INFANT MORTALITY IN SASKATCHEWAN:
Evidence to Inform Public Health Practice

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Executive Summary

Over the past decade considerable progress has been made in the reduction of provincial infant mortality rates. In 2005, however, Statistics Canada data reported Saskatchewan's rates to be higher than the majority of provinces, second only to Nunavut. This recent increase points to the need to focus attention towards intervention and prevention strategies that address the prevalent risk factors associated with infant mortality.

This document describes how modifiable risk factors within the preconception, prenatal and postnatal periods impact the risk of infant mortality. Each section contains a set of strategies related to those risk factors identified in the document, to assist service providers in providing effective initiatives to reduce infant mortality. Where possible, these practices have been supported by examples of existing practices that have shown to be helpful in the reduction of infant mortality. While this document is not intended to be a comprehensive review of literature, programs or resources, it is meant to provide guidance, strategies and support to help expand existing programs and/or generate new program ideas that may contribute to the reduction of infant mortality in Saskatchewan.

Each stage of pregnancy presents opportunities to ensure appropriate levels of care are available that meet the needs of all women. Examining those modifiable risk factors related to infant mortality provides the opportunity for the design of care and services that integrate effective preventative programming to improve birth outcomes.

Preconception Care

Increasingly, evidence indicates that improving a woman's health before pregnancy is an important factor in optimizing birth outcomes. The preconception period provides an opportunity to effectively reduce perinatal risk factors through the implementation of interventions before pregnancy occurs.

The preconception section focuses on the following modifiable risk factors that could adversely affect a pregnancy and may be ameliorated by early intervention prior to conception.

- Micronutrient deficiencies
- Poverty
- Alcohol
- Obesity
- Awareness of genetic history

Based on research, clinical guidelines, promising practices, and identified areas of need, the following strategies have been suggested to increase preconception health initiatives.

1. Inform women about the risks of inadequate nutrient intake, prior to and throughout pregnancy. Educate on the importance of proper nutrition and recommend the use of a daily, folic acid fortified multivitamin starting in the preconception period and continuing through the prenatal and postpartum periods.
2. In addition to providing education around the importance of folic acid and multivitamin supplementation, implementation strategies around micronutrient supplementation must consider that these supplements are inaccessible for many marginalized and vulnerable populations.
3. Advise women on the importance of healthy weight gain before and during pregnancy through appropriate messaging, counselling and support.
4. Conduct screening for alcohol, tobacco, and other drugs with all women of childbearing age using a standardized screening tool. Motivational interviewing, harm reduction strategies, and the use of brief interventions are explored.
5. Design community interventions for women with or at risk of developing diabetes.
6. Present genetic counselling as an option for all women of childbearing age who may be at risk of a genetic condition in order to promote informed choice regarding future pregnancy decisions.
7. Implement information sharing strategies to increase public awareness of preconception risk factors.
8. Use community-based initiatives to increase public access to health promotion initiatives for women of childbearing age.
9. Provide opportunities for collaboration and professional development. Provide opportunities for health care professionals to learn more about preconception health and working with women of childbearing age.
10. Ensure existing resources and programs are culturally appropriate. Information, tools and programs should be culturally relevant and address any cultural barriers that may prohibit the use of preconception services among certain groups.
11. Support evidence-based changes in health care provider knowledge, attitudes and practice.
12. Increase the collaboration and communication across health sectors and community partners in the sharing of successful programs and in the development of new initiatives.
13. Evaluate current preconception practices and services.
14. Support interdisciplinary preconception health research.
15. Conduct monitoring and surveillance of maternal and infant health outcomes.
16. Develop policies supportive of preconception health that will provide the foundation to guide future strategies and approaches to preconception care.

Prenatal Care

Prenatal care has the potential to reduce infant mortality and morbidity through the promotion of healthy lifestyle behaviours, the identification and reduction of modifiable risk factors and the treatment of medical conditions.

The prenatal section discusses prevalence and risk factors for low birth weight, and examines major risk factors for poor pregnancy and birth outcomes, including:

- Low birth weight
  - ⇢ Smoking
  - ⇢ Poor Nutrition
  - ⇢ Psychosocial support
  - ⇢ Maternal age
- Inadequate access to prenatal care
- Domestic violence
- Maternal mental health
- Genetics

Based on key risk factors identified in the literature, the following strategies have been suggested to assist in developing initiatives throughout the prenatal period:

17. Provide ongoing surveillance of prenatal risk factors and outcomes.
18. Conduct continual monitoring and evaluation of current programs.
19. Provide ongoing training and support continuing education initiatives in the area of prenatal care.
20. Create opportunities for sharing and collaboration among health regions regarding prenatal programs and services. To the extent possible, training resources and effective strategies should be shared province-wide and be inclusive of other service providers.
21. Increase strategies to attract and retain at-risk participants in prenatal care.
22. Utilize holistic, multi-strategy approaches in order to address the multifactoral nature of behavioural and lifestyle issues associated with poor birth outcomes.
23. Use both universal and targeted interventions to improve outcomes for all women.
24. Develop recruitment and retention strategies for programs.
25. Explore group prenatal care.
26. Encourage early initiation into prenatal care.
27. Review all programs to ensure cultural appropriateness.
28. Ensure all pregnant women are offered and have access to genetic screening services.
29. Perform regular psychosocial screening for substance use, intimate partner violence, stress and mental health concerns.
30. Incorporate strategies aimed at reducing modifiable risk factors for low birth weight infants.

Postnatal Care

Postnatal care provides a critical opportunity to provide women a supportive and safe environment in which to begin care for a new infant. Inadequate care within this period reduces the opportunity for health promotion and for the prevention or early detection of problems that might increase the risk of neonatal and postneonatal morbidity and mortality.

This section will examine risk factors for infant mortality in the postnatal period. The section also discusses the provision of interconception care as a means to promote the health and well-being of women and infants in future pregnancies. The identified risk factors include:

- Young maternal age
- Infant injury
- Sudden Infant Death Syndrome (SIDS)
- Early postpartum discharge

The following strategies provide opportunities for improvements to reduce the risks of infant death throughout the postnatal period:

31. Use effective, timely home visiting as a strategy for service delivery of postnatal care.
32. Develop home visiting programs specifically targeting at-risk mothers.
33. Incorporate the use of peer home visitors into postnatal programs.
34. In the initial postpartum period, introduce effective injury prevention messaging using home assessments that assess the caregiver, child and safety of the home environment.
35. Strengthen supports for teen parents throughout the postnatal period.
36. Provide parents with consistent messaging about Abusive Head Trauma (AHT), an example of which is Shaken Baby Syndrome.
37. Ensure that adequate home support is individualized to the needs of women receiving early discharge after delivery.
38. Utilize the interconception period to improve maternal health for future pregnancies.
39. Policies, programs and services should support a seamless continuum of care from community to hospital to community.

To generate improvements in maternal and infant health, each woman's contact with the health care system should be used as a mechanism for health promotion in order to prevent adverse birth outcomes. Fragmentation in the provision of services affects the quality and delivery of care, resulting in missed opportunities for timely health promotion. The development of responsive and effective services must be provided in collaboration between health care providers in order to minimize gaps and improve the opportunity for positive birth outcomes.

1.0 INTRODUCTION

The decline of infant mortality rates across Canada over the past few decades has set processes in motion to promote progressive change in maternal and infant health services.[A] As an indicator, infant mortality rates reflect the state of health care and the health status of a population, and are also reflective of the value placed on maternal and child health, and the supports and social environments available to women of childbearing age. Infant and maternal health is a product of many interconnected factors, surrounded by a broader context of the social determinants of health.

This document is intended as a guide to facilitate the planning and implementation of policies, programs and initiatives across the spectrum of community-based health services that impact maternal and infant health in Saskatchewan. The document highlights risk factors commonly associated with infant mortality and places them within a broader dialogue encompassing preconception, prenatal and postnatal care. While this document is not intended to be a comprehensive review of literature, programs or resources, it is meant to provide guidance, strategies and support to help expand existing programs or generate new program ideas that are relevant to the reduction of infant mortality. As the risk factors for infant mortality are difficult to view in isolation, there will be some overlap between sections.

Maternal and infant health requires a continuum of care across a woman's reproductive life course. Each stage of pregnancy presents opportunities to ensure that an appropriate level of care is available to meet the needs of all women. Through an examination of risk factors within each stage, this document provides the opportunity to identify areas that could benefit from additional and/or strengthened prevention strategies.

1.1 Infant Mortality in Saskatchewan

In Saskatchewan, infant mortality rates, as a whole, have declined over the past few decades. Through the 1990's and into the early 2000's, rates in Saskatchewan fell close to the national average and assumed the lowest levels ever in the prairie region. However, after dropping to a historic low in 2001, from 2001-2005 the infant mortality rates in Saskatchewan have been increasing. In 2005, Saskatchewan's infant mortality rate was the second highest in the country.[1]

As **Table 1.1** displays, in 2001 Saskatchewan's infant mortality rate was 5.5 deaths per 1,000 live births, comparable to the national rate of 5.2 deaths per 1,000 live births. Over the five year period of 2001 to 2005, rates in Saskatchewan increased to a high of 8.3 infant deaths per 1,000 live births in 2005, while Canada's rate increased slightly to 5.4 deaths per 1,000 live births.

[A] *The infant mortality rate is calculated as the number of deaths of infants less than one year of age per 1,000 live births.*

Table 1.1 Infant Mortality Rates, Both Sexes, by Province and Territory, Canada, 2001-2005.

Province/Territory	2001	2002	2003	2004	2005
Newfoundland & Labrador	4.9	4.5	5.0	5.1	6.2
Prince Edward Island	7.2	1.5	4.9	4.3	2.2
Nova Scotia	5.6	4.2	5.7	4.6	4.0
New Brunswick	4.3	3.8	4.1	4.3	4.1
Quebec	4.7	4.8	4.4	4.6	4.6
Ontario	5.4	5.3	5.3	5.5	5.6
Manitoba	7.0	7.1	8.0	7.0	6.6
Saskatchewan	**5.5**	**5.7**	**6.3**	**6.2**	**8.3**
Alberta	5.6	7.3	6.6	5.8	6.8
British Columbia	4.1	4.6	4.2	4.3	4.5
Yukon Territory	8.7	8.8	6.0	11.0	0.0
Northwest Territories	4.9	11.0	5.7	0.0	4.2
Nunavut	16.9	11.0	19.8	16.1	10.0
Canada	**5.2**	**5.4**	**5.3**	**5.3**	**5.4**

Source: Statistics Canada, CANSIM, table 102-0504 and catalogue no. 84FO211X.

The Canadian Perinatal Health Report of the Canadian Perinatal Surveillance System provides a cautionary note regarding the meaning and accuracy of rate comparisons between areas and underscores the importance of carrying out detailed regional examinations of causes and circumstances of infant mortality with the specific purpose of identifying preventable causes of death.[2] Since infant deaths are rare, the actions and events surrounding an infant death may point to deficiencies in systemic and/or other social determinants of health, whose cause needs to be carefully examined.

Figure 1.1 describes trends in infant mortality rates in Saskatchewan over three five-year time periods, 1991-1995, 1996-2000, 2001-2005. As indicated in **Figure 1.1**, substantial regional variations can be seen in five year average infant mortality rates throughout Saskatchewan's Regional Health Authorities (RHAs) from 1991 to 2005.

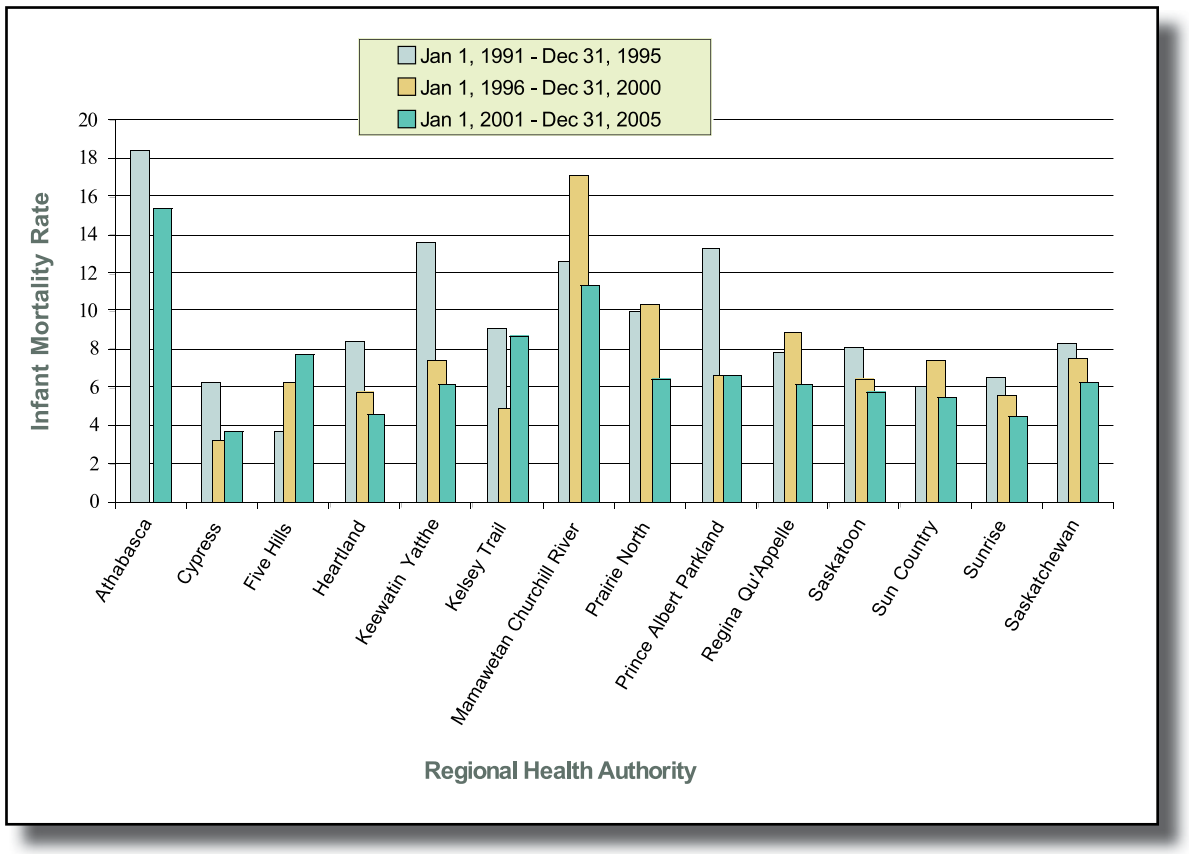

Figure 1.1

Infant Mortality Rates, Five Year Average, by Regional Health Authority, Saskatchewan, 1991-2005.

Source: Saskatchewan Ministry of Health

With the exception of Five Hills, all health regions show the infant mortality rate was down in 2001-2005 as compared to 1991-1995. Despite this general downward trend, as **Figure 1.1** above demonstrates, the infant mortality rate for Saskatchewan as a whole reached a high of 8.3 in 2005. However, as can be seen in **Table 1.2**, preliminary data suggests that the infant mortality rate for Saskatchewan dropped again to 6.3 in 2006 and 5.9 in 2007.

In 2001-2005, among the thirteen Regional Health Authorities (see http://www.health.gov.sk.ca/health-regions-map), five year average infant mortality rates varied from a high of 15.34 infant deaths per 1,000 live births in the Athabasca Health Authority to a low of 3.72 infant deaths per 1,000 live births in the Cypress Health Region [see **Table 1.2**].

When the 2001 to 2005 five-year average infant mortality rates for Saskatchewan Regional Health Authorities are compared to Canada's rate of 5.3 for 2001 to 2005, only three RHAs have lower rates than the Canadian rate. These are Cypress (3.72 deaths/1,000 live births), Heartland (4.6 deaths/1,000 live births), and Sunrise (4.54 deaths/1,000 live births).

Table 1.2 Infant Mortality Rate, by Regional Health Authority, Saskatchewan, Five Year Average (2001-2005) and preliminary data for 2006 and 2007.

Regional Health Authority	Infant Mortality Rate		
	2001-2005	2006	2007
Canada	**5.3**	**na**	**na**
Athabasca	15.3	15.2	27.4
Cypress	3.7	2.3	6.3
Five Hills	7.7	6.2	na
Heartland	4.6	11.6	6.3
Keewatin Yatthé	6.2	8.4	11.2
Kelsey Trail	8.7	6.7	13.2
Mamawetan Churchill River	11.4	10.1	9.2
Prairie North	6.5	10.0	8.7
Prince Albert Parkland	6.7	4.3	8.3
Regina Qu'Appelle	6.2	5.2	6.6
Saskatoon	5.8	5.9	3.5
Sun Country	5.5	3.2	1.6
Sunrise	4.5	7.4	3.5
Saskatchewan	**6.3**	**6.3**	**5.9**

Source: Saskatchewan Ministry of Health

There are many different factors which influence infant mortality. At this time, no single underlying factor has been identified that might account for the increase in 2005. Whether indicative of a trend or merely incidental fluctuation, as health care providers and policy makers, our goal remains unchanged; that is to continue to improve infant health and reduce infant morality rates to the lowest levels possible.

Table 1.3 shows the leading causes of infant mortality in Saskatchewan between 2001 and 2007 to be conditions arising in the perinatal period and congenital anomalies. The next most frequent causes of infant mortality are Sudden Infant Death Syndrome, followed by unintentional and intentional injury, then respiratory distress syndrome. It was not possible to break down the "Other" causes into anymore detail because of small numbers. (See appendix D for a breakdown of causes by RHA.)

Table 1.3 Seven Year Average Infant Deaths and Infant Mortality Rate, by Cause, 2001 to 2007

Cause of Death	7 year Total Counts	7 year Average Rates (per 1000 live births)
Conditions arising in the perinatal period	211	2.5
Congenital anomalies	125	1.5
Sudden Infant Death	52	0.6
Unintentional and intentional injuries	14	0.2
Respiratory Distress Syndrome	6	0.1
Other	104	1.2
Unknown	22	0.3
Total	***534***	***6.2***

Source: Saskatchewan Ministry of Health

Maternal and infant health cannot be discussed in isolation from the broader social determinants of health. Many factors including poverty, ethnicity and culture, language, financial circumstances, education level, geography, housing and access to services are critical underlying factors that affect infant and maternal health. While this document will not address all of these factors in detail, it will provide an understanding of the broader context necessary to bring effective changes to current maternal and infant health strategies.

