live births. A birth was considered a multiple birth if there was the ICD–9–CM code of V31–V37. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts
6	Neonatal Hospital Readmission	The number of newborns readmitted to hospital within 28 days of birth was divided by the total number of live births in a given time and place. Only inpatient hospitalizations were included (i.e., newborns admitted for day procedures were not included). Additionally newborns that were directly transferred to another hospital after birth were not counted as a readmission. In some cases, newborns may be readmitted to hospital not because they are ill themselves, but because their mother is hospitalized and an effort is being made to keep the mother and newborn together. The analysis was done both with and without these "boarder Newborns".Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2003/04–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Newborns with a length of stay greater than 20 days, Stillbirths, Newborns with a birth weight of less than 1,000 grams, Boarder Newborns	Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Neonatal Hospital Readmission – Reasons	The primary diagnosis for readmission for newborns readmitted to hospital within 28 days of birth (see Neonatal Hospital Readmission) was grouped into the following categories: Jaundice: ICD–10–CA codes P58.0, P59 Respiratory: ICD–9–CM codes 4659, 4661, 4781, 4787, 4801, 4808, 4823, 485, 486, 4871, 512.1; ICD–10–CA codes J00, J05.0, J06.9, J12.1, J18.0, J18.9, J20.9, J21.0, J21.9, J22, J38.5, J45.90, J69.0, J95.80, J98.8, P22, P23.9, P24.3, P289, R06.8 Congenital Anomalies: ICD–9–CM codes 7421, 7434, 7450, 7451, 7452, 7454, 7460, 7461, 7463, 7465, 7467, 7468, 7471, 7473, 7474, 7478, 7483, 7505, 7511, 7512, 7513, 7514, 7550, 7566; ICD–10–CA codes Q12.0, Q13.4, Q21.0, Q21.3, Q23.0, Q25.0, Q25.1, Q25.5, Q30.0, Q31.5, Q32.0, Q38.1, Q40.0, Q40.2, Q41.2, Q42.3, Q43.1, Q43.3, Q56.4, Q60.0, Q64.38, Q82.3, Q89.1 Infectious/Parasitic: ICD–9–CM codes 0088, 0330, 0381, 0384, 0389, 0479, 0499, 0529, 0578, 0579, 0788, 0799, 1120, V29.0; ICD–10–CA codes A08.4, A09, A40.8, A41.50, A54.3, A86, A87.0, A87.9, B01.9, B08.2, B34.9, P35.2, P35.9, P369, P37.5, P38, P39 Digestive: ICD–9–CM codes 5308, 5509, 5589, 5693, 5781; ICD–10–CA codes K12.1, K21.9, K40.3, K40.9, K52.9, K58.9, K59.0, K90.4, P76.8, P77, P78.2, P78.3, P78.88, R11.2, R13.8, R14 Feeding Problems: ICD–9–CM codes 7793, 7833; ICD–10–CA codes P92, R63.3 Dehydration/fever/pyrexia: ICD–9–CM codes 7784, 780.6; ICD–10–CA codes P81.0, P81.8, P81.9, R50.9 Endocrine/Metabolic: ICD–9–CM codes 2552, 2701, 2703, 2711, 2765, 2767; ICD–10–CA codes E72.3, E73.9, E74.2, E86.0, P70.4, P71.1, P72.0, P74.0, P74.1 Genitourinary: ICD–9–CM codes 5990, 605; ICD–10–CA codes N10, N39.0, N44.08 Lack of Expected Development: ICD–9–CM code 7834, ICD–10–CA code R62.8 Injury/Poisoning/Wounds: ICD–9–CM codes 8000, 8100, 9331, 9598, 9879, 998.1, 9988; ICD–10–CA codes K91.8, S06.5, S06.8, T25.7, T59.7, T74.0, T81.0, T81.4, T85.8 Nervous System: ICD–9–CM codes 3332, 3455, 3518, 3798, 3829; ICD–10–CA codes G03.0, G25.3, G40.2, G40.5, H04.2, H04.3, H05.0, H10.9, H66.9, R25.8 Other diagnoses: any code not mentioned above	2001/02–2008/09	Newborns who weighed less than 1,000 grams, Newborns with initial length of stay of more than 20 days, Newborns who were directly transferred to another hospital after birth, Day surgeries	Hospital Abstracts
6	Neonatal Mortality	The neonatal mortality rate is defined as the number of deaths of live born Newborns weighing 500 grams or more within 27 days of birth per 1,000 live births.	Table: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Neonatal Mortality – Reasons	See Causes of Neonatal and Postneonatal Death	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics
6	Neonatal Special Care Unit (SCU) Admission. Also known as Neonatal Intensive Care Unit (NICU)	The number of SCU admissions was divided by the total number of live births in a given time and place. A live born baby was considered to have an SCU admission if there was any admission to a SCU unit during the birth hospitalization, which was noted by the presence of the scu unit 50 (Neonatal Intensive Care Nursing Unit) and SCU unit 98. Limited to 2004/05 onwards due to coding changes that occurred in 2004/05. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2004/05–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths	Hospital Abstracts
7	Newborn Morbidity – Infant Mortality	Newborn morbidity for infant mortality was defined as a hierarchical variable with : 1) Admitted to Special Care Unit (presence of SCU ID of 50 or 98) else 2) Not admitted to SCU but low birth weight or preterm (if not admitted to SCU but birth weight of less than 2,500 grams or gestational age of less than 37 weeks) else 3) Not admitted to SCU, not low birth weight, not preterm but had a five–minute Apgar of 7 or less else 4) No newborn morbidity (newborn had none of 1, 2 or 3)	2004/05–2007/08	Stillbirths, Births weighing less than 500 grams	Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports
SDO and Chapter 7	Newborn Morbidity – Postpartum Psychological Distress	Newborn morbidity for the postpartum psychological distress was defined as a hierarchical variable with: 1) Admitted to Special Care Unit (presence of SCU ID of 50 or 98) else 2) Not admitted to SCU but low birth weight or preterm (if not admitted to SCU but birth weight of less than 2,500 grams or gestational age of less than 37 weeks) else 3) No newborn morbidity (newborn had none of 1 or 2); reference group	2007/08–2008/09		Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
3	No or Inadequate Prenatal Care	The proportion of women with no or inadequate prenatal care was determined using the R–GINDEX (Revised–Graduated Prenatal Care Utilization Index) by dividing the number of women with a low R–GINDEX by the total number of women giving birth in a given place and time. The R–GINDEX is a measure of the adequacy of prenatal care by a healthcare provider which identified six major categories of prenatal care: inadequate prenatal care utilization, intermediate prenatal care utilization, adequate prenatal care utilization, intensive care, no care, and missing information on prenatal care. Knowledge of three birth–related outcomes is required to calculate R–GINDEX: 1) the gestational age of the infant (date of pregnancy and birth) as calculated from the hospital abstract, 2) the trimester during which prenatal care began, using the medical services database (physician claims) and hospital abstracts. The ICD–9–CM tariffs that were included are: 8400, 8401, 8501, 8507, 8509, 8529, 8540, and 8550. 3) the total number of prenatal visits during pregnancy as calculated from the hospital abstract and physician claims.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Women receiving prenatal care from a midwife, Cases with missing prenatal care or trimester of first prenatal visit values	Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports
SDO	Other Malpresentation at Birth	A woman were considered to have an other malpresentation at birth by the presence of the ICD–10–CA code of O33	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Ovulation Induction	See Use of Infertility Drugs	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Parity	For hospital births, the field obpara (with 0 being primipara and 1 being multipara) was used to determine parity. For homebirths, parity was determined from the Midwifery Discharge Summary Reports.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Placenta Previa/Abruptio Placenta Diagnosis	A woman was considered to have had a placenta previa/abruptio placenta diagnosis if the ICD–10–CA code of O44 or O45.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
6	Postneonatal Mortality – Reasons	See Causes of Neonatal and Postneonatal Death	2001/02–2008/09	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Vital Statistics
6	Postneonatal Mortality	The number of live births that died within 28–364 days of birth was divided by the total number of live births in a given place and time.	Table: 2001/02–2007/08; RHA, Winnipeg CA, and SDO: 2001/02–2007/08	Births with a gestation of less than 20 week, Newborns with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health Insurance Registry
6	Postterm Birth	The number of live births with a gestation of 42 or more weeks was divided by the total number of live births in a given time and place. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator RHA and Winnipeg CA: 2005/06–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts
6	Preterm Birth	The number of live births with a gestation of less than 37 weeks was divided by the total number of live births in a given time and place. This can further be divided into early preterm (less than 34 weeks) and late preterm (34–36 weeks). Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2005/06–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Previous Cesarean Birth	A woman was considered to have had a previous cesarean birth by the presence of one or more of the following codes – ICD–9–CM: 65420, 65421, 65423; ICD–10–CA: O34.201, O34.203, O34.209, O34.291, O34.293, O34.299, O75.701, O75.703, O75.709.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Previous Preterm Birth	A mother was considered to have had a previous preterm birth if the gestation of any of her previous children was less than 37 weeks. This was determined by calculating the gestation of all children associated with the woman. Gestation was calculated from the birth hospitalization abstract associated with each child.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Hospital Abstracts, Manitoba Health Insurance Registry