It should be acknowledged that not all infant deaths are preventable, and that advances in medical care and technology have contributed to the lowering of infant mortality rates in recent years. However, in Saskatchewan, much work is still needed in areas with disproportionately high rates of infant mortality. The promising strategies contained in this document may assist to enhance the continuity and quality of maternal and infant health across the province.[B]

[B] *For further data on infant mortality in Saskatchewan please refer to Appendix D.*

References

1. Statistics Canada. Infant mortality rates, by province and territory. In. *CANSIM database: Table 102-0504*, 2008; http://cansim2.statcan.ca.

2. Health Canada. Canadian Perinatal Health Report. In. Ottawa: Minister of Public Works and Government Services Canada (Cat. No. H49-142/2003E), 2003.

2.0 PRECONCEPTION CARE

Traditionally, prenatal care begins with the first prenatal visit at about 12 weeks gestation. However, as the period of greatest environmental sensitivity for the developing fetus occurs between 17 and 56 days after conception, many birth outcomes have already been decided before a woman enters prenatal care.[1] Preconception care is defined as care that promotes maternal and child health throughout the entire reproductive lifecycle by providing care before a first pregnancy or between pregnancies in order to identify and reduce the risk of conditions and behaviours that may adversely affect a pregnancy.[2]

It is well established that a woman's pre-pregnancy health status, lifestyle and personal history contribute to pregnancy outcomes.[3] For many women with a history of poor health, promoting changes during pregnancy may not provide adequate time to improve upon lifestyle issues such as alcohol consumption, smoking, nutrition and weight management that can influence birth outcomes. As such, the most important prenatal visit is commonly cited as the one that occurs prior to pregnancy.[4] Increasingly, evidence indicates that improving a woman's health before pregnancy is an important factor in optimizing birth outcomes.[5] Many interventions designed to reduce perinatal risk factors must be implemented before the start of pregnancy to be effective.

Care before conception provides an opportunity for education and counselling about healthy pregnancies. While health care providers report that preconception care is important, little is known about current health care provider practices around preconception.[4] Results from a national survey measuring preconception practices among family physicians and obstetricians-gynaecologists reported that prior to conception only 40% of physicians discussed the risks of alcohol use during pregnancy and less than 60% reported discussing the risks of smoking during pregnancy despite their impact on infant mortality.[4]

Similarly, despite the documented evidence for the use of folic acid in the reduction of risk for neural tube defects, only half of all family physicians and obstetricians-gynaecologists reported discussing this with their patients prior to conception.[4] This presents a troubling finding as consultation with a health care provider before conception is the strongest predictor of a woman's compliance with folic acid supplementation recommendations.[6] In this national survey, less than 50% of participants also reported routinely discussing weight, addiction history and substance abuse with their patients of childbearing age.[4] These findings suggest opportunities are being missed to discuss pregnancy-related topics before conception. Expanding the scope of prenatal care to include preconception health care can provide a means of increasing healthy birth outcomes for women and their families.

Protection against adverse birth outcomes is strongly influenced by the ability of women to engage in pregnancy planning, and to be informed of the preconception health risks that may affect a pregnancy.[7] Data from the Community Perinatal Care Study in Alberta which surveyed 2,015 pregnant women found that only 37% of women reported discussing pregnancy-related issues with their physician prior to their first prenatal visit.[8] In Canada, research shows that women understand the importance of pre-pregnancy health, but have limited knowledge of the modifiable risk factors and positive health practices involved.[9] Knowing which health practices will improve birth outcomes, having the skills to carry them out, feeling good about these practices, being provided the opportunity and access to participate in these practices, and doing so in a supportive environment, all play a role in a woman's ability to improve her health before pregnancy.[9] The fact that over half of all pregnancies in Canada are unplanned further emphasizes the need for health care providers to address reproductive issues before conception.[44]

This section describes some of the risk factors that influence preconception health, presents evidence related to these factors, and remarks on the challenges involved in program implementation.

2.1 Risk Factors Influencing Preconception Health

Several preconception risk factors and behaviours exist that affect fetal development and can lead to death. The Center for Disease Control and Prevention (CDC) identifies 14 key risk factors around which preconception interventions could be focused.[A]

Interventions that provide protection:

1. Folic acid fortified multivitamin supplementation
2. HIV/AIDS testing
3. Hepatitis B immunization
4. Rubella immunization

Interventions that encourage the avoidance of certain teratogens:

5. Alcohol misuse
6. Tobacco
7. Accutane®
8. Anti-epileptic drugs (certain cases require the use of these drugs in pregnancy)
9. Oral anticoagulants

Interventions that involve the management of certain pre-existing conditions:

10. Diabetes
11. Obesity
12. Sexually Transmitted Infections (STIs)
13. Maternal Phenylketonurea (PKU)
14. Hypothyroidism

Additional risk factors that may adversely influence pregnancy outcomes include:

- hypertension
- oral health
- eating disorders
- domestic violence
- poor nutrition
- repeated pregnancy loss [9]

[A] *Please refer to Appendix A for a detailed copy of CDC's recommendations.*

From a community health perspective, it is important to develop prevention strategies based upon risk factors that may be relevant to the unique needs of individual communities.

As it is beyond the scope and purpose of this document to focus on all risk factors, this section will focus on only some modifiable preconception risk factors for which there is good evidence of an association with infant mortality. These include:

- Micronutrient Deficiencies
- Poverty
- Substance use Disorders
- Obesity
- Awareness of genetic history

2.1.1 Micronutrient Deficiencies

The association between vitamin and mineral deficiencies and the increased likelihood of maternal and infant morbidity and mortality has been well established. Micronutrients, including vitamins, are essential to healthy growth and development. Research consistently shows that even moderate levels of micronutrient deficiency may continue to negatively impact maternal and infant mortality. Micronutirent deficiency is associated with an increased likelihood of birth defects and intellectual impairment of infants, and may compromise the immune system of the mother.[10] Conversely, adequate levels of micronutrients during pregnancy have been shown to reduce the incidence of low birth weight among babies.[11]

Neural tube defects (NTDs) highlight the importance of early intervention as they occur around 25 to 27 days following conception, and are highly preventable.[9] The prevention of NTDs due to folic acid is well documented. Available evidence shows that 0.4mg daily of folic acid reduces the number of NTD cases by 60-70%.[9] A further 20% reduction of NTDs has been attributed to the food fortification initiatives that began in 1998. Specific Canadian examples of reduced NTD rates after fortification can be seen in Newfoundland where the total annual incidence of NTDs fell by 78%, and in Nova Scotia where the incidence of NTDs decreased by 50%.[6] An 85% reduction rate in NTDs is expected with the daily 5.0mg dose; this dosage is recommended for women who may be at increased risk for an NTD affected pregnancy.[12]

Evidence has also shown that folic acid provides a protective effect in the prevention of paediatric cancers.[13] Currently, it is recommended that all women of childbearing age take a multivitamin daily containing 0.4mg of folic acid.[14]

The Public Health Agency of Canada noted that of women who could become pregnant, as many as 67% were not taking folic acid.[15] Education around the use of folic acid before pregnancy is essential as many women are unaware of the need for supplementation and more than half of all pregnancies are unplanned.[12] Relying on dietary intake alone to achieve adequate folate levels is unrealistic and presents a significant challenge especially for low income women. Folic acid supplementation prior to and at the beginning of pregnancy is essential. Evidence now suggests that multivitamin supplementation, along with higher levels of folic acid, among certain groups of women may not only prevent NTDs but also provide protection against a number of congenital anomalies.

In 2006, a systematic review and meta-analysis evaluated the effectiveness of multivitamin supplements in preventing congenital anomalies in addition to neural tube defects. The meta-analysis found that consumption of multivitamins containing folic acid by women pre-conceptually and throughout the first trimester of pregnancy was associated with a consistent protective effect against neural tube defects (33% to 48% protective effect), cardiovascular defects (22% to 39% protective effect) and limb defects (43% to 52% protective effect), and a less consistent protective effect for cleft palate, urinary tract anomalies and congenital hydrocephalus.[17]

Goh's (2006) study has important implications for healthcare messaging and support for multivitamin use in the preconception period, particularly when considering the high rate of unplanned pregnancies in Canada. Since over half of all Canadian pregnancies are unplanned, only a small portion of women may actually be taking a folic acid fortified multivitamin at the time of conception.[16,17]

Micronutrient supplementation provides an effective, critical and feasible opportunity for reducing the occurrence of congenital anomalies, which may lead to neonatal death, through the strengthening of preconception care practices. Supplementation of folic acid alone does not provide the same protective effects of a multivitamin containing folic acid. Other studies examining the effects of multivitamins on congenital anomalies have been consistent with the findings that preconception multivitamin use reduces the overall occurrence of birth defects, in addition to the demonstrated reduction on NTDs by as much as 15%.[18] The role of specific micronutrients is discussed in the following sections.

- Vitamin A

  Vitamin A plays an important role in healthy fetal development and is required for growth and tissue maintenance of the fetus. It also plays a role in lung and eye development and immune function.[19] Vitamin A deficiency in the third trimester is associated with preterm delivery and maternal anemia.[20] Vitamin A supplementation with beta-carotene instead of retinol is recommended.[21] However, supplements containing the recommended amounts of folic acid, Vitamin B12, iron and Vitamin A as well as beta carotene are not readily available.[22]

- Vitamin D

  Vitamin D is needed for bone growth and skeletal development and is required for calcium absorption.[23] Research has also shown that Vitamin D may provide a protective effect in preventing mother-to-child transmission of Type 1 diabetes.[24]

- Iron

  Although iron is more important in the latter part of pregnancy, many women are iron deficient at the time of conception.[14] Iron is needed for the development of blood supplies and is stored by the infant for use after birth. Large stores of iron are necessary at birth to prevent the development of psychomotor impairments.[14] Iron deficiency anemia during the first two trimesters is associated with a twofold increased risk for preterm birth and a threefold increased risk of delivering a low birth weight baby.[7] Maternal iron anemia has been linked to impaired resistance to infection, fatigue and poor tolerance to blood loss and therefore to a poor tolerance during surgical interventions. Severe maternal anemia affects the brain development of the baby, acting as a human teratogen. Severe maternal anemia is also linked to neonatal anemia.[25]

Women of lower socioeconomic status or with short birth spacing are at increased risk of developing anemia due to poor access to nutrition and the body's inability to rebuild stores of iron lost in a previous pregnancy. Risk factors for iron deficiency are also higher among multiple gestation births.

- Calcium

  Calcium is critical for skeletal mineralization and growth. During pregnancy large amounts of calcium are transferred from the mother to the fetus. If calcium in the mother's diet is inadequate, the fetus will leach what it needs from the mother's bones, leading to possible maternal health problems later on.[58]

2.1.2 Poverty

The Public Health Agency of Canada reports that rates of adverse pregnancy outcomes rise with increased socio-economic disadvantage. Access to care, environmental exposures and health behaviours are three major determinants of health that are influenced by low socioeconomic status.[7,9] A cross-sectional ecological study conducted on health disparities in Saskatoon's core neighbourhoods found that infant mortality rates were four times higher in low income areas of Saskatoon.[27] A study conducted in British Columbia examining maternal and pregnancy characteristics by neighbourhood income concluded that living in a low income, urban neighbourhood was associated with poorer birth outcomes including increased rates of preterm births, neonatal mortality, stillbirth rates, small for gestational age births, and post-neonatal mortality.[28] In this analysis, both urban and rural low income areas comprised a higher proportion of mothers who were First Nations, unmarried and adolescent.

Low socioeconomic status is highest among recent immigrants, First Nations people and lone parent families. Research suggests that poorer health outcomes and infant mortality are associated with each of these groups. For example, First Nations women face higher risks of adverse pregnancy and infant health outcomes, and the infant mortality rate among First Nations people is twice that of the general Canadian public.[29]

Women who are experiencing poverty or a lower income may lack access to nutritious food which provides essential micronutrients. For example, 83% of First Nations women have low daily intake of folic acid, up to 57% of First Nations women in northern communities have been shown to have low intake of vitamin A, 46% of First Nations women have low vitamin D intake, and 46 to 70% of First Nations people have low calcium intake.[30]

Income is cited as a significant predictor of folate intake. Women below the Low Income Cut Off (LICO) have lower folate levels due to a lower consumption of nutritious foods with naturally occurring folate.[9] Those living on low incomes may experience high levels of food insecurity and may not be able to afford or have access to healthy, nutritious food and supplements that would allow for a higher folate intake.[14]

As well, a significant portion of pregnant women of lower socioeconomic status suffer from iron deficiency.[31] In Canada, iron deficiency anemia is common among First Nations infants. A study measuring the prevalence of iron anemia in First Nations communities found varying rates between 14 and 50% compared to 4 and 55% in the general Canadian population.[31] Iron deficiency amenia is both a nutritional and socioeconomic problem.

Food security and access to nutritious food play an essential role in determining the ability to ensure a healthy maternal diet during pregnancy and reduce the risks for infants born to low income women.[32,33] Access to programs that combine nutritional information with access to healthy, affordable foods, and dietary supplements is essential.

2.1.3 Substance Use Disorders

Alcohol is the most widely used teratogen among women of childbearing years and is a leading cause of neurobehavioural damage in children. Alcohol use in pregnancy is associated with increased rates of miscarriage, stillbirths, malformations, growth deficiencies, and central nervous system dysfunction.[34,35] It is not known how much alcohol a pregnant woman can safely drink; the effects on a baby depend on the amount of alcohol used, the stage of pregnancy, the pattern of use and the genetic makeup of the mother and fetus.[36]

The importance of preconception education in the area of alcohol consumption is demonstrated by looking at a study conducted in Alberta which found that half of all women consumed alcohol in the early stages of pregnancy, while a small but significant portion of women (11%) engaged in binge drinking before learning they were pregnant.[59] Although most women stop drinking when they find out they are pregnant, many women continue to drink well into their first trimester without realizing they are pregnant. A survey measuring women's drinking behaviours while trying to conceive found that 80% of women becoming pregnant for the first time reported consuming alcohol in the preconception period. Despite the fact that 8% of women surveyed were planning a pregnancy, this behaviour did not change until 5 weeks after conception when they realized they were pregnant.[9]

Both illicit and prescription drug use can be potentially harmful to the developing fetus.[64,65] Isolating the effects of specific drugs during pregnancy is often complicated by the issue of polydrug use.[66] Some adverse outcomes associated with certain drugs include an increased risk of preterm birth, small for gestational age, congenital anomalies, stillbirth, miscarriage, increased hospital stays and neonatal death.[64,65,67] Environmental factors such as child neglect, poor nutrition and unsafe housing are additional risk factors associated with drug use that have the potential to create unsafe environments for infants.[64]

2.1.4 Obesity

Compared with women of normal weight, the risk of stillbirth and neonatal death is more than double among obese women.[37] Maternal obesity is linked to an increased risk of severe adverse pregnancy and birth outcomes such as hypertension, congenital anomalies, preterm birth, gestational diabetes, caesarean section, thrombophlebitis, labour inductions and late fetal death.[37] In addition, being overweight or obese increases the risk of the development of diabetes mellitus which produces a three-fold increase in the prevalence of birth defects in infants of women with Type 1 and Type 2 diabetes.[9,38] The incidence of congenital anomalies is significantly increased in infants born to obese women with diabetes.[38,39] This situation is often further complicated by the fact that a large number of women with diabetes do not access preconception care.[38,39] Consequently, obesity during pregnancy is also associated with increased use of health care services, longer hospital stays and increased risk of other maternal delivery complications.[40] Such adverse pregnancy outcomes stress the need for public interventions to prevent obesity in women of childbearing age.

The fact that 60% of Canadians are considered to be overweight or obese raises some challenging questions in terms of the development of appropriate interventions. In 2004, obesity rates had more than doubled among the 25 to 34 year old age group who have the majority of pregnancies, leading to more women beginning pregnancy with a high body mass index (BMI).[72] Low income households have an even higher risk of having a high BMI and being overweight because affordable food is often high in calories and low in nutrition.[41] Aboriginal women are also at increased risk; obesity rates among the aboriginal population in Canada are 1.6 times higher than the national average.[9]

Women who are overweight or obese need to be made aware of the risks and offered support to reduce risks prior to pregnancy, and provided with appropriate care during pregnancy. Before pregnancy, risks can be reduced through exercise, appropriate nutritional intake and weight loss. During pregnancy, risks can be reduced through exercise, appropriate nutritional intake and access to appropriate prenatal care, including guidance on appropriate weight gain during pregnancy.[7,39]

2.1.5 Awareness of Genetic History

As some risks for disease can be determined before birth, genetic counselling and a family genetic history can be an important aspect of preconception care. Knowledge of genetic risks can help couples to prepare and make decisions regarding their pregnancies, collect information and receive appropriate counselling prior to the birth.[23] The advanced identification of a genetic disorder also provides the opportunity to prepare for potential medical complications during pregnancy and delivery and may also influence the location a woman may choose to deliver.[42]

Genetic counselling provides a means of dealing with the issues and challenges associated with the occurrence or risk of occurrence of a genetic condition. The process of genetic counselling involves helping the family/individual to comprehend medical facts, understand the alternatives for dealing with risk, choose a course of action consistent with the family's goals, ethics, and religious beliefs, and make the best possible adjustment to the condition.[43]

2.2 Approaches for the Development of Preconception Health Care

Preconception health care is a relatively new way of envisioning prenatal care, and the body of research is not large. Systematic evaluations of interventions addressing multiple pregnancy risk factors do not yet exist in the literature.[6] According to the Center for Disease Control and Prevention, limited evidence exists regarding the effective methods for delivering preconception health care.[7] This section outlines possible strategies to guide discussions for the continued development of preconception health.