2	Primiparas	The number of the live births to women giving birth at more than 20 weeks' gestation for the first time was divided by the total number of births in a given time and place. Stillbirths were included in the calculations. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
SDO and Chapter 7	Psychological Distress Prior to Pregnancy	See Maternal Psychological Distress for codes. The period used was the two years prior to the pregnancy.	2007/08–2008/09		Midwifery Discharge Summary Reports, Hospital Abstracts, DPIN

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
4	Severe Maternal Morbidities	The rate of specific severe maternal morbidities was determined from the maternal delivery hospitalization record using the ICD–10–CA codes reported by Joseph et al (2010). If a woman experienced more than one condition during a delivery, all conditions were counted separately. Thirteen morbidities were included in this analysis. The ICD–10–CA codes are listed in parentheses. Eclampsia: O15 Rupture of uterus during labour: O71.1 Puerperal sepsis: O85 HIV disease: B20–B24, Z21 Cardiac arrest, cardiac failure, or myocardial infarction: O89.1, O74.2, O75.4, I21–I22, I46, I50, J81 Assisted ventilation: 1.GZ.31.CA–ND, 1.GZ.31.CR–ND Hysterectomy, open approach: 1.RM.89.LA (excluded if 1PL74, 1RS74, 1RS80 also present), 1.RM.87.LA–GX Blood transfusion: CIHI variable of red blood cell=yes, trans_auto=yes, or trans_other=Yes Repair of bladder, urethra, or intestine (5.PC.8–.JR, 1.NK.8–^ ^, 1.NM.80^ ^ Embolization/ligation/suture uterus for postpartum hemorrhage: O72 + 1 of (1.RM.13^ ^ or 1.KT.521 OR 5.PC.91.LA Placenta previa with hemorrhage and blood transfusion: O44.1 + CIHI variable of red blood cell=yes, trans_auto=yes, or trans_other=Yes Postpartum hemorrhage and blood transfusion: O72 + CIHI variable of red blood cell=yes, trans_auto=yes, or trans_other=Yes Postpartum hemorrhage and hysterectomy: O72 +1.RM.89.LA (excluded if 1PL74, 1RS74, 1RS80 also present), 1.RM.87.LA–GX (Joseph et al., 2010).	2004/05–2008/09		Hospital Abstracts, Midwifery Discharge Summary Reports
6	Severe Neonatal Morbidity	The number of live births who had one of the morbidities listed below was divided by the total number of live births. The mean length of stay was calculated from the total number of days of care for an inpatient hospitalization episode associated with each morbidity, calculated by subtracting the discharge date from the admission date. Direct transfers between hospitals are included in the calculation of length of stay. Neonatal sepsis: ICD–10–CA: P36, P39 Respiratory distress syndrome: ICD–10–CA: P22 Hypoxic ischemic encephalopathy: ICD–10–CA: P91.6 Convulsions of newborn: ICD–10–CA: P90 Brachial plexus injury/palsy: ICD–10–CA: P14 Persistent fetal circulation/Neonatal hypertension: ICD–10–CA: P29 Grade III or IV Intraventricular hemorrhage (IVH)/ Periventricular Leukomalacia (PVL): ICD–10–CA P52.2, P91.2 Intubation: 1GZ30CJ, 1GZ30JH, 1GZ31CAMP, 1GZ31CAND, 1GZ31CBND) Gastroschisis: Q79.3 Omphalocele: Q79.2 Diaphragmatic hernia: Q79.0+C88 Congenital malformations of the circulatory system: Q20, Q21, Q22, Q23, Q24, Q25	2004/05–2008/09	Stillbirths	Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
SDO	Sex of Baby	Determined from newborn's birth hospitalization record (field labeled sex). In case of homebirths attended by a midwife, it is determined from the discharge summary report (field labeled gender).	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
2	Short Interpregnancy Interval	The proportion of multiparous women who had a short interpregnancy interval were divided by the total number of multiparous women giving birth in a given time and place. A short interpregnancy interval was defined if the time between the last delivery and conception of the most recent pregnancy was less than 12 months. The date of the last delivery was determined from the Manitoba Health Insurance Registry while conception of the most recent pregnancy was determined from the Hospital Abstract Database or the Midwifery Discharge Summary Reports.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2005/06–2008/09	Primiparous women	Manitoba Health Insurance Registry, Hospital Abstracts, Midwifery Discharge Summary Reports