Approaches to preconception care must include: those who are planning a pregnancy, those who plan to have a family later in life and those who could become pregnant.[23] Given the substantially varied needs of each group, preconception care must be provided across the reproductive lifespan and be adapted to each woman's stage and particular needs. Depending on the stage of life or level of risk a woman may be at, some interventions may be more relevant than others. These differences should reflect how interventions are integrated and speak to the importance of being able to meet women's individual needs.[7]

Ontario's Best Start Resource Centre outlines some underlying key principles that should be considered in the implementation, development and evaluation of preconception health strategies: [23]

1. Value pregnant women, children and families
2. Encourage active pregnancy-readiness
3. Identify women considered at risk and target information to reduce those risks
4. Be aware of the many possible environmental factors that may influence a person's decision-making ability
5. Respect the diversity of people's lives and experiences
6. Help create understanding of health issues as they relate to pregnancy and conception in order to empower informed decision making

Below, we explore specific practice guidelines and strategies for addressing the key preconception risk factors discussed in the previous section.

2.3 Promising Strategies

The promising strategies for improving the area of preconception health focus on four general areas:

- Micronutrient supplementation
- Health service delivery
- Promoting awareness and knowledge of preconception health
- Further suggestions for developing the field

2.3.1 Messaging and Strategies around Micronutrient Supplementation

1. Inform women about the risks of inadequate nutrient intake, prior to and throughout pregnancy. Educate on the importance of proper nutrition and the need for a daily, folic acid fortified multivitamin starting in the preconception period and continuing through the prenatal and postpartum periods.

In light of the evidence that multivitamin supplementation with folic acid reduces rates of congenital anomalies, the Society of Obstetricians and Gynaecologists of Canada (SOGC) has published new folic acid recommendations. The recommended strategy for the primary prevention of congenital anomalies includes different options, depending on age, ethnicity, genetic factors, and compliance.[B]

Promising Practices

Option A: Low Risk

Patients with no personal health risks, planned pregnancy and good compliance require a folate-rich diet and daily supplementation with a multivitamin containing folic acid (0.4-1.0 mg) for at least two to three months before conception and throughout pregnancy and the postpartum period (4 to 6 weeks and as long as breastfeeding continues).

Option B: Health Risks

Patients with health risks, including epilepsy, insulin dependent on diabetes, obesity, family history of neural tube defect, or belonging to a high-risk ethnic group require increased dietary intake of folate-rich foods and daily supplementation, with multivitamins with 5mg folic acid, beginning at least two to three months before conception and continuing until 10 to 12 weeks post conception. From 12 weeks post-conception and continuing throughout pregnancy and the postpartum period (4 to 6 weeks or as long as breastfeeding continues), supplementation should consist of a multivitamin with folic acid (0.4-1.0 mg).

Option C: High Risk

Patients who have a history of poor compliance with medications and additional lifestyle issues or variable diet, no consistent birth control, and possible teratogenic substance use (alcohol, tobacco, recreational non-prescribed drugs) require counselling about the prevention of birth defects and health problems with folic acid and multivitamin supplementation. The higher dose folic acid strategy 5.0 mg with multivitamin should be used, as it may obtain a more adequate serum red blood cell folate level with irregular vitamin and folic acid intake but with a minimal additional health risk.[44]

[B] *For the full practice guidelines visit SOGC's website at www.sogc.org*

Vitamin A supplementation as beta-carotene instead of retinol is advised.

Women need to be informed not to take over 10,000mg of Vitamin A per day. Too much Vitamin A is teratogenic, causing potential congenital malformations.

Universal iron supplementation to meet the iron requirements of pregnancy is recommended by The Centre for Disease Control and Prevention (CDC). Although evidence around universal iron supplementation during pregnancy is inconclusive, supplementation is recommended due to the fact that it is not associated with health risks, while iron-deficiency anemia during pregnancy is associated with adverse outcomes.[45]

The current Dietary Reference Intake Research Synthesis states that calcium absorption adapts to pregnancy, and that a woman should meet the minimum requirements of calcium intake for her age category. As many women do not meet this minimum level, it is important to increase their calcium intake. [14] Research indicates that calcium supplements during pregnancy aid in the prevention of pre-eclampsia and pre-term birth and lowers the risk of serious maternal morbidity and infant death. Additionally, supplementation of calcium may protect against low birth weight. Calcium supplementation during pregnancy has also been shown to provide protection from hypertension during childhood. [26]

2. In addition to providing education around the importance of folic acid and multivitamin supplementation, implementation strategies around micronutrient supplementation must consider that these supplements may be out of reach for many marginalized and vulnerable populations.

Dieticians of Canada call for consideration of universal access to supplements as part of the feasibility for the implementation of a multi-supplement strategy.[46] Increased awareness is essential for an increase in access to be of benefit. While preconception care cannot ameliorate all of the social determinants of health, nutritional advice should consider the context of a woman's daily life.

2.3.2 Health Service Delivery

3. Advise women on the importance of healthy weight gain before and during pregnancy through appropriate messaging, counselling and support.

Pre-pregnancy obesity is associated with increased risks of preterm birth, birth asphyxia, congenital malformations, preterm birth, preeclampsia, stillbirth and infant mortality.[71] Adequate dietary intake and maternal weight gain are important factors in lowering these risks. Additionally, evidence points to the role of maternal obesity in contributing to the onset of childhood obesity. [69]

In response to the growing obesity epidemic of obesity among women of childbearing age, the American College of Obstetricians and Gynaecologists has issued a recommendation suggesting obstetricians provide preconception assessment and counseling around healthy weight gain and encourage obese patients to undertake a weight reduction program.[4]

The risks of developing obesity begin very early in life, as such interventions need to begin before women enter their reproductive years. Creating linkages with schools around issues of food education and increased physical activity provides the opportunity for the promotion of healthy weights early-on.[69,70]

Promising Practices

The Calgary Health Region (2007) has recently conducted their Healthy Pregnancy Weight Project in which they produced and distributed clinical tools to assist health care professionals to measure weight gain during pregnancy. "*A healthy baby is worth the weight*" pamphlets and posters for patients outlining the importance of healthy weight gain during pregnancy were included in physician packages. A community referrals resource list was also provided with services available to provide counseling in a variety of areas. These areas included: eating disorder programs, diabetes management services, prenatal nutrition and nutritional counseling services and alcohol and substance abuse programs. The project found that women were more likely to gain an optimal amount of weight if advised to do so early in their pregnancy.[50]

The Student Wellness Initiative Toward Community Health (SWITCH), a student lead integrated health care service in Saskatoon's core neighbourhoods, offers the Triple F program: Fun, Food and Fitness. Participants are invited to join in exercise classes in an effort to reduce barriers to physical fitness and address the growing problem of diabetes in the community. As part of this program nutritious food and child care are provided. Although not specifically targeted to pregnant women, this program is offered to all members of the community.

4. Conduct screening for alcohol, tobacco, and other drugs with all women of child bearing age using a standardized screening tool.

Asking screening questions may open up discussions regarding a woman's use of alcohol, tobacco and other drugs. In providing the opportunity for women to self-report risky behaviour, health care providers are better able to develop appropriate interventions. Research recommends the use of a standardized screening tool to detect substance use that may require further assessment. Several screening tools have been developed to assist in identifying at risk women. The T-ACE screening tool has been suggested to be a more effective tool due to its increased sensitivity rating in predicting risky behaviours.[35,48] Several agencies, including the Saskatchewan Prevention Institute (Alcohol Risk Assessment project), Alberta Drug and Alcohol Commission (ADAC) and Best Start, have each produced guides educating health care professionals on alcohol screening using standardized screening tools. The purpose of these guides is to open discussions with pregnant women and women of childbearing age about alcohol consumption. The following strategies could be used to assist in addressing alcohol use during the preconception period:

- Motivational interviewing

  Motivational Interviewing, a counselling model developed for health risk behaviour, has shown to be effective with people with substance abuse issues.[64] Project CHOICES used motivational interviewing sessions to target women at risk of drinking during pregnancy. Women who drank daily and/or engaged in binge drinking in the previous three months, who had participated in recent sexual activity, and who had no or ineffective contraception were chosen to participate. Results from these sessions showed that 68% of women reduced their risk of an alcohol exposed pregnancy through decreased alcohol use and effective contraception.[6] In Saskatchewan, Motivational Interviewing training has been provided for many health care professionals through various health regions, professional development opportunities and the Saskatchewan Prevention Institute's Alcohol Risk Assessment project.

- Use a harm reduction strategy

  While the safest choice is to not use substance during pregnancy, many women may not be ready, willing or able to consider complete abstinence. An abstinence approach may not only alienate women from prenatal care, but may also increase substance use behaviours due to shame and stigma. The Pregnancy-Related Issues in the Management of Addictions (PRIMA) project is designed to assist Canadian health care professionals in providing care to women with problematic substance abuse issues during pregnancy. The project has produced a reference booklet providing accurate and up-to-date information for health care professionals on the issue. Train-the-trainer workshops are also provided.[49]

- Use brief interventions

  An option for women who are not substance dependent and have reasonable social support is brief interventions ranging from one to three sessions. Evidence shows that brief interventions with women of childbearing years successfully reduce alcohol intake during pregnancy.[6] An introduction to brief interventions is provided in the "Enhancing Patient Care" resource developed by the Saskatchewan Prevention Institute's ARA project.

- Prevention and intervention programs aimed at women with substance use problems must consider the provision of holistic services that can address the entire context of a woman's life.

  The Sheway program in Vancouver provides an example of a program using a women-centered philosophy that takes into consideration the varied needs of women living in Vancouver's Downtown Eastside. In addition to services designed to support the reduction of substance use among women, this program also supports women in addressing additional barriers to improving their health. Program evaluations have shown to be successful in improving the nutritional status of women coming into the program, improving the housing situation for women with no home or inadequate housing and helping women to retain custody of their children.[68]

5. Design community interventions for women with or at risk of developing diabetes.

Among possible interventions, studies show that community interventions play an important role in reducing the development and rate of progress of Type 2 diabetes.[38]

Promising Practices

The National Public Health Initiative on Diabetes and Women's Health developed a National Agenda for Public Health Action to identify 10 priority steps to improve the lives of women with or at risk of developing diabetes. Due to the difficulty preconception programs often have in reaching at-risk populations, these recommendations advocate for a community-based strategy involving collaboration with other community-based organizations currently serving these populations. Some of the recommendations include:

- Expanding outreach into a variety of settings where women frequent such as work, school, other support programs, etc... and offer health promotion, education and incentives
- Educating community leaders about diabetes prevention and control in order to develop roles they can play to help promote health environments
- Encouraging health care providers to promote risk assessment and self-management.[60]

From the recommendations within the National Agenda, the use of Community Health Workers (CHWs) is suggested as a promising practice to addressing diabetes in the preconception period. Supported by the Institute of Medicine (IOM) in the United States, this strategy has been incorporated into various community-based projects funded through the Center for Disease Control and Prevention. CHWs are used as links for community members who have not traditionally accessed health care services. Additionally, this role facilitates an increased awareness of available preconception services and provides women with culturally or linguistically appropriate diabetes information. Several programs employing CHWs have reported increased access to health services and improved health outcomes.[38]

6. Present genetic counselling as an option for all women of childbearing age who may be at risk of a genetic condition in order to promote informed choice regarding future pregnancy decisions.

Genetic counseling is available in the province and although referrals from family physicians are most common, self-referrals are accepted. Most often in Saskatchewan genetic counseling is not sought until after invasive screening, such as amniocentesis, where abnormalities have been detected.[51] A population health approach has at its foundation the view that the earlier action is taken, the greater the potential for population health gains. Investing in preconception genetic counselling may have a greater potential to influence positive outcomes for the child.

2.3.3 Promoting Awareness and Knowledge of Preconception Health

Studies have demonstrated a consistent lack of public knowledge regarding preconception risk factors that may increase the chance of adverse pregnancy outcomes.[9] Promising strategies include social marketing campaigns and community outreach:

7. Implement information sharing strategies to increase public awareness of preconception risk factors.

A variety of approaches can be used to raise awareness of preconception health. A commonly used strategy for this purpose involves the development of social marketing campaigns based upon preconception health issues.[23] Using social marketing campaigns may target both mainstream and at-risk populations simultaneously, while key messages can be integrated into existing health promotion campaigns.[7] Developing messages that can be adapted to different cultural groups and ages that target specific modifiable risk behaviours is also important.[5] Working with other community-based programs to integrate reproductive messages will ensure consistent messaging.

Displays, ribbon campaigns, the use of media, information packages and distribution of free multivitamins have been used in various health campaigns. Many organizations exist with many free or downloadable preconception resources that may help to support preconception health promotion campaigns:

Saskatchewan Prevention Institute - www.preventioninstitute.sk.ca [C]

Best Start Resources - www.beststart.org

March of Dimes - www.marchofdimes.com

Examples of such social marketing campaigns are illustrated in the following programs:

Promising Practices

Georgia Folic Acid Campaign (GFAC)

Georgia's state Department of Health Services and the federal Women, Infants and Children program (WIC) sought to increase the number of reproductive age women consuming folic acid in six family planning clinics throughout the state. Strategies included the promotion of a "folic acid friendly environment: through the active promotion of educational materials which were displayed and made available to participants. In some clinics folic acid tablets were also provided. A 41-54% increase in knowledge levels on the topic of folic acid was found among participants".[52, 61]

[C] *The Saskatchewan Prevention Institute can assist communities in the development of resources that are relevant to their identified needs. Organizations and health regions throughout the province are invited to contact the Prevention Institute to discuss their identified needs.*

"Your Health Before Pregnancy"

Ontario Best Start (2005) implemented a preconception campaign targeting those women in Ontario who were planning a pregnancy. Messaging focused on the concept that the health of a baby begins long before conception and that babies are dependent on the health of both mothers and fathers before a pregnancy. The campaign utilized media strategies and supported local initiatives in the community through the provision of resources to interested organizations. A health before pregnancy workbook covering a range of preconception topics was also produced and available free of charge. Further information can be found at www.healthbeforepregnancy.ca [62] Subsequent evaluations of the campaign indicated an increase in knowledge among women to visit a health care provider before pregnancy.[9]

8. Use community-based initiatives to increase public access to health promotion initiatives for women of childbearing age.

Community outreach initiatives range from classes, community events, and at-home meetings to telephone support and door-to-door outreach. Below are two examples of successful community outreach initiatives focusing on preconception health.

Promising Practices

"Before you Become Pregnant" Classes

Capital Health, in Edmonton, currently holds free monthly preconception classes. These classes change locations every month in order to allow for greater access to these programs. The Calgary Health Region runs a similar program offering preconception workshops called "Before you become pregnant...."[9]

Lay Health Worker Program

In North Carolina, a group of community professionals and citizens joined together to develop a plan for improving women's health. These discussions led to the development of the Lay Health Worker Program in which community leaders received training to provide support to women who may be in need of additional help. The Lay Advisors conduct door-to-door outreach, maintain telephone contact with women, do presentations and participate in community events and arrange at-home meetings with women. Lay Workers are able to build healthy relationships with women and enable the exchange of knowledge and skills to improve women's health. Each month the Lay Advisors are able to make 82 needed referrals to support agencies for the women they serve. The Coalition credits the program's success to the involvement of community members with agency personnel from the beginning stages of the project.[53]

9. Provide opportunities for collaboration and professional development. Provide opportunities for health care professionals to learn more about preconception health and working with women of childbearing age.

Professional in-services, workshops and learning collaboratives can increase awareness and may provide opportunities for collaborative planning.[7] Examples of this include the following:

Promising Practices

"Folic Acid - You Don't Know What You're Missing"

In 2006, the Unites States National Council on Folic Acid sponsored a week of folic acid awareness aimed at health care providers. A national education teleconference reached 2,300 participants. The awareness week was conducted again in 2007.[9]

"Not all Habits are Bad"

After finding that health care providers were saturated by professional education around the prevention of neural tube defects, this project chose to reframe the folic acid message. Information delivered to health care practitioners focused on the concept that a daily multivitamin would improve the overall health of women. Physicians on the mailing list were also alerted to the availability of the CME program entitled: "Reconsidering Multivitamin Supplementation: Meeting the needs of our female patients throughout the age continuum".[54]

"Every Woman, Every Time"

The California Preconception Care Initiative, in their efforts to address the need for access to preconception care, developed materials for health care practitioners aimed at changing their practices to include preconception care. Included in the package was a rationale for increasing the importance of preconception care, a description of the essential elements for preconception care and educational materials that could be provided to women on the subject. In a survey conducted of health care providers, 75% indicated that the materials would change their current practices around preconception care.[54]

"Becoming a Parent"

In Wisconsin, a preconception health tool kit was sent out to both health care providers and consumers in order to increase knowledge levels and provide practical tools for improving preconception outcomes. The tool kit included a position statement for health care providers explaining the importance of preconception care, a preconception self-assessment checklist for women to be reviewed with their health care provider, a health care provider's reference with instructions for use of the checklist, as well as information, references and resources for the provider, and parent resources focusing on preconception care. Since the initial mail-out of the toolkit, 7,000 additional copies have been ordered from hospitals, clinics, public health departments and other community organizations providing preconception care.[55]

10. Ensure existing resources and programs are culturally appropriate. Information, tools and programs should be culturally relevant and address any cultural barriers that may prohibit the use of preconception services among certain groups.

Promising Practices

Alberta Health Services through their Healthy Diverse Populations services provides information and resources to assist staff in working with diverse populations. Presentations, workshops and web resources are available to staff and administrators on diversity related issues that are relevant to various situations.[63]

2.3.4 Further Suggestions for Developing the Field

11. Support evidence-based changes in health care provider knowledge, attitudes and practice.

We suggest influencing clinical practice through adaptation, development, revision, consolidation and dissemination of evidence-based guidelines and appropriate screening tools. This includes developing policies and guidelines that can assist with the integration of components of preconception care into current prevention strategies. Evaluation is also a key aspect of promoting evidence-based changes among health care providers.

12. Increase the collaboration and communication across health sectors and community partners in the sharing of successful programs and in the development of new initiatives.

Preconception health is affected by many barriers to health that extend beyond the capacity of health regions alone. Increased collaboration across health sectors and among community partners provides the opportunity for integrated approaches that promote and protect preconception health in a comprehensive way. Increased communication among different groups provincially also provides the opportunity to increase the knowledge of services and resources that currently exist to assist clients with various health challenges.

13. Evaluate current preconception practices and services.

All strategies to improve preconception knowledge and health before pregnancy should be evaluated in terms of its impact to determine the effectiveness of the strategy in meeting women's needs.

Gathering information about current practices is necessary in order to make training and tools for health care providers more relevant. This is also critical to the ability to evaluate the success of training/tools. Health services need to be re-organized to include preconception initiatives that can connect women to community resources.[8]

14. Support interdisciplinary preconception health research.

Supporting research in the area of preconception health provides the opportunity for the advancement of knowledge that will improve preconception health and aid in the development of effective strategies for delivering preconception care.[9] Research should collaborate across disciplines and include community members, policy and decision makers, direct service providers, families and advisory committees. As such, research can be used to seek answers to questions around preconception health that would be most relevant to the community.[57] Research provides the opportunity to develop effective key messages and design new research project proposals that can be targeted as a regional priority. Examining risk factors can also be useful in providing guidelines for at-risk populations.

Including the community in the implementation and evaluation of preconception programs is an important means of creating effective and sustainable strategies. Using community-based, participatory research may assist in assessing the self perceived needs of the community and may help to define relevant research agendas in preconception health.[5]

15. Conduct monitoring and surveillance of maternal and infant health outcomes.

Timely provincial surveillance, data collection and meaningful analysis of maternal and infant deaths can help to guide prevention efforts. Existing data and surveillance should be examined for gaps.[5] Improvements to the monitoring and surveillance of preconception health will assist in gathering relevant information to direct program development.

Promising Practices

In Saskatchewan, KidsFirst offers a screening survey to postpartum women to assess at-risk women. The screening is done on a voluntary basis and collects information regarding congenital or acquired health challenges, family history of genetic health issues, birth weight, pregnancy events, pregnancy complications, previous neonatal deaths/apprehensions, maternal education level, maternal age, substance use during pregnancy and other factors that may be relevant in examining pregnancy outcomes for certain regions.[56]

16. Develop policies supportive of preconception health that will provide the foundation to guide future strategies and approaches to preconception care.[9]

Supportive policy allows for the re-envisioning of the current prenatal structure that may be inhibiting effective preconception health initiatives.

2.4 Conclusion

Ultimately, the successful incorporation of preconception care rests in the ability to shape maternal and infant health policies. Creating the expectation that preconception care is not a single visit, but is part of the entire reproductive lifespan requires that efforts be directed at patients, providers and policy makers. This process presents several challenges that must be addressed in making this transition. The high rate of unintended pregnancies in Canada and lack of knowledge among patients and providers regarding the benefits of preconception care provide two of the largest challenges to preconception integration. Additional barriers include the lack of access to services by at-risk women and the fragmentation of services already in existence.[23] Implementation of effective programs and policies must consider these challenges.

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3.0 PRENATAL CARE

The provision of prenatal care provides the foundation for health promotion during pregnancy and is an important predictor of positive birth outcomes. Prenatal care has the potential to reduce infant mortality and morbidity through the promotion of healthy lifestyle behaviours, the identification and reduction of modifiable risk factors and the treatment of medical conditions.[1] Infant mortality rates tend to be higher in infants whose mothers had no prenatal care, while women who have access to prenatal care are less likely to deliver a preterm infant or have other serious problems related to pregnancy and are more likely to have a healthier infant.[2]

For the purpose of this report, prenatal care is discussed as the overall spectrum of care, inclusive of prenatal medical visits and prenatal education, both clinical and community-based, that a woman may access throughout her pregnancy. Prenatal care includes care from physicians, midwives, public health nurses and other community-based programs such as Community Action Program for Children (CAPC).

Prenatal care offered by health care professionals, is generally initiated in the first trimester of pregnancy. Studies show that women who access prenatal care early in their pregnancies have better birth outcomes than those women who do not access prenatal care.[1] However, many women who are at higher risk of poor birth outcomes, including adolescents, single women, women who use alcohol and other drugs, smokers and marginalized women, often seek prenatal care late in pregnancy and initiate fewer visits to a health care professional.[3,4]

In addition to individual factors, socioeconomic factors have been associated with inadequate prenatal care. Levels of inadequate prenatal care have been cited as two to three times higher in neighbourhoods with high rates of low family income, high unemployment, lower education levels, high rates of single parent families, and significant numbers of women who smoke during pregnancy. First Nations and immigrant women have also been found to have inadequate levels of prenatal care. Consequently, these factors contribute to higher levels of maternal stress which negatively impact healthy birth outcomes.[5]

The reasons underlying the inadequate utilization of prenatal care are not clear, however it is generally acknowledged that the current model of prenatal care does not meet the needs of all women. High quality prenatal care could be delivered to build on integrative models of well-woman care. Important considerations include services that are community based, accessible, culturally appropriate, provide a continuity of care and meet the needs expressed by women and their families in target populations.[6] Attention should also be given to interventions that address those risk factors associated with adverse birth outcomes, particularly infant mortality. Even in a universal system of care, optimal birth outcomes will not be achieved until programs can better meet the needs of all women.[3]

This section discusses prevalence and risk factors for low birth weight, and examines major risk factors for poor pregnancy and birth outcomes, including:

- Smoking
- Poor nutrition
- Inadequate access to prenatal care
- Maternal Mental Health
- Lack of social support
- Maternal age
- Domestic violence
- Genetics

3.1 Low Birth Weight

In Saskatchewan, the infant mortality rate by birth weight shows that low birth weight has considerably the highest rate of infant deaths of all birth weights (See **Table 3.1**). (See Appendices for break down of birth weight by RHA)

Table 3.1 Infant Mortality Rate, by Birth Weight, Saskatchewan, 2001 to 2007.

	2001	2002	2003	2004	2005	2006	2007	7 year Total
Extremely Low (500g - <1000g)	500.0	566.7	466.7	394.7	509.4	428.6	705.9	**501.7**
Very Low (500g - <1500g)	258.1	204.1	250.0	185.2	262.7	221.3	337.0	**243.5**
Low (500g - <2500g)	66.7	42.6	54.5	45.2	58.5	63.7	56.9	**55.7**
Normal (2500g to <4000g)	1.6	2.3	2.8	3.1	3.6	2.0	2.2	**2.5**
High (4000g+)[A]	1.5	2.2	0.5	2.7	1.0	0.0	3.5	**1.7**
Total (excluding <500gms)	**5.5**	**5.7**	**6.2**	**6.2**	**8.2**	**6.3**	**5.9**	**6.3**

Source: Saskatchewan Ministry of Health

Low birth weight (LBW) infants are those with a weight of less than 2,500g. Low birth weight is caused by a preterm birth (PT) (less than 37 weeks gestation) and/or, babies that are small for gestational age (SGA) (less than the 10th percentile for gestational age). Low birth weight is a significant determinant for infant mortality and also contributes to poor long-term, and potentially lifelong, health outcomes. These outcomes include: behavioural problems, ADHD, lower IQ scores, motor and sensory impairments and respiratory problems.[6,7]

Women with no prenatal care are three times more likely to have infants with a low birth weight than women who receive adequate prenatal care. These infants are also five times more likely to die.[8] A small size at birth can be a predictor of mortality in adulthood as low birth weight is associated with an increased risk of cardiovascular disease, type 2 diabetes and osteoporosis later in life.[9]

[A] *High birth weight or fetal macrosomia is associated with an increased risk of perinatal and infant mortality and morbidity with the leading cause of death being asphyxia in the neonatal period. High birth weight and very high birth weight fetuses have been found to be more likely to be stillborn and were also twice as likely to die of SIDS when compared to normal weight infants.[36] Aboriginal women are particularly at risk for macrosomic infants.[20,38,39] Recent trends in the literature suggest an increase in mean birth weight and large for gestational age. Changes in sociodemographic factors combined with increases in gestational weight gain, diabetes, maternal body mass and height and reduced maternal smoking have been attributed to this increase.[36] In Saskatchewan, five year average rates of high birth weight from 1991 to 2005 have been steadily increasing in the majority of health regions, however no causal relationship exists between high birth weight and infant mortality in this province.*

Low birth weight creates a significant burden on the health care system, costing more than $13 billion annually in Canada.[10] Average hospital costs for LBW infants range from $3,592 to over $117,000 depending on the infant's weight, whereas the cost for a baby of normal weight is only around $795.11. Lifetime costs of long-term morbidities caused by LBW are significant and can only be estimated depending on the severity and development of associated problems. The psychosocial and emotional costs for families and individuals, which is much more difficult to estimate, is also an important consideration in examining the overall impact of low birth weight.[6]

3.1.1 Rates of Low and Very Low Birth Weight

In Canada, in 2005, the low birth weight rate was 60 per 1,000 live births and the very low birth weight (VLBW) (<1,500g) rate was 10 per 1,000 live births. In Saskatchewan, in 2005, the low birth weight rate was 57 per 1,000 live births and the very low birth weight rate was 11 per 1,000 live births. [64]

Examination of the distribution of low birth weight rates across Saskatchewan health regions may allow for public health initiatives to target relevant programming in those areas with high rates of low birth weight. [see **Figure 3.1**]

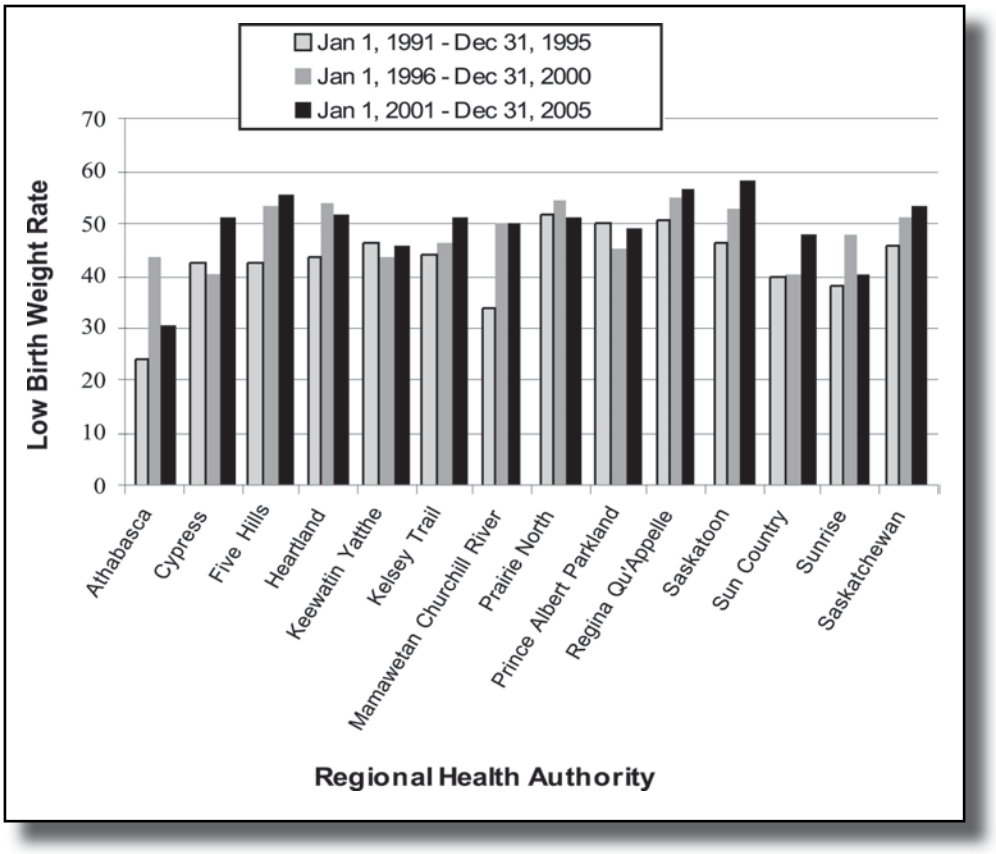

Figure 3.1
Low Birth Weight Rates by Regional Health Authority, Five Year Averages, Saskatchewan, 1991-2005.

Source: Saskatchewan Ministry of Health

Table 3.1 outlines five year average rates for both LBW and VLBW according to regional health authorities in Saskatchewan. As the table indicates, for the period of 2001 to 2005, the five year average low birth weight rates ranged from a high of 58.4 per 1,000 live births in the Saskatoon Health Region to a low of 30.7 per 1,000 live births in the Athabasca health region. The rate for the province was 53.69 per 1,000 live births. The very low birth weight (< 1,500g) rate for Saskatchewan was 9.64, and the VLBW rates ranged from a high of 11.3 per 1,000 live births in Regina Qu'Appelle to a low of 5.7 per 1,000 live births in Mamawetan Churchill River.

Table 3.2 Low Birth Weight Rate and Very Low Birth Weight Rate by Regional Health Authority, Five Year Averages, Saskatchewan, 2001-2005.

Regional Health Authority	LBW	VLBW
Athabasca	30.7	
Cypress	51.7	6.1
Five Hills	56.0	8.5
Heartland	52.0	11.0
Keewatin Yatthé	46.2	8.0
Kelsey Trail	51.3	11.2
Mamawetan Churchill River	50.4	5.7
Prairie North	51.7	9.5
Prince Albert Parkland	49.4	8.4
Regina Qu'Appelle	56.8	11.3
Saskatoon	58.4	10.6
Sun Country	48.2	8.6
Sunrise	40.5	6.1
Saskatchewan	**53.7**	**9.6**

Source: Saskatchewan Ministry of Health

Preterm birth is one cause of LBW. In Canada, for 2001 to 2005, the preterm birth rate was 76 per 1,000 live births, while in Saskatchewan, the preterm birth rate was 72 per 1,000 live births. 65 Keewatin Yatthe, Mamawetan Churchill River, Northern Saskatchewan, Prince Albert Parkland, and Saskatoon had rates that were higher than the provincial average, whereas Athabasca, Cypress, Five Hills, Kelsey Trail, Heartland, Prairie North, Sun Country, and Sunrise had rates that were lower.

Efforts to address the issue of low birth weight require an understanding of those risk factors that may be contributing to these rates. The following section outlines some modifiable risk factors for low birth weight that will require attention in order to reduce the low birth weight rates that are evident in Saskatchewan.

3.1.2 Risk Factors for Low Birth Weight

Identifying the determinants of an event is necessary to appropriately target interventions. Although preterm birth and small for gestational age are different pathways to low birth weight, there are many modifiable (and other) risk factors that are common to both pathways.[10] For the purposes of looking at the issue from a program planning perspective, risk factors for low birth weight due to preterm birth, small for gestational age (SGA), or common to both, will be considered together. The outline of the following risk factors is adapted from: Best Start (1998)[12] and Toronto Public Health (2002).[13]

Behavioural Risk Factors

Behavioural risk factors involve:

- smoking
- exposure to second hand smoke
- alcohol/drug use
- violence/abuse
- underweight prior to conception and/or inadequate weight gain during pregnancy
  Note: also due to biological factors
- multiple pregnancies
- working in physically demanding occupations

Social Characteristics

Risk factors can also be associated with social characteristics such as:

- low socioeconomic status
- lack of prenatal care
- maternal malnutrition
- maternal stress
- lack of social support
- being a single parent

Demographic Risk Factors

Demographic risk factors comprise:

- race/ethnicity
- extremes of maternal age
- marital status
- education

Medical/Biological Risk Factors

Medical and or biological factors can pose risks:

- inadequate weight gain during pregnancy and/or underweight prior to conception
- previous history of preterm/LBW births
- bacterial vaginosis
- urinary tract and other infections
- HIV
- Placental factors
- genetic factors
- previous delivery of a low birth weight infant
- chronic pre-existing conditions in mothers (e.g. diabetes, hypertension)
- woman born preterm or SGA herself

Socioeconomic, psychosocial and environmental influences interact in ways that impact preterm and SGA births (although the causal pathway is not completely clear). Given this, and the fact that women are likely to experience more than one risk factor and, as a result, low birth weight interventions require a multi-strategy approach to be effective.[6]

This section discusses some major modifiable risk factors that have been found to be highly correlated with the incidence of low birth weight:

- smoking
- psychosocial support
- poor nutrition
- maternal age

Smoking

Smoking has been clearly established as the largest modifiable cause of low birth weight and infant mortality.[7] Almost a quarter of preterm births (23.2%) and small for gestational age births (24.5%) are attributable to smoking.[10] The risk of both perinatal and neonatal deaths increases by 33% for women who smoke during pregnancy.[15] It is estimated that infants born to smoking mothers are 150-200 grams smaller compared to babies born to non-smokers.[10,16] In addition, strong associations have been found between the effects of smoking on the fetus and increased risk of sudden infant death syndrome, stillbirth, growth restrictions, poor neuro-cognitive development, delayed motor development and the development of asthma and poor dental health in the infant later in life.[3,9,15,17-19]

Socioeconomically disadvantaged neighbourhoods have been shown to indirectly influence maternal behaviours such as smoking.[5] A higher prevalence of smoking has been found among aboriginal women, teens and pregnant women living in poverty.[4,20] Women with low levels of education, low income and are unemployed are more likely to continue smoking throughout pregnancy.[22]

While maternal smoking has decreased over the past several decades, a significant number of pregnant women continue to smoke: a Canadian Tobacco Use Monitoring Survey found that, of 1.5 million pregnant women in Canada, 11% smoked during pregnancy.[14] The Canada Prenatal Nutrition Program (2007), a program aimed at reducing the incidence of unhealthy birth weights, reported that 31% of participants smoke during pregnancy.[21]

A woman's social support system also affects health behaviours and lifestyle patterns during pregnancy. A study examining the effects of social support during the prenatal period on pregnancy outcomes found that women with low social support had significantly higher rates of self-reported smoking during the first trimester of pregnancy compared to those with higher levels of social support. Additionally, women with low social support who smoked during early pregnancy had babies with significantly reduced birth weights (3,175g ± 453g) compared with babies of mothers with high support who smoked (3,571g ± 409g). Among smokers, pregnancy complications were also higher in women with low social support (34%) compared with those women with high support (10%).[9]

Smoking cessation is the primary strategy for the reduction of low birth weight.[22] A systematic review of 64 randomized and cluster-randomized trials conducted for the Cochrane Collaboration found that smoking cessation interventions reduced the proportion of low birth weight and preterm birth, while increasing the mean birth weight by 33g.[23]

Psychosocial supports, lack of associated stress and maternal motivation have all been cited as important factors for successful smoking cessation.[13] While the majority of women quit smoking within the first month or two of pregnancy, those with less education, teens, unmarried women and heavy smokers are not as likely to quit.[13] Despite this, evidence has shown that the rate of smoking cessation among pregnant women is higher compared to the general population.[13] The motivation women feel at pregnancy to protect the health of their child provides a unique opportunity for behaviour change.[24] Regardless of the fact that not all pregnant women may be capable of quitting during pregnancy, a reduction in smoking can still provide protective effects for the fetus. A reduction in smoking of up to 50% is associated with a 92g increase in birth weight.[17]

Psychosocial Support

Social support is a significant predictor of birth weight. A study examining social support during pregnancy found that babies born to mothers with low social support in the early part of pregnancy weighed an average of 200g less than babies born to mothers with adequate support. The physical and emotional impacts of low social support have been reported to increase maternal stress, anxiety and depression. These conditions are significantly associated with low birth weight, prematurity and growth restrictions due to their physiologic effects on biologic systems such as hormones and immune mediators.