SDO	Singleton Birth	A birth was considered a singleton by the presence of the ICD–9–CM code of V27.0 or V27.1.	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
6	Small–for–Gestational Age (SGA)	The number of births categorized as SGA were divided by the total number of live births. A birth was considered to be small–for–gestational–age if the birth weight was at less than the 10th percentile for their gestational age and sex using a Canadian standard (Kramer et al., 2001). Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Multiple births, Newborns with a gestation of less than 20 week, Newborns with missing birth weights	Midwifery Discharge Summary Reports, Hospital Abstracts
2	Social Isolation	The number of women with live births who were socially isolated was divided by the total number of women with live births in a given time and place. Social isolation is assessed by the public health nurse when completing the Families First screen. A woman was considered to be socially isolated if the variable isolation in the Families First Data was set to yes, otherwise she was not considered socially isolated. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Women living in First Nations Communities, Cases where the variable was missing in the data set, Stillbirths, Out of province births	Families First, Hospital Abstracts, Midwifery Discharge Summary Reports

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
2	Spontaneous Abortions	The number of women who had a spontaneous abortion was divided by the total number of pregnancies in a given year. A spontaneous abortion was determined by the ICD–9–CM code of 634, 637 or 656.4 or the ICD–10–CA code of O03 or O36.4. The total number of pregnancies was the sum of the molar pregnancies, ectopic pregnancies, spontaneous abortions, induced abortions, live births, and stillbirths in a given year.	2001/02–2009/10		Hospital Abstracts, Medical Services (physician claims), Midwifery Discharge Summary Reports
SDO	Spontaneous Vaginal Birth	Births that were not coded as cesarean (see cesarean birth) and were not coded as having been an assisted vaginal birth (see Assisted Vaginal Birth).	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
6	Stillbirths	The number of fetal deaths with a gestation of 20 weeks or greater or a birth weight of at least 500 grams was divided by the total number of births (live and stillbirths) in a given time and place. Presented as a rate per 1,000 total births.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09	Births with a birth weight less than 500 grams and a gestational age of less than 20 weeks	Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Term Birth	Births with a gestation of between 39 and 41 weeks. See also Early Term as the traditional definition of Term (37–41 weeks) was divided in Early Term and Term for this report.	As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Newborns with a gestation of less than 20 weeks, Newborns with a birth weight of less than 500 grams	Midwifery Discharge Summary Reports, Hospital Abstracts
4	Travelling to Give Birth – Distance	The proportion of women traveling more than 46.7 km (and 113.8 km) was calculated by dividing the number of women traveling more than 46.7 km (and 113.8 km) by the number of women giving birth in a given time and place. Using the centroid of the postal code of the women's residence to the centroid of the postal code of the hospital where she gave birth, the distance travelled to give birth was calculated. This is calculated " as the crow flies" and does not take into account that in many areas the distance travelled may be greater as the roads do not follow the most direct route. To determine what distance to look at, the distribution of distances was calculated using all deliveries to women who reside outside of Winnipeg. The distribution ranged from 0.73 km (5th percentile) to 473.95 km (95th percentile), with the median being 46.7 km and the 75th percentile being 113.8 km. These distances (46.7 km and 113.8 km) were used as the distance thresholds.	Time trends: 2001/02–2008/09; RHA and SDO: 2007/08–2008/09	Winnipeg residents	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health Insurance Registry

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