Lack of social support has also been found to exacerbate additional lifestyle risk factors such as smoking.[9,18] Conversely, the presence of social support is associated with increased rates of smoking cessation. Intervention strategies using a rewards system combined with social supports have been shown to result in significantly greater smoking reduction than other strategies.[23] These results provide important implications for the prevention of low birth weight and the structure of smoking cessation programs. Efforts to reduce low birth weight should incorporate measures to identify women at risk and improve upon psychosocial supports throughout the prenatal period.[9]

Poor Nutrition

The relationship between pregnancy, nutrition and fetal growth is complex; however, evidence suggests that inadequate maternal nutrition status during pregnancy is one of the strongest predictors of low birth weight.[22] Not only does malnutrition affect fetal development, it can also contribute to stress which is associated with preterm birth.[13]

Inadequate gestational weight gain is related to one and a half to two times higher risk of preterm delivery.[12] A study conducted in Alberta found inadequate weight gain to be associated with a threefold increase in the likelihood for the delivery of an SGA infant.[10] From a public health perspective, interventions working to improve pre-pregnancy weight and caloric intake have the potential to have short-term impact on intrauterine growth.

For women living in difficult life situations, additional challenges around food security need to be addressed. Nutrition assessments of pregnant women should identify those with limited resources and/or additional stressors that are affecting their ability to meet their nutritional needs during pregnancy.[13] Low levels of education about healthy nutrition and limited or inadequate resources to purchase good food can impact a woman's ability to meet nutritional guidelines while pregnant.[12] Education and counseling about nutrition is insufficient without access to affordable, healthy food options.

A study examining the effects of nutritional supplementation during pregnancy found that caloric supplementation may impact low birth weight. However, these effects are often difficult to assess due to a multitude of other factors in these women's lives (e.g., high maternal stress) that also influence low birth weight outcomes.[12] Evidence affirms that interventions that combine support, education and access to food have a greater impact on a person's food choices than simply the provision of food supplements.[4]

At the other end of the spectrum is the concern around diabetes. Infants born to diabetic mothers are at a significantly increased risk for major congenital anomalies, macrosomia and perinatal mortality.[25] Access to diabetes screening and management during the prenatal period are important for reducing these impacts.

Maternal Age

Both younger (under 20 years) and older (over 34) women are at increased risk of having a low birth weight baby, as the table below shows.[11,15] [see **Table 3.3**]

Table 3.3 Percentage of Low Birth Weight by Age of Mother, Canada, 2005.

Mothers' Age Group	LBW %
Under 20 years	6.6
20-34 years	5.7
35-49 years	7.1

Source: Statistics Canada. Live birth, Birth weight indicators, by characteristics of the mother and child Canada, annual (CANSIM Table 102-4511). Ottawa, Statistics Canada, 2008.

Table 3.4 below examines mother's age as a factor in infant death. This table indicates that, in Saskatchewan, maternal age is related to infant mortality. Infant deaths are higher among women from 10 to 19 years of age. Even 20 to 24 year old mothers have a higher infant mortality rate than women between 25 and 34 years of age. When looking at women from 35 to 39 years of age, again the infant mortality rate increases. Note that the rate for the 40+ age group (and the rate for 35-39 in 2001), should be interpreted with caution due to very small number of births to women in these age groups. The small number of births to women 40+ makes it difficult to draw any conclusions from this data. (See appendices for a break down of infant mortality by mother's age by RHA)

Table 3.4 Infant Mortality Rate, by Mother's Age, Saskatchewan, 2001 to 2007

Mother's Age	2001	2002	2003	2004	2005	2006	2007	7 year Total
10 to 19	9.8	6.9	8.5	7.5	10.3	10.3	6.2	**8.5**
20 to 24	6.0	3.8	5.8	6.5	9.4	6.8	7.5	**6.6**
25 to 29	6.4	4.2	3.7	5.8	6.4	4.2	4.6	**5.0**
30 to 34	1.9	5.2	5.8	5.6	6.3	3.6	4.2	**4.6**
35 to 39	2.8	6.7	7.6	4.9	7.0	9.4	6.8	**6.5**
40 +	0.0	5.8	9.7	9.3	5.1	0.0	5.5	**5.2**
Total	**5.5**	**5.6**	**6.1**	**6.2**	**8.2**	**6.3**	**5.9**	**6.2**

Source: Saskatchewan Ministry of Health

The remaining two sections discuss specific issues related to advanced and young maternal age.

Advanced Maternal Age (≥ 35 years)

An Alberta study examining the impact of delayed childbearing on the rates of low birth weight and pre-term birth found that the risks of preterm birth increase by 20% and the risks of SGA increase by 40% among women 35 years of age and older.[10] Studies suggest that high risk behaviours like smoking and alcohol have a greater negative impact in older women than in younger women.[15] Women over the age of 35 report higher rates of alcohol use during pregnancy.[27]

In Saskatchewan, between 2001 and 2005 of 59,938 live births in the province there were a total of 6,150 infants born to women 35 years of age or older (10.3%). In Saskatchewan advanced maternal age is not a trend among First Nations women who tend to have children at a younger age.[27]

Due to the increased risk of poor pregnancy outcomes, it is recommended that all women over the age of 35 access prenatal care early in pregnancy. First trimester screening and early intervention of potential health complications should be a priority for this population.

Young Maternal Age (< 20 years of age)

Research indicates that the infant mortality rate among adolescent mothers is higher than for infants born to women in their primary childbearing years (23-29 years).[66] Rates of teen pregnancy are higher among populations that are economically disadvantaged and marginalized. Consequently, teen pregnancy is high among adolescents living in low-income areas compared to high-income areas.[28] Adolescent mothers face numerous negative health outcomes for themselves and their babies. Many of these outcomes are tied to poverty including an increased risk of preterm, low birth weight and death during infancy. A poor birth outcome for an adolescent mother is found to be more common in low income neighbourhoods. This may be of particular concern given that a prior poor birth outcome for teen mothers is a significant predictor of poor birth outcomes in subsequent pregnancies.[29]

In comparison to other provinces, Saskatchewan has the third highest rate of teen births with 10.2% of all live births being to mothers between 10-19 years of age; (only Nunavut and the Northwest Territories have higher rates). This is well above the national average of 4.8%.[30] The number of subsequent (or second) births among teens in Saskatchewan (6.3 births per 1,000 women) is also well above the national average of 2.6 births per 1,000 women aged 15 to 19.[29]

An additional challenge in Saskatchewan is the high rate of teen pregnancy among First Nations youth in Canada. One study found that pregnancy rates among on reserve adolescent girls are 38 times higher than the general population.[31] Low birth weight and preterm birth among teen pregnancies are often the result of poor prenatal nutrition, lack of prenatal care and substance use. Socioeconomic status rather than young maternal age is cited as a cause for poor health outcomes for the mother and child.[32] Adolescent mothers living in poverty may experience social isolation, discontinued education, homelessness, subsequent pregnancies,

increased vulnerability to abuse and psychosocial concerns that can contribute to poor pregnancy outcomes.[28] Research shows that interventions aimed at reducing maternal poverty and increasing support of pregnant teens may be more effective at improving the health outcomes of these infants.[33] The use of home visiting programs focusing on social support, education and access to services has also shown to reduce low birth weight among at-risk and adolescent women.[90]

3.2 Inadequate Access to Prenatal Care [B]

The provision of prenatal care provides the foundation for health promotion during pregnancy and is an important predictor of positive birth outcomes. Prenatal care has the potential to reduce infant mortality and morbidity through the promotion of healthy lifestyle behaviours, the identification and reduction of modifiable risk factors, and the treatment of medical conditions.[1] Infant mortality rates are shown to be higher in infants whose mothers have had no prenatal care, while women who have access to prenatal care are more likely to have a healthier infant., and less likely to deliver a preterm infant or have other serious problems related to pregnancy.[2]

Studies show that women who access prenatal care early in their pregnancies have better birth outcomes than those women who do not access prenatal care.[1] However, many women who are at higher risk of poor birth outcomes, including adolescents, single women, women who use alcohol and other drugs, smokers, and marginalized women, often seek prenatal care late in pregnancy and initiate fewer visits to a health care professional.[3,4]

The reasons for inadequate utilization of prenatal care are not clear; however, one explanation that is supported in the literature is that the current model of prenatal care does not meet the needs of all women. High quality prenatal care could be delivered to build on integrative models of well-woman care. Important considerations include services that are community based, accessible, culturally appropriate, provide a continuity of care and meets the needs expressed by women and their families in target populations.[6] Attention should also be given to interventions that address those risk factors associated with adverse birth outcomes, particularly infant mortality. Even in a universal system of care, optimal birth outcomes will not be achieved until programs can better meet the needs of all women.[3]

A study from Manitoba examining the utilization of prenatal care found that social inequalities existed amongst women with certain characteristics. These were women living in low-income neighbourhoods with high rates of unemployment, First Nations populations, recent immigrants, single parent families, individuals with fewer than nine years of education and women who smoked during pregnancy.[5] In addition to these findings others have cited drug use, lack of social support, lack of peer support, fear, lack of perceived benefit, complex life circumstances, residential instability, numerous children and extremes of maternal age as potential factors reducing the likelihood of staying engaged in prenatal care.[49]

[B] *For the purpose of this report, prenatal care is discussed as the overall spectrum of care, inclusive of prenatal medical visits and prenatal education, both clinical and community-based, that a woman may access throughout her pregnancy. Prenatal care includes care from Physicians, Midwives, Public Health Nurses and other community based programs such as Community Action Program for Children (CAPC).*

High risk women cite the following barriers to accessing prenatal care:

- attitudes of service providers
- inadequate information
- lack of referrals to accessible community resources
- provision of advice from health care professionals without the appropriate means of implementation

In addition to individual factors, socioeconomic factors have been associated with inadequate prenatal care. Studies indicate that women are 2-3 times less likely to access prenatal care if they live in lower socioeconomic neighbourhoods and/or neighbourhoods with high unemployment, high rates of single parents, and high rates of smoking during pregnancy.[5] These factors also contribute to higher levels of maternal stress and low self-esteem which negatively impact healthy birth outcomes.[5] First Nations and immigrant women have also been found to have inadequate levels of prenatal care.

A lack of cultural sensitivity within programs serving women can also be a significant barrier to entry into prenatal care, and can affect the adequacy of care a woman receives. When compared with non-First Nations women (3.6%), one study in Manitoba found that First Nations women (15.7%) were more likely to receive inadequate prenatal care.[1] In assessing the cultural competency of existing programs, health care providers must work with First Nations individuals and communities towards improved pregnancy outcomes for First Nations women.[57]

3.3 Domestic Violence

Pregnancy is a high risk time for the onset, continuation, and/or escalation of abuse. Studies estimate that between 4% to 17% of women have experienced violence during pregnancy. These numbers only take into account those who have reported the abuse and were able to be captured by studies.[69, 70] Violence against women during pregnancy is more common than preeclampsia and gestational diabetes and the risk of experiencing violent physical incidences heightens during pregnancy.[69,71,77]

Violence during pregnancy can directly and indirectly lead to maternal, fetal and neonatal death. Violence has been associated with spontaneous and elective abortions, miscarriages, fetal injury leading to fetal or neonatal death, fetal hemorrhaging, maternal shock resulting in oxygen deprivation of the fetus, premature birth, low birth weight and homicide of the mother and fetus.[72,73,74] Indirectly, violence during pregnancy can lead to maternal suicide, post partum depression, poor nutrition, and the use of alcohol, tobacco and other drugs as coping mechanisms.[75,76,77]

Despite the fact that abused women and their children are one of the highest consumers of health care services, studies have shown that only 25% of women are asked if they are experiencing abuse.[76,78,79,81] During a woman's childbearing years, service providers have many opportunities to initiate discussion, screen and identify women at risk of violence.

3.4 Maternal Mental Health

Maternal mental health during pregnancy has been found to have an impact on birth outcomes. Psychological distress, prenatal depression and other psychiatric and/or substance use diagnoses are associated with an increased risk of delivering a preterm or LBW infant.[83,84,85,86,87] These findings are of concern as it has been estimated that as many as 18.4% of pregnant women experience depression at some point during pregnancy.[88]

Despite the fact that a history of depression is a major determining factor of postpartum depression, surveys have shown that fewer than 50% of physicians discussed mental health or depression with women of childbearing age.[82] As the early identification of depression is critical to proper care and referral services, it is even more important that the opportunity for identification is not again missed in the early prenatal period.

3.5 Genetic Screening and Counselling

In February of 2007, the Society of Obstetricians and Gynaecologists of Canada (SOGC) issued a new guideline recommending that every Canadian woman, regardless of age, be provided the choice of undergoing non-invasive genetic screening during her pregnancy. With results produced from these tests, health care professionals can offer appropriate counseling or further screening using more invasive methods such as amniocentesis.[41] Prenatal screening presents the individual risk of having a child with Down Syndrome, Trisomy 18 and open neural tube defects. Advances in prenatal screening in the detection of chromosome abnormalities have resulted in improved detection rates and lower false positives.

Knowledge of genetic risks can help couples to prepare and make decisions regarding their pregnancies.[42] The early identification of a genetic disorder also provides the opportunity to prepare for potential medical complications during pregnancy and delivery and may also influence the location a woman may choose to deliver.[41]

Genetic counselling provides a means of dealing with the issues and challenges associated with the occurrence, or risk of occurrence, of a genetic condition. The process of genetic counselling involves helping the family/individual to comprehend medical facts, to understand the alternatives for dealing with risk, to choose a course of action consistent with the family's goals, ethics, and religious beliefs, and to make the best possible adjustment to the condition.[43]

The following are some important considerations around the provision of prenatal screening:

- Allow for informed choice - discuss benefits, risks and limitations before ordering a test
- Support autonomy - the patient makes the decision of whether to have screening done.
- Ensure women understand that a screening test is not diagnostic - a screening test can indicate a higher than average chance of having a certain disorder, but it does not indicate that the baby has that disorder.[44]

3.6 Promising Strategies

Based on key risk factors identified in the literature, this section outlines promising strategies that may assist health professionals and organizations in Saskatchewan to work together towards the development of initiatives that focus on those risk factors for prenatal health outlined in the document. Where possible, strategies have been supplemented with examples of promising practices containing innovative ideas and/or strategies for the implementation of prenatal health initiatives.

3.6.1 Research Strategies

How can we know if programs are working? The following strategies comment on the need for ongoing monitoring, evaluation and research in the area of prenatal health.

17. Provide ongoing surveillance of prenatal risk factors and outcomes.

Outcome related data can provide important information for policy direction and help to identify effective service procedures. It is important to identify outcomes, client groups and/or service delivery methods that require increased attention. Surveillance will increase understanding of the relationship between risk factors in the prenatal period and birth outcomes and consequently impact health planning. Population based data can supply predictors and patterns in prenatal care that may provide information to assist in monitoring behaviours and outcomes. Patterns may become evident that can help to focus effort in areas that can improve long-term outcomes.[15]

Promising Practices

Currently, the Alberta Perinatal Health System maintains up-to-date databases monitoring baseline characteristics of infant outcomes and maternal characteristics for all births in Alberta. Infant characteristics include birth outcomes, gestational age, pre-term or low birth weight, birth defects, number of infants, and gender. Maternal characteristics include marital status, maternal age, fetal loss, prenatal visits, alcohol use, drug use, smoking during pregnancy, attended prenatal classes and whether labour was spontaneous or induced.[15]

18. Conduct continual monitoring and evaluation of current programs.

Evaluate current programming to determine the impact of existing programs. Measuring areas such as the retention and recruitment of high risk women, client satisfaction, provision of social support, connections to other community services, and birth outcomes may assist in identifying opportunities to provide more support for behaviour and lifestyle changes.[16]

Promising Practices

The Calgary Health Region evaluated the impact of implementing additional prenatal support into the standard of care. The study identified the characteristics of individuals for whom this intervention had the greatest impact including women who were under the age of 25, pregnant for the first time, smoked, were low income (<$40,000/yr.) and had limited social support/networks, had a history of abuse and/or were non-Caucasian. The findings informed recommendations for universal programming coupled with targeted strategies to meet the needs and improve access to services for all women.[3]

3.6.2 Strategies for Practice

The following strategies for practice focus on models of prenatal care that examine opportunities to restructure our current understanding of prenatal care.

19. Provide ongoing training and support continuing education initiatives in the area of prenatal care.

Health care professionals need to be supported in developing skills to better support at risk and special populations.

Promising Practices

The ANEW program in Australia is an education program based on a theory of woman-centered practice which aims to provide skills to health care providers to identify and support women with psychosocial issues during pregnancy and to improve the degree of comfort women feel in disclosing these issues. The project's main objective is to increase the listening skills of health care professionals in order to better recognize women's cues during consultations. Through the provision of an experiential environment practitioners are exposed to a variety of psychosocial issues such as: depression, substance abuse issues, domestic violence, homelessness, lack of social and interpersonal support and social isolation. The program uses evidence based resources, interactive workshops and role play to accomplish its objectives. Self-report data noted a high measure of satisfaction among participants. Recommendations from the evaluation highlighted the need to extend similar training for other health professionals.[45]

20. Create opportunities for sharing and collaboration among health regions regarding prenatal programs and services. To the extent possible, training resources and effective strategies should be shared province-wide and be inclusive of other service providers.

Creating opportunities to share program successes and prenatal content is a means for increasing knowledge transfer among professionals. Establishing a province-wide and up-to-date database of all prenatal programs might allow for an increased sharing, collaboration and consensus building around the content of prenatal care.

21. Increase strategies to attract and retain at risk participants in prenatal care.

Disparities in access, utilization and retention in prenatal care must be addressed through the effective targeting of programs and services that will meet women's needs.[5]

As low income pregnant women have a variety of lifestyle factors affecting their decisions, they tend to be less likely to enter prenatal care. Although many of these women may be aware of the benefits of prenatal care, there are many barriers a woman may experience that prohibit entry and accessibility into prenatal care. As such, a service provider's role includes minimizing the impacts of poverty through available programs.[4]

Some of the following questions can be used to assess prenatal care programs:

a) Does the program function from a holistic, women focused approach?
b) Does the program provide child care?
c) Is transportation provided?
d) Are there flexible appointment times, e.g., evening and weekends?
e) Are drop-in services provided?
f) Are outreach programs offered, including home visits?
g) Are there different locations for programs, i.e., accessible and community based?
h) Do programs provide incentives?
i) Does the program provide referrals to other accessible community organizations?
j) Does the program (organization) work in partnership with community based programs in their location?
k) Are women using the program involved in its implementation and evaluation?
l) Does the program supply literacy friendly materials?
m) Does the program provide adequate follow up to ensure that advice is being followed?
n) What barriers could be eliminated to increase participation?

Adapted from: (Best Start, Reducing the Impact) [4]

The provision of prenatal care should develop opportunities to build partnerships with target populations. The following strategies may be effective in building connections with populations of interest:

- including women in the development and implementation of programs
- examining women's perspectives on issues that are being addressed
- examining personal biases
- utilizing peers and lay advisors within the community
- choosing strategies that address social support
- maintaining a high level of flexibility [46]

Promising Practices

The Calgary Health Region implemented a new method of delivering prenatal care to retain and support high and low risk pregnant women. Through the provision of extra prenatal support for women in the form of extra nurse and/or home visitor support the program was successful in ensuring that both higher risk and low risk pregnant women used a written resource guide, attended an early prenatal class, used nutritional counseling and used other services providing child care information. Additionally, results indicated a small increase in women's use of mental health and other poverty-related supports.[16]

22. Utilize holistic, multi-strategy approaches in order to address the multifactoral nature of behavioural and lifestyle issues associated with poor birth outcomes.

Studies show that enhanced prenatal care that includes the multi-strategy approaches such as education, behavioural interventions, and psychosocial support is effective in reducing risks for infant mortality.[47] Focus group research has indicated that women want a more holistic model of care that incorporates psychosocial needs in addition to physical needs.[48] Comprehensive approaches provide the opportunity to address compounding risk factors through broader structural and organizational change within the community.[12,48]

Low birth weight, for example, is affected by many factors. Effective programs cannot address these factors alone and require numerous community programs to influence societal values, governments, schools, popular culture and other community groups.[28] Limiting programs to one risk factor may overlook opportunities to address the issue of infant mortality in other areas and therefore may have limited success in impacting the overall infant mortality rate.

Promising Practices

The Healthy Mother, Healthy Baby program in Saskatoon is a community-based program designed to meet the needs of "hard to reach" women who may not access traditional prenatal care services. Healthy Mother Healthy Baby has an open referral policy targeting teens and women with risk factors that might negatively impact their pregnancies. The program works with various community programs to provide information, advocacy, education and support at various locations including a woman's home. Participants are provided with milk and vitamin and mineral supplements to assist in reducing barriers to the attainment of a healthy diet. The program recognizes and respects the cultural differences of participants.[80]

23. Use both universal and targeted interventions to improve outcomes for all women.

Reviews of the prenatal literature suggest that interventions must be able to be implemented using both universal and targeted programs to improve outcomes for all women.[3,49] While community-wide interventions allow for the inclusion of the entire population, interventions can also be tailored to address the differing needs of special populations within the group. A community by community approach is necessary to determine relevant interventions. Although mainstream approaches will always be a strategy for the majority of the population, some sub-populations will not identify with mainstream messaging and will require alternate strategies.

Promising Practices

MotherCare, a Community Prenatal Nutrition Program in Barrie, Ontario has begun a drop-in program that seeks to increase healthy pregnancies. The program is based on the principles of accessibility, flexibility, empowerment and mutual trust. Educational supports and social and emotional supports are all provided. Peer support is utilized in the program, and participants work in collaboration to assist in directing programming and activities. The initial program is open to all pregnant women, however those women identified as low income status who may be isolated and marginalized are referred to the MotherCare Next Step program in order to help meet the needs of mothers and infants from birth to six months of age.[4,50]

24. Develop recruitment and retention strategies for programs.

Despite having a publicly funded health system, universal usage of prenatal care has not been realized. Often programs encounter difficulties in the recruitment and retention of subgroups within prenatal care which presents substantial barriers to achieving program intentions. There is growing support for the idea that these populations are not "hard-to-reach", rather that an adequate strategy for meeting their needs has not yet been developed.[46] Determining the characteristics of women who are not accessing prenatal care is important to help identify women who may benefit from alternate approaches.[49]

A low usage of community based prenatal care resources gives rise to question the planning and delivery of prenatal care. Knowledge of how the characteristics of prenatal care affect a woman's satisfaction can help to increase the utilization of prenatal care and improve birth outcomes. Involving women in their own prenatal health may increase utilization of these services. The ability to recognize underlying factors of health behaviours, learn about the specific population, and identify barriers to change for women and practitioners are all important steps in defining a strategy that will meet the needs of certain populations.[46]

Promising Practices

A low user rate of prenatal care services and the trend of late entry into prenatal care in Calgary led to a study to measure the characteristics of women retained in a prenatal care intervention program using increased nurse/home visitor support during the prenatal period. The study was successful in obtaining an 80% retention rate; however, specific characteristics among those women who were not retained were also identified. Specifically, those women who were non-Caucasian, had not completed high school, had separated or divorced parents, were single, were under 25 years of age, had a household income less than $40,000, and smoked regularly before pregnancy were less likely to be retained in the study. These findings may assist in program planning by identifying gaps in programs and those participants who may require alternate or specific retention strategies.[49]

Project DC-HOPE in Washington DC provided interventions for risk factors in pregnant women using an integrated approach. This study examined the effectiveness of an integrated intervention using both psychosocial and biological risk factors that may influence the incidence of LBW. The primary goal was to estimate whether a multi-model, integrated counseling and education intervention targeting smoking, depression and partner abuse amongst minority women was likely to retain women in behavioural clinical trials. Results showed that the use of targeted recruitment and retention strategies were successful in retaining women. Of the 1,398 women who agreed to participate in the study, results showed a 90% recruitment rate and a 79% rate of retention. Specific retention strategies included financial and other incentives, regular contact with participants and attention to cultural competence among staff. The study also tracked differences in characteristics between women who dropped out compared to those who were lost to follow up. Women who dropped out were more likely to have some education, be married and employed, be older and have no medical insurance. Whereas those lost to follow–up included women who were less educated, single, unemployed and younger. These differences emphasized the need for different strategies among non-retainers.[51]

25. Explore group prenatal care.

Group prenatal care provides an alternative means for the delivery of prenatal care and has been shown to increase participation and retention rates, produce high levels of client satisfaction, and contribute to the reduction of negative birth outcomes.[49] Groups of women who are expected to deliver around the same time are placed together for a series of sessions throughout their pregnancies. All prenatal care occurs in these sessions and women support one another in the group. The model allows more time for the development of a provider-patient relationship. As such, the opportunity exists to address the entire spectrum of a woman's health including the clinical, psychological, social and behavioural factors that contribute to a healthy pregnancy.

Group prenatal care has been shown to improve perinatal outcomes, specifically the reduction of low birth weight resulting from preterm birth. A randomized control trial measuring the effects of group prenatal care on perinatal outcomes found a 33% reduction of risk for preterm birth in women assigned to group care.[52] In addition, group care builds community, decreases isolation, increases social support, helps develop peer groups during pregnancy and into parenting, and has been shown to increase prenatal knowledge, reduce maternal stress levels and increase women's satisfaction with care.[47]

Promising Practices

The Centering Pregnancy Program[C] is a group model of prenatal care that emphasizes risk assessment, education and support within a group setting. In this environment, up to 12 women receive ten, 2-hour sessions from week 16-40 of their pregnancy. Offered at various sites in the US, the Centering Pregnancy Program has two goals:

- Empower women to take control of their pregnancies
- Support health care providers in sharing their care-giving with clients.

The program is run by an obstetric provider and is designed to improve the quality of care with the goal of increasing positive birth outcomes. This model is a new approach in response to the need for a more comprehensive model of prenatal care.[67,68]

26. Encourage early initiation into prenatal care.

Early prenatal care is a critical factor in achieving a healthy pregnancy outcome. Women who receive delayed or no prenatal care are not receiving timely preventative care and education that may reduce the risk of complications throughout pregnancy. Early access is essential for the recruitment and retention of diverse populations in prenatal care for the duration of pregnancy.[53] In addition, early access allows the establishment of a participant-practitioner relationship, provides opportunities for education, genetic screening for certain diseases, nutritional counseling and the opportunity to be referred to other needed community resources for social intervention.[54] Early initiation to prenatal care has also been associated with higher rates of retention in prenatal care throughout pregnancy.[49]

Outreach has been cited as a potential means to initiate earlier access to prenatal care. Peer education, family support, use of incentives, media and social influence, and psychosocial support have all been used with limited success. Home visits and developing community links between consumers and providers are a means of initiating outreach to pregnant women. The use of community members as role models and leaders in providing support to pregnant women can help to address barriers to care.[53] Several programs have used lay neighbourhood women to link pregnant women into prenatal care which has resulted in earlier rates of enrolment to care.[53]

Promising Practices

The Women's Health Van initiative, a mobile health service center, was developed by Stanford University Medical Center in order to improve access to prenatal care for immigrant women by reducing common barriers such as transportation, language, cost and the need for structured appointments. The van offers services free of charge on a walk-in or appointment basis. The aim of the initiative was to increase the early access to adequate prenatal care including information, counseling and referrals to other community services. Results showed that women accessing the van services initiated care an average of three weeks earlier than non-van users and were more likely to begin care in the first trimester.[55]

[C] *A group prenatal care model is currently being pilot tested by the Calgary Health Region in an underserved area of the city. Plans include delivering services in non-medical settings and having more flexible appointment times.*[49]

27. Review all programs to ensure cultural appropriateness.

Cultural appropriateness has been defined by the World Health Organization as a key determinant to accessible programs and services.[56] Programs should be reviewed to ensure that they are culturally appropriate.

Promising Practices

Four Directions Community Health Centre in Regina provides a variety of services to promote the health of pregnant women. The program incorporates a strong cultural component using the Medicine Wheel and holistic practices to provide healing. In order to best meet the needs of participants, community members are actively involved in decisions regarding programs and services. Community members act in various roles as advisors, leaders, volunteers and partners. Other unique cultural components are woven into the program such as the utilization of Elders and special programming such as moss bag classes. Four Directions encourages inter-agency cooperation providing space for other community programs and flexible evening programming. The Healthiest Babies Possible program is a community based component of Four Directions and provides support to at risk prenatal mothers and families. Women are provided with support, counseling and the provision of milk, multivitamins and referrals to other services and resources.[58]

28. Ensure all pregnant women are offered and have access to genetic screening services.

Due to the increased risk of pregnancy complications, SOGC recommends that all women over the age of 35 access prenatal care early in pregnancy. First trimester screening and early intervention of potential health complications should be a priority for this population.

29. Perform regular psychosocial screening for substance use, intimate partner violence, stress and mental health concerns.

Ideally, opportunities for identifying and addressing issues of mental health, substance use and domestic violence should be made for all women of childbearing age, however pregnancy is a critical time to ensure appropriate assessments and interventions are made.

The American College of Obstetricians and Gynecologists (ACOG) recommends that psychosocial screening should be performed on a regular basis and documented in the patient's prenatal record. The screen should include assessment of depression, substance use, intimate partner violence and stress, among others. Screenings that identify areas of concern should result in timely and effective interventions, including brief interventions and/or referrals where indicated.[89] In addition, when an area of concern is indentified, increased monitoring of the pregnancy should be implemented with the goal of timely interventions to improve birth outcomes.[85]

Research efforts should also be conducted into the effectiveness of screening and treatment of women with prenatal mental health difficulties.[85]

30. Incorporate strategies aimed at reducing modifiable risk factors for low birth weight infants.

Studies have shown that modifiable risk factors contribute to 29% of preterm births and 31% of SGA births.[10] Translating the knowledge of modifiable risk factors into preventative interventions presents a significant opportunity to reduce the incidence of low birth weight. Interventions integrated into existing programming that have demonstrated effectiveness in preventing low birth weight, include:

- providing smoking cessation programs
- regularly screening for alcohol use to identify at risk women
- combining prenatal care with other services, e.g., substance abuse treatment and treatment of infections
- screening mothers with a previous history of preterm/low birth weight babies for infection
- providing antenatal care including the assessment, diagnosis and management of maternal medical conditions
- enrolling pregnant adolescents into prenatal programs early in their pregnancies
- supporting home visiting programs, inclusive of psychosocial support
- providing transportation for high risk women to prenatal resources and medical services
- promoting appropriate/adequate weight gain during pregnancy
- assessing nutritional status of pregnant women
- promoting nutritious diets
- providing nutritious food to mothers identified as having limited resources[13]

Socioeconomic, psychosocial and environmental influences affect the physiologic pathway to preterm and SGA births and there is an interaction between many of these factors. Women are likely to experience more than one risk factor and, as such, low birth weight solutions require more than one effective strategy.[6] A number of strategies can be used to promote health, including:

- social marketing
- community development
- policy development
- screening
- health education
- community organization
- enactment of legislation

Community wide approaches provide an opportunity to focus on multiple risk factors and to involve a number of existing organizations to address various aspects of health and well-being.[12,48]

3.7 Strategies Targeting Specific Risk Factors for Low Birth Weight

The following promising practices outline strategies that target modifiable risk factors for low birth weight. The subsequent risk factors include:

- Smoking
- Poor Nutrition
- Adolescent Pregnancy

3.7.1 Smoking

The Colorado Prenatal Plus Program targets a number of prenatal risk factors including smoking, psychosocial support and inadequate weight gain during pregnancy. Smoking interventions that involved care coordination, nutritional counseling and psychosocial counseling resulted in the low birth weight rate among participants to be 8.5% compared to a rate of 13.7% for those who had not received the intervention.[60] A concentration on multiple risks has provided the opportunity for women to resolve several interrelated risk factors.

3.7.2 Poor Nutrition

Despite the fact that a strong causal association has been established between nutrition and low birth weight, there remains a clear lack of systematic evidence regarding what interventions work to prevent a low birth weight outcome. Numerous approaches to target low-income women are promising practices to achieving nutritional behaviour change. Some helpful approaches include:

- using food as an incentive to attract and retain participants in programs
- using non formal education tools, such as kitchen table discussions groups to facilitate dialogue around healthy food choices
- providing knowledgeable referrals to services that are accessible to women in their own communities
- focusing on end of the month programming that factors in the timing of social assistance distribution[4]

Interventions targeting low socioeconomic groups and women with multiple risk factors are lacking. Further research efforts should be directed towards these interventions in order to assist in establishing guidelines and recommendations in this area.[22]

A connection among many prenatal nutrition programs includes the provision of childcare, transportation and participant-driven programming.