4	Travelling to Give Birth – Outside of RHA of Residence	The proportion of women travelling outside of their RHA of residence to give birth as calculated by dividing the number of women who travelled outside of their RHA of residence to give birth by the number of women giving birth in a given time and place.	Time trends: 2001/02–2008/09; RHA and SDO: 2007/08–2008/09	Winnipeg residents	Midwifery Discharge Summary Reports, Hospital Abstracts, Manitoba Health Insurance Registry
3	Use of Infertility Drugs Prior to a Live Birth	The number of women, aged 18–44, identified as having a live birth following the use of any drug (see list below) for ovulation induction or controlled ovarian hyperstimulation in the two years prior to giving birth was by dividing by the total number of women giving birth in a given place and time. The DINS of the medications used to identify ovulation induction or controlled ovarian hyperstimulation are: 00254916 , 00368385, 00640158, 00755613, 00893722, 01925679, 01958992, 02041820, 02042096, 02091879, 02125405, 02125412, 02182904, 02231464, 02231465, 02231655, 02242439, 02242441 , 02243004, 02243948, 02244787, 02247459, 02247790, 02248154, 02248156, 02248157, 02262088, 02268140, 02269066, 02270382, 02270390, 02270404, 02283093, and 02344815. Leterzole (less than 15 pills per month): 02231384, 02348969, 02347997, 02338459, 02322315 was also included. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Stillbirths, Births to women 12–17 and 45 and older	Midwifery Discharge Summary Reports, Hospital Abstracts
SDO	Vaginal Birth	Births that were not coded as cesarean (see Cesarean Birth).	As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts
4	Vaginal Birth after Cesarean (VBAC)	The number of women with a prior cesarean birth who subsequently delivered vaginally was divided by the total number of women giving birth vaginally. A woman was considered to have had a previous cesarean delivery by the presence of one or more of the following codes – ICD–9–CM: 65420, 65421, 65423; ICD–10–CA: O34.201, O34.203, O34.209, O34.291, O34.293, O34.299, O75.701, O75.703, O75.709. The current delivery was considered a vaginal birth by the absence of a code indicating a cesarean birth (see cesarean birth for more details). All homebirths were coded as vaginal births. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	Time trends: 2001/02–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)		Midwifery Discharge Summary Reports, Hospital Abstracts

Chapter	Indicator	Definition	Years of Data	Exclusions	Databases
4	Vaginal Births with Epidural Anaesthesia	The number of women giving birth vaginally (who received an epidural) was divided by the number of women giving birth vaginally in a given time and place. These analyses were limited to 2004/05 onwards due to coding changes, where an anaesthesia code is provided for each intervention that is performed (up to 20). A woman was considered to have a vaginal birth by the absence of a code indicating a cesarean birth (see cesarean birth for more details). A birth was coded as having received an epidural if there was an intervention coded as 5MD** with the presence of an epidural based on the associated anesthesia technique (3 Epidural). If any other anesthesia was indicated, then the birth was coded as not having received an epidural. All home births were coded as not having received an epidural. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	As an indicator Time trends: 2004/05–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09; As an SDO factor: varies (see the indicator for which it is an SDO factor)	Cases with missing anesthesia were excluded (N=732)	Midwifery Discharge Summary Reports, Hospital Abstracts
4	Vaginal Breech Birth	The number of women with a vaginal breech birth was divided by the total number of women having a breech birth in a given time and place. A breech birth was defined by the presence of one or more of the following codes in the hospital birth abstract – ICD–10–CA: O32.1 and O64.1 or the birth being coded as a breech birth in the Midwifery Discharge Summary Reports. Those breech births that were delivered vaginally were determined by the absence of a code indicating a cesarean birth (see cesarean birth for more details). All home births were coded as vaginal births. Note: When this was used as an SDO factor, it was used as a classification variable and, therefore, there are no numerators or denominators.	Time trends: 2004/05–2008/09; RHA, Winnipeg CA, and SDO: 2007/08–2008/09		Midwifery Discharge Summary Reports, Hospital Abstracts

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SDO refers to the Sociodemographic and Other Figure

Source: Manitoba Centre for Health Policy, 2012

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