A Food Mentoring Project (Single Mothers Support Network) in Kingston links older women as mentors with low-income pregnant women. The program focuses on addressing food security issues by giving women the opportunity to share skills and ideas to meet their nutritional needs. Transportation, childcare and food preparation costs are provided through the program.[4]

Food for Thought in Saskatoon focuses on the use of cooking low-cost and nutritious food as a means to improve the health of pre/postnatal women and their children. Women work together to prepare healthy food which creates the opportunity to share information and develop social networks with other women. Topics of discussion are participant-driven and peer leaders assist with the operations and development of the program. The program is designed for women living with issues associated with poverty, social isolation, poor housing, illiteracy, family violence, substance use issues, mental health issues, lack of medical care and new immigrants. Transportation and child-care services are provided.[61]

The Higgins Nutrition Intervention Program in Montreal has the goal to identify pregnant women at risk for adverse pregnancy outcomes and to intervene. Through the provision of food supplements to at risk women, this program has been effective in reducing the incidence of low birth weight. The success of this program is credited to, not only nutritional supplementation, but to its efforts in addressing all the women's individual needs which may be directly or indirectly related to nutrition. Results from subsequent program evaluations have shown that infants of adolescents participating in the intervention program weighed on average 55g more than those infants in the non-intervention groups. In addition to these findings, a lowering of low birth weight rates by 39% and of very low birth weights by 56% was found among program participants.[62]

The Women, Infant and Children Supplementation Program is a nutritional intervention program targeting low-income pregnant women in the US, and has shown positive results in reducing the incidence of low birth weight. Within the program, food supplements were provided with an option for home delivery, personalized nutritional counseling as well as referral to other on site health services.[12]

3.7.3 Adolescent Pregnancy

Various interventions have been used to reduce the incidence of pregnancy among the adolescent population including home visits, clinic visits, school programs, social support, early identification and education. Interventions that involve pregnant adolescents early in their pregnancy and programs that use multi-strategy approaches have been shown to be effective in reducing the incidence of low birth weight. A combination of psychosocial support and home visitation has also elicited positive results.[13] Recent literature around teen pregnancy prevention initiatives is focusing on strategies to engage youth in the design of accessible programs that are able to integrate youth experiences, perspectives, and actions.[28]

The Resource Mothers Program, through the Virginia Department of Health's *Cradle our Future Program*, is an early intervention program that uses lay visitors to support pregnant adolescents in the early stages of pregnancy. Lay visitors help to support teen mothers by ensuring medical appointments are met and educating about healthy behaviours with the goal of ensuring that teens staying in school/work and delaying subsequent pregnancies until adulthood. Evaluations demonstrated the effectiveness of this intervention in improving prenatal care and birth weight. Results showed reductions in low birth weight and repeat pregnancies which carry increased risks for low birth weight outcomes.[48]

In Baltimore, the Retrospective Cohort Study used existing data sources to compare birth outcomes amongst teenagers receiving prenatal care in comprehensive adolescent pregnancy programs in school based versus hospital based settings. Participants in school based programs were significantly less likely to deliver a low birth weight infant compared with those teenagers who received hospital based care. Adolescents in both cohorts registered late into prenatal care; however, the school based program was associated with higher numbers of total prenatal visits suggesting that the school based prenatal care may have diminished the impact of late access to care. Findings suggest that outcomes can be mediated through adequate and comprehensive care.[63]

3.8 Conclusion

As has been demonstrated in the literature, women at risk of poor birth outcomes need a variety of services to have healthy babies. Examining those risk factors related to infant mortality provides the opportunity to strengthen women's supports and services throughout the prenatal stage. Developing initiative around low and high birth weight, building on programs specifically targeting smoking, nutrition and psychosocial support, ensuring adequate access to prenatal care and addressing the needs of women at different stages of their lives present viable opportunities for the promotion of healthy birth outcomes. As many of these above promising practices demonstrate, interventions tailored to a woman's specific needs improves birth outcomes and ensure that women receive an adequate level of care throughout their pregnancy.

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4.0 POSTNATAL CARE

The postnatal period presents a significant time of adjustment in the physiological, social and emotional lives of women, producing multiple challenges for new mothers and families. Postnatal care provides a critical opportunity to provide women a supportive and safe environment in which to begin care for a new infant.[1] The needs of women and their newborns throughout this period extend well beyond the management of acute conditions.

Care throughout this period allows for the identification of needs, timely and effective provision of information and resources, psychosocial support, referrals and preventative education and interventions.[2] Inadequate care within this period reduces the opportunity for health promotion and for the prevention or early detection of problems that might increase the risk of neonatal and post-neonatal morbidity and mortality.[3]

Complications arising in the postnatal period can be grouped into life-threatening, mid-term and long-term chronic conditions. Skilled care can reduce the incidence of death and disability within this period. Unfortunately, the postnatal period is often the most neglected period of the reproductive span.[3] Limited research has been conducted on the postnatal period with little attention paid to overall system-wide improvement. As a result, among many developed countries there remains a consistent lack of reliable best practice evidence about the scope and effectiveness of postnatal care.[4]

A significant trend affecting the provision of postnatal care has been decreased lengths of hospital stay after childbirth.[1] With women being discharged as early as 12 to 48 hours after a vaginal birth, this trend has meant a reduction in the time available for care and support by hospital staff after birth. This trend raises concerns regarding the potential for adverse health outcomes for both mothers and infants.[5] Consequently, the responsibility for postnatal care has been shifted to personal and community-based resources to support women throughout this period. As such, a heightened demand is placed on community-based programs and supports in order to ensure effective care that meets the health needs of mothers and their newborns.[6]

This section examines some of the risk factors related to infant mortality throughout the postnatal period and offers some recommendations for improvements to women's needs throughout this period.

4.1 Infant Mortality Rates

Within the first year of life, different causes of death are linked to the neonatal and post-neonatal periods. Neonatal deaths, within the first 27 days after birth, are most often attributed to complications resulting from low birth weight, preterm birth and other biological causes, while post-neonatal deaths, from 28 days after birth to one year, are associated with congenital anomalies, infection, Sudden Infant Death Syndrome (SIDS), and intentional and unintentional injuries.[7]

In comparison to other provinces, in 2005, Saskatchewan had higher rates of neonatal and post-neonatal deaths. Saskatchewan's rates are significantly higher than the average rate in Canada. [see **Table 4.1**]

Table 4.1 Infant Mortality Rates by Age Group, Canada, Provinces and Territories, Annual for 2005.

Province/Territory	Mortality Rate per 1,000 Live Births	
	Neonatal (0-27 days)	Post-neonatal (1-11 months)
Newfoundland & Labrador	4.0	2.2
Prince Edward Island	2.2	0.0
Nova Scotia	2.6	1.4
New Brunswick	3.0	1.0
Quebec	3.6	1.0
Ontario	4.4	1.2
Manitoba	4.7	1.9
Saskatchewan	**5.2**	**3.1**
Alberta	5.1	1.7
British Columbia	3.2	1.3
Yukon Territory	unknown	unknown
Northwest Territories	1.4	2.8
Nunavut	4.3	5.7
Canada	**4.1**	**1.3**

Source: Statistics Canada. Infant mortality, by age group, Canada, provinces and territories, annual (CANSIM Table 102-0507)

Within Saskatchewan, data indicates that the early neonatal and the post-neonatal periods are of particular concern. **Table 4.2** below shows that the 7 year average of infant mortality rate is highest in the early neonatal period (0 to 7 days), followed by the post-neonatal period (27 days to 1 year).

Table 4.2 Seven Year Total Infant Deaths and Average Rates by Neonatal Stage at Death, 2001 to 2007

Neonatal Stage at Death	7 year Total Numbers	7 year Average Rate (per 1000 Live Births)
Early-neonatal	281	3.3
Late-neonatal	45	0.5
Post-neonatal	208	2.4
Total	**534**	**6.2**

Source: Saskatchewan Ministry of Health

A set of national guidelines to assist with the planning, implementation and evaluation of maternal and infant health programs can be found in Health Canada's *Family-Centered Maternity and Newborn Care. National Guidelines* (2000).[66] In spite of these guidelines, large variations in practice appear to exist across the country with no province having a universal and consistent approach to the delivery of postnatal care.[4] Given these variations in practice, it is clear that there has been no systematic adoption of existing guidelines and no means to ensure their appropriate implementation and compliance.[1]

4.2 Risk Factors in the Postnatal Period

The response of the health care system to the needs and challenges of the postnatal period presents a significant challenge to health care planners. Examining the modifiable risk factors associated with infant mortality in the postnatal period provides the opportunity for the design of care and services that integrate effective preventative programming within the broader psychosocial, emotional and medical needs of women and infants during this crucial period.

This section will discuss risk factors for infant mortality in the postnatal period. The section will also discuss the provision of interconception care as a means to promote the health and well-being of women and infants in future pregnancies. The risk factors discussed include:

- Young maternal age
- Sudden Infant Death Syndrome (SIDS)
- Injury
- Early postpartum discharge

4.2.1 Young Maternal Age

Infants born to adolescent mothers have an increased risk of death within the first year of life.[8] It has been established that infants born to adolescent mothers are at an increased risk of child abuse and neglect, non-accidental injury, SIDS, and severe morbidity and mortality.[9] Unintentional injuries and hospitalizations during the first five years of life are also significantly higher among adolescent mothers.[10]

Higher rates for both neonatal and post-neonatal deaths are prevalent among infants born to adolescents in contrast to those infants born to non-adolescent women.[7,11] In Saskatchewan the data supports this (See **Table 4.3**); deaths are higher in both the neonatal and post-neonatal period for young mothers (10 to 19 years), as compared to other ages. This suggests that for young mothers there needs to be resources focusing on the prevention of both neonatal and post-neonatal deaths.

Table 4.3 Infant Mortality Rate, by Mother's Age and Age at Death, 2001 to 2007

Mothers' Age Group	Neonatal	Post-neonatal	7 Year Total
10 to 19	5.2	3.3	**8.5**
20 to 34	3.3	2.1	**5.4**
35+	4.2	2.1	**6.3**
Total	**3.8**	**2.4**	**6.2**

Source: Saskatchewan Ministry of Health

Young maternal age has long been associated with an increased risk of neonatal death due to the higher prevalence of preterm and low birth weight infants among adolescents. Research also shows that healthy infants born to adolescent mothers are at increased risk of post-neonatal death.[7,11] Post-neonatal mortality rates for adolescents 15 years and younger have been cited as three to four times higher than for women in the 23 to 29 age range.[7] A similar study found that infants born to adolescents between 12 to 17 years of age were 1.69 times more likely to suffer a neonatal death and 2.47 times more likely to die during the post-neonatal period compared to older mothers (20-34 years).[11]

Deaths in the post-neonatal period among infants born to adolescents have also been linked to abuse and neglect. A study examining the risk to healthy infants born to adolescent mothers found that abuse and neglect accounted for 52% of post-neonatal deaths. Although the odds of post-neonatal death were highest among adolescents 15 years of age and younger, rates remained elevated for infants born to older adolescents.[7,16-19]

Injury remains a major cause of mortality among infants. A strong and independent correlation has been identified between young maternal age and increased risk of infant mortality due to injury. Behavioural and environmental modifications within the postnatal period present a significant opportunity to reduce the rate of injury-related mortality among infants.[12] There is a need to focus postnatal support programs on healthy infants born to mothers of young maternal age as a means of impacting the high incidence of post-neonatal deaths within this age range.

Since young maternal age is strongly related to low socioeconomic status, young maternal age cannot be viewed in isolation of this factor. Although biological factors have been offered as a partial explanation for the increased risk of infant mortality among adolescent births, the impact of poor social conditions due to low socioeconomic status cannot be overlooked.[7,11,13] Social factors such as poverty place low risk infants at greater risk of injury and death.[14] A recent Canadian study measuring socioeconomic status and perinatal outcomes found that despite access to public health care, low socioeconomic status and family income increased the risk of post-neonatal death by more than five times compared to the highest income groups. The authors of this study proposed that such large differences in post-neonatal deaths point to a lack of supports for socioeconomically vulnerable mothers within the first year of their infant's life.[15]

4.2.2 Injury

Within the postnatal period, injury is a significant and preventable cause of infant morbidity and death.[16] For infants under one year of age, unintentional injuries is the fourth leading cause of death.[17] In Canada, data on the leading causes of unintentional injury death and hospitalization in 2004 show that 21 deaths (per 100,000) and 1,171 (per 100,000) unintentional injury-related hospitalizations occurred to infants under 12 months of age.[18]

Among all age groups, infants are the most vulnerable to injury with an 8 to 10 times higher risk for hospitalization than any other age group.[19] Among infants from zero to two months of age, falls have been shown to account for half of all infant injuries, with Saskatchewan reporting 334 hospitalizations from 1995 to 2005.[16,20] The post-neonatal period is the period where almost 90% of infant deaths occur.[19]

A community-based survey conducted among Canadian parents found that parents lacked knowledge of specific risk factors related to injury and the mechanisms for risk reduction.[17] Due to the fact that most injuries occur in the home, it has been suggested that effective prevention strategies should focus on environmental modifications.[16] The postnatal period presents a considerable opportunity for health care professionals to assist parents through injury prevention strategies and provide a safe environment to reduce post-neonatal mortality. An analysis conducted by a Cochrane systematic review found that multi-faceted parenting interventions offered within the home were successful in reducing child injuries especially among families at risk of poor child outcomes.[19, 21]

Socioeconomic status is associated with increased rates of injury. Children living in poor neighbourhoods are at increased risk.[19] A study examining the association between socioeconomic status and childhood injury found that the risk of injury was almost one and a half times higher among those in disadvantaged neighourhoods compared with less deprived areas.[22] An additional risk factor related to low socioeconomic status is the increased risk of injury among women who lack social support.[22] Another study that interviewed mothers from low socioeconomic areas regarding their injury prevention practices after birth found family income, housing quality and environmental factors to be significant barriers for the implementation of injury prevention strategies.[22] Many barriers exist for low-income families that may require supplemental strategies to address.[23]

Programs that couple parenting skills with improvements in socio-economic status may prove more effective in reducing infant injuries.[19] Implications from these findings suggest that program planning should be directed towards those families with limited social support in deprived neighbourhoods.[22]

Infant injury literature advocates for the provision of anticipatory guidance around injury prevention. Strategies that have demonstrated reasonable effectiveness for the prevention of injury include:

- Home visits
- Counselling
- The provision of low cost safety equipment
- Parent education aimed at changing knowledge, attitudes and behaviours
- Training programs for health care professionals
- Community prevention programs
- Media campaigns[17,22,24]

4.2.3 Sudden Infant Death Syndrome (SIDS)

In Canada, SIDS remains the leading cause of post-neonatal mortality (PNM; deaths among infants aged 28-364 days). Despite a reduction in SIDS rates in Canada and around the world, as a result of the "*Back to Sleep*" risk reduction campaigns of the early nineties which recommended placing infants on their backs to sleep, approximately three infants die from SIDS each week across the country.[26,27]

In Saskatchewan, the decline of SIDS rates has been slower than most other provinces and remains higher than the national average. A study examining the infant care practices and lifestyle issues associated with the increased SIDS rate in Saskatchewan investigated 258 provincial cases of SIDS over a 13 year period. Unsafe infant care practices increased the risk of death from SIDS by three times that of comparison cases. Unhealthy lifestyles were also shown to increase the SIDS rate. Furthermore, aboriginal infants showed a five and a half times greater risk of mortality due to SIDS than non-aboriginal infants. Some cultural practices which include the wrapping and overheating of infants have been associated with this increased risk. The high rate of SIDS in the aboriginal population has been offered as a casual explanation for the increased risk of SIDS in Saskatchewan.[28]

Although the cause of SIDS remains unknown, numerous risk factors have been found to increase the occurrence of SIDS including: prone sleeping position, sleeping on a soft surface, maternal smoking during pregnancy or exposure to environmental tobacco smoke (ETS), overheating, late or no prenatal care, young maternal age, preterm birth/low birth weight and male gender.[27,29]

[A] *See Appendix C for further details*

Evidence Based Recommendations for Reducing SIDS Risk

This section it meant to provide a brief overview of current SIDS recommendations. Findings from case control studies support the following recommendations: [A]

- In the first year of life, normal, healthy infants should be placed on their backs to sleep.[22,27,29,30]
- A room-sharing arrangement is recommended. [30]
- Infants should be cared for in a smoke/drug free environment.[27] Environmental Tobacco Smoke (ETS) should be kept out of an infants sleeping environment. Mothers who smoke should be informed during pregnancy of the increased risk for SIDS.[30]
- Use firm, flat bedding with light/thin blankets as needed. Sleeping environments should be free of soft objects and loose bedding.[29,30]
- Avoid the use of products to maintain sleeping position.[29]
- Infants should not sleep alone or with adults on couches, chairs or any other makeshift bed.[30]
- Infants who become overheated have an increased risk of SIDS.[27]
- There is evidence to show that the use of pacifiers may provide protective effects against SIDS. Concerns about the effects of pacifier use on breastfeeding have resulted in limited recommendations being made for their use to reduce the incidence of SIDS.[29]
- To avoid the development of Plagiocephaly (a malformation of the skull that results in the flattening of one side of the skull) place infants' heads in different positions on alternate days and provide supervised tummy time for infants when awake.[29,32]

It is important to remember that association does not necessarily indicate causality. Research around SIDS suggests that more than one factor, event or condition may lead to SIDS, therefore interventions should not focus on a single risk factor.[29] Strategies for the translation of research into parental knowledge should emphasize information that is brief and uses interventions that gets information into the home and into infants' sleep environments.[33]

Additional consideration should be given to the secondary caregivers including child care centers and relatives or other caregivers. A study examining the sleep position policies of licensed child care providers found that 43% of licensed facilities were not aware of the risks associated with an infant's sleeping position and 20 to 28% continue to place infants in a prone position to sleep. This is of particular concern given that an 18-fold increase in the risk of SIDS has been found among infants who are unaccustomed to the prone sleeping position.[29]

Despite reductions in SIDS rates across North America, disparities in post-neonatal mortality are still prevalent. In British Columbia, an analysis examining pregnancy characteristics by neighbourhood income found that women living in poorer neighbourhoods have higher post-neonatal mortality rates due to preventable causes of death including SIDS.[34] In the US, the majority of SIDS cases occur in cities considered to have lower socioeconomic status.[35] Although public education efforts have been successful in improving knowledge levels of specific risk factors, the known relationship between the degree of poverty and the risk of SIDS signals the need for adequate infant care and improved environmental conditions for those living in poverty in order to reduce disparities among certain populations.[33-35]

4.2.4 Early Postpartum Discharge

Shorter hospital stays are a significant trend with implications for the design of postnatal care.[1] Reduced lengths of hospital stays have resulted in decreased time and less opportunity for the provision of education and support before discharge. Considering that after birth women experience fatigue, sleep deprivation and sensory overload, the time hospital staff have for education with new mothers is all the more reduced.[4] The progressive move towards early discharge has taken place in response to calls for the demedicalization of childbirth as well as a means to reduce health care costs.[54] Given this development, the responsibility of postnatal care has been shifted onto community-based care providers, families and other community services.[4] This redistribution of postnatal care responsibility places increased pressure on community-based programs to ensure women's needs are being adequately met.[6]

The question of lengths of stay following birth remains controversial. There is a lack of conclusive evidence regarding the risks and benefits of early discharge policies for newborns.[55] Despite the controversy, early discharge has been shown to increase the risk of neonatal mortality.[56] The largest study examining neonatal mortality found that newborns discharged within 30 hours of birth had an increased risk of mortality in the first month and first year of life. Infants in the early discharge group were more likely to die of cardiac causes, infections and SIDS.[57] Additional studies have found increased rates of neonatal morbidity including increased rates of emergency room visits and readmissions to hospital after early discharge.[58,59] In Saskatchewan, neonatal hospital readmission rates after discharge remain significantly higher than the national average and most other provinces and territories, exceeded only by Nunavut and Alberta.[55]

Currently, no scientific support exists providing conclusive recommendations as to the ideal length of stay or outlining services that should be universally provided to all women.[1] In Canada, the Society of Obstetricians and Gynecologist of Canada (SOGC) and the Canadian Pediatric Society (CPS) released a joint statement (1996) on early postpartum discharge outlining criteria for early discharge. Within this recommendation a length of stay of 12 to 28 hours was cited as sufficient for normal, term infants with the provision of nursing follow-up in the home.[60] Additionally, SOGC published a recent policy statement (2007) outlining criteria for discharge less than 48 hours after birth.[56] Despite the existence of formal guidelines, no structures are in place to ensure that these recommendations are implemented in a systematic way. Furthermore, there seems to be little awareness of the guidelines; a survey conducted by the British Colombia Reproductive Care Program also found that one third of primary care givers were not aware of discharge criteria.[1]

A consensus statement produced by the BC Reproductive Care Program recommends that focus on discharge should be broadened from "early" discharge to "appropriate" discharge in order to maximize maternal and infant health during this period.[1] Without appropriate community or home support structures for women after discharge, the possibility of adverse outcomes is increased.[54]

4.2.5 Interconception Care

The postnatal period can be used to provide interconception care to protect the health of future children. Expanding the content of postnatal care to enhance care between pregnancies provides an opportunity to address conditions and behaviours that pose a risk to future pregnancies and provide families with early preventative care. While the prenatal period provides a window of opportunity to motivate change, the birth of an infant provides a chance to encourage behavioural and lifestyle changes.[36] Interconception care is relatively similar to effective prenatal care; including risk assessment, health promotion, and clinical and psychosocial interventions.[37] For healthy women, interconception care provides an opportunity for continued health promotion, while for higher risk women interconception care provides the opportunity for risk reduction before a subsequent pregnancy occurs.[37]

An adverse outcome in a previous pregnancy is an important predictor of future reproductive risk.[38] In fact, the largest predictor of a low birth weight infant is the previous birth of a low birth weight infant.[39] Women who have given birth to a preterm infant also have a 2 to 12 times increased risk of a subsequent poor birth outcome. Short intervals between pregnancies are also associated with poor birth outcomes.[40] A further complication is the repetition of behavioral and lifestyle risk factors that might affect subsequent pregnancies.[37]

Recognizing the limits of prenatal care, it is critical to ensure health *before* pregnancy. Studies show that interconception care has the potential to improve birth outcomes while addressing the continuity of risk from one pregnancy to the next. Support for this finding can be seen in the results of a study of a home-based management program for women who had delivered a low birth weight infant, a fetal death, or a child with congenital anomalies. The program's goal was to improve pregnancy outcomes in future births. Results showed that, compared to the control group, the program resulted in:

- improved compliance with contraception
- increased access to prenatal and postpartum care
- longer intervals between pregnancies
- lower rates of low birth weight as determined by NICU admissions and low birth weight rates[40]

Enhancing the content of postnatal care to promote interconception health presents a significant opportunity to expand the impact of preventative health promotion.

4.3 Promising Strategies

The following promising strategies provide opportunities for improvements to reduce the risks of infant death throughout the postnatal period. These strategies are focused on the following issues:

- home visiting
- early discharge
- injury prevention
- the interconception period
- ensuring a continuum of care

31. Use effective, timely home visiting as a strategy for service delivery of postnatal care.

Most home visiting programs seek to provide caregivers with social support and practical assistance through education and linking families to other community resources in order to ensure the well-being and healthy development of infants.[41] Home visiting programs have significant benefits:

- Producing fewer subsequent pregnancies
- Increasing birth spacing
- Lowering emergency room visits
- Reducing accidental injuries requiring hospital care
- Decreasing the incidence of child abuse and neglect
- Improving growth in low-birth weight infants
- Improving maternal-infant interactions
- Increasing infant development[42]

Home visiting has also been shown to reduce the risk of infant death. A study measuring the effectiveness of a community-based home visiting program to reduce the risk of infant mortality found children from at-risk families that did not receive home visiting care were 2.5 times more likely to die in infancy than children in families receiving home visiting.[43] Home visit interventions are also associated with improvements in the quality of home environments and increased linkages to community services and programs.[44] Among adolescent pregnancies, home visits have been associated with reduced childhood injuries, reduced hospital admissions in the first year of life and fewer repeat pregnancies.[9,45]

A systematic review to examine the effectiveness of home visiting as a delivery strategy in the postnatal period found that the most effective interventions involved multiple community agencies and primary care services, were more intensive, offered weekly visits, and targeted women at risk due to social disadvantage.[22,46] Research has also shown the following elements to be successful in the provision of postnatal home visiting:

- Focusing on at-risk families
- Ensuring flexible programming in order to meet the specific needs of families. Among low-income and at-risk families, interventions should be targeted to problems that are commonly experienced within those populations in order to increase the effectiveness of health promotion efforts[14]
- Improving physical and social environments in order to reduce family stress
- Beginning interventions during pregnancy and continuing into the second - fifth year of life
- Focusing on the family's entire well-being including physical, mental, social and spiritual dimensions, as addressing only one factor may not account for the full spectrum of a family's needs. Home visitors can see the home environment allowing for a better understanding of a family's needs and an ability to tailor interventions to meet those needs.
- Focusing on the provision of social support should not replace the active promotion of positive healthy behaviours and specific practices of infant-care giving.
- Using broadly focused programs is considered to be more effective than narrowly focused home visiting programs.

Adapted from: American Academy of Pediatrics, 1998[42] and Olds, 1992[66]

Home visitation, as a strategy for the delivery of care in the postnatal period, provides a degree of social support, outreach and liaison with primary care, and the opportunity for preventative care within a family's home environment.[42] It allows for early follow up and support to those at-risk clients that might otherwise not access another means of care.[46] Ensuring the adequate delivery of home visitation presents many challenges for program planners. While some home visiting programs are universal, many are based on individual needs and as such, programs are not necessarily a single, standardized intervention but instead represent an individualized approach to the delivery of care.[4,47]

Research indicates that the effectiveness of interventions is negatively impacted by inadequate intensity and poor timing of home visits.[46] Although no recommendations exist outlining a standard quantity of visits required to produce the best possible effects from home visiting, certain studies have suggested that a minimum number of five home visits with additional visits made as necessary throughout the first year after birth may be required to reduce adverse health outcomes and illicit healthy behaviour change.[9,41] Findings also suggest difficulty in engaging and retaining families in home visiting services. The importance of retention strategies for maintaining contact with at-risk women and ensuring an adequate intensity of services is a necessary consideration for program planners.[41,48]

Home visitation programs offer a unique option for the delivery of care that has shown numerous benefits to the healthy development of infants especially when integrated with other community services.[42] The diversity within home visiting programs contributes significantly to the differences in program outcomes shown in the literature. Continued efforts must be directed at determining the effective components of home visiting programs in order to increase the long-term impacts of interventions in the postnatal period.[49]

Promising Practices

The purpose of Ontario's Healthy Babies, Healthy Children program was to identify families that could benefit from additional community service in order to improve child health, parenting skills and service utilization by families. On average home visits consist of 1.2- hour home visits every 18 days by a public health nurse or lay home visitor with the lay visitor acting as the main contact with the family. The program does not follow a standardized curriculum but is individualized to the family's needs.[51] A two year evaluation of the program showed better child health among those families receiving home visits compared with those who did not. Results also indicated an increased use of community resources by participants in the program, and identified a number of issues for further consideration: [51]

- What is the duration and intensity of intervention required for the optimal results?
- How can at-risk clients be retained and engaged in programs?
- Which families have the best chance of benefiting most from the program?
- What type of intervention is most effective to different clients and different needs?

The Early Intervention Program (EIP) in California evaluated the maternal and infant health outcomes of a two year home visiting intervention program for at-risk teens. Using a case management approach with individualized care, adolescents in the EIP program received care from pregnancy to one year postpartum with a maximum of 15 postnatal visits (1.5-2 hours each). In order to retain adolescents in the program, regular telephone contact was made with the participants throughout the year. The results suggest that telephone contact may have contributed positively to the intervention. The mean number of postnatal visits provided was 10.35. In comparison, mothers receiving traditional public health nursing care generally receive one postnatal visit within the first six weeks postpartum. Infants of the EIP program showed lower rates of hospitalization due to injury and ingestion in the first year of life, higher immunization rates and fewer repeat pregnancies in the two year post-birth period. Findings indicate that the EIP program achieved its goal of improving child health outcomes, improving certain aspects of maternal health and improving the competence of adolescent mothers. The success of the intervention has been attributed to the case management approach, the duration of program delivery, the inclusion of first-time mothers and the comprehensive nature of the program.[10]

Given the findings that healthy full term infants suffer higher rates of morbidity when born to low income mothers, the REACH program in Chicago targeted healthy infants born to adolescent mothers, mothers with no prenatal care, mothers discharged early from the hospital and mothers with psychosocial problems. The intervention focused on relationship building between women and health care professionals with a minimum of five home visits provided over the first year postpartum. Additional visits were made when required and telephone contact was used to check in with participants on the outcomes of referrals and to address additional concerns, confirm appointments, follow-up missed appointments, verify immunization status, and maintain current contact information.[14]

In order to increase the impacts of their health promotion efforts, the REACH program focused on preventable causes of post-neonatal death with targeted care instructions specific to the most prevalent problems experienced by women living in low-income neighbourhoods. Through individualized and culturally appropriate programming it was found that the REACH program helped mothers to manage health problems before they became life-threatening. The post-neonatal mortality rate among REACH infants was 4.7 deaths per 1,000 live births compared to that of the comparison group within the targeted community whose post-neonatal mortality rates ranged from 5.2 to 10.9 per 1,000 births. These findings suggest that this program was successful in reducing preventable post-neonatal deaths.[14]

Six components comprise Saskatoon's KidsFirst and include prenatal referral and support, in-hospital screening and assessment, home visiting services, mental health and addictions services and early learning, care and family support. The in-hospital screening helps to identify women with high risk factors. As the program is voluntary, women choosing to participate are provided support around child development and parenting and are linked with other community resources. A quantitative evaluation found that the program had a positive impact with families reporting feeling less isolated and feeling better able to meet their children's need in practical ways.[53]

32. Develop home visiting programs specifically targeting at-risk mothers.

The effects of home visitation programs have been particularly effective when using high intensity interventions and with at-risk populations such as adolescents, women of low socioeconomic status, and women with lower levels of education.[42,46] Recommendations from the American Academy of Pediatrics Council on Child and Adolescent Health support the importance of early identification and referral of at-risk women and families to home visitation programs at the time of first contact during the prenatal period.[43]

Among adolescents home visiting strategies, for example, studies have shown reductions in childhood injuries and hospital admissions rates, reductions in adverse neonatal outcomes, reductions in post-neonatal mortality, increases in immunization rates, increases in birth spacing and fewer subsequent pregnancies.[9] Results of these programs suggest the need for further development and evaluation of home visiting programs targeted to adolescent mothers as a means of improving mortality rates among infants born to adolescent mothers.

33. Incorporate the use of peer home visitors into postnatal programs.

The use of community members as role models and leaders in providing support to pregnant women and new moms can help to address barriers to care.[68] Prenatally, the use of lay support workers has resulted in improved birth outcomes and earlier initiation into prenatal care.[68, 69] Peer home support presents the opportunity to develop relationships with 'hard-to-reach' families that professional health care providers may not be able to achieve. [71]

Promising Practices

The Supporting Wings Parent Mentoring Program through the Yorkton Tribal Council began in 2007. This program utilizes a Parent Mentor in each of their six member First Nations to support parents in their homes. Parent Mentors are members of the community and receive special training and continuing education on issues relevant to the women and families they serve. The program is voluntary and open to parents from the prenatal period to six years of age. Both high risk and non-risk families are able to access this program. [70]

The Healthy Beginnings: Enhanced Home Visiting Initiative of Nova Scotia builds on existing programs to offer on-going support for up to three years to families requiring increased support. Part of this overall initiative is the inclusion of a peer support home visiting program. The peer support component will focus on supporting parents, and fostering healthy parent-child relationships and healthy child development through the provision of emotional and particle supports, referrals, information, role modeling of parenting behaviours and assistance with goal setting. Training of peer home visitors and their supervisors is an important component of the program. [71]

The REACH-Futures program integrated a shared model of care between health care professionals and community health advocates throughout the first year of life. Training and continuing education for both the nurses and community health advocates was a significant part of this process. The involvement of the nurse ensured interaction with hospital based health care providers and medical expertise, while the community advocates who were familiar with the community provided a level of credibility to the program. A key challenge to this program was maintaining contact with participants. The program used various strategies to ensure retention of participants including: collecting several emergency contact numbers, collecting information from neighbours and family members, locating families in frequented areas and immediately following up on undelivered mail from monthly mail outs. Comparison of the REACH-Futures group to the previous REACH program showed higher rates of immunization among REACH-Futures participants. Compared with city-wide rates the program had positive impacts on incidences of post-neonatal mortality.[52]

34. In the initial postpartum period, introduce effective injury prevention messaging using home assessments that assess the caregiver, child and safety of the home environment.

Promising Practices

The Chilliwack Safe Baby Program in British Colombia has taken a home assessment approach to reducing the occurrence of infant injuries in the home. Evidence has shown both home visits and the provision of safety kits to parents are effective in reducing injury among children under 2 years of age. This study sought to measure the combination of these interventions in infants from 2 to 12 months of age. Included as part of regular postnatal home visits, a home walk through was conducted to identify potential hazards. Dangers were identified and parents were instructed on how to remove or alter any hazards. The study found that home visitation combined with safety kits may help to increase the parental use of safety devices.[17]

Alberta's Million Messages campaign provides another example of integrating postnatal home visits with injury prevention messaging. This program was developed to assist health care professionals to provide consistent injury prevention information depending on the child's developmental stage at every contact with a community health nurse and specifically during well-child visits. Prevention messages in the program were drawn from regional data and offered simple, consistent and targeted messages appropriate to the developmental age of infants and children. Evaluations of the program found a high level of satisfaction and increased injury awareness among parents and community health nurses.[25] Of the 541 parents included in an evaluation of the program, 60% reported learning something new while 46% reported an active change in behaviour as a result of the information. The Saskatchewan Prevention Institute has adapted this program based on Saskatchewan injury data, for health care professionals working with parents in home and clinic environments.[B]

[B] *Please see Appendix B for a sample tool used in Saskatchewan's Million Messages initiative.*

35. Strengthen supports for teen parents throughout the postnatal period.

Within the first year of life, infants born to adolescent mothers have an increased risk of mortality.[8] Rates of injuries and hospitalizations are significantly higher among adolescent mothers, while infants born to adolescent mothers are also at an increased risk of child abuse and neglect, non-accidental injury, SIDS, and severe morbidity and mortality.[9, 10] Young maternal age and pregnancy tends to be strongly associated to low socioeconomic status which places infants at a greater risk of injury and death.[7,11,13] Interventions should target infants born to women of young maternal age in order to increase the support available to teens throughout the postnatal period.

36. Provide parents with consistent messaging around Abusive Head Trauma (AHT), specifically Shaken Baby Syndrome (an extreme form of AHT).

Abusive Head Trauma accounts for 95% of injuries and mortalities caused by child abuse. Accidental intracranial (inside the skull) injury is also rare in infants under one year of age and research shows that Abusive Head Trauma (AHT) occurs most often to infants under one year of age resulting in extremely high rates of mortality and long-term morbidity.[72,73] It is estimated that between 15%-27% of children will die from injuries associated with this type of abuse.[73] The extent of infants affected by Shaken Baby Syndrome in Canada is unknown due to missed diagnoses and the underreporting of cases.[72] A Canadian retrospective chart review from 1988-1998 of 364 cases identified as Shaken Baby Syndrome showed that 19% of these children died, while 55% had neurological injury, and 65% had visual impairment.[73]

Risk factors associated with AHT include social isolation, family violence, substance abuse, mental health disorders, poor parental attachment to a child, abuse of the parent/caregiver as a child, and inadequate knowledge of child development.[72]

Efforts to support parents around the issue of Abusive Head Trauma should be especially targeted to those at higher risk of abusing a child such as young parents, males and those parents/caregivers under considerable stress.[72]

37. Ensure that adequate home support is individualized to the needs of women receiving early discharge after delivery.

Shortened hospital lengths of stay post-delivery necessitate the early identification of women's needs and individualized planning with women will help to increase the well-being of women and their infants.[61]

The SOGC (2007) made the following recommendations based on current research that may be useful in guiding the effective planning and delivery of postnatal care programs and services:

- Early discharge (< 24 hours) from hospital postnatally increases the risk of neonatal mortality and morbidity. Follow up programs should take this into account
- The physical, psychological, and social well-being of the mother and newborn must be assessed when discharge planning takes place. Primiparous women (women giving birth to their first child), young, and single women are more likely to return to emergency room departments with their neonates
- Programs in place for postpartum care in the community are well used and appreciated. Additional programs in the community may decrease neonatal mortality, morbidity and readmissions.

Promising Practices

A postnatal home-care worker program from Australia was designed to enable postnatal women who have had early discharge to have support in their homes for the first few days following discharge. Midwives are used to provide daily home visits for six hours up to six days post-discharge. Findings from this study showed a high level of maternal well-being, successful mother-infant attachment and a less stressful transition into motherhood.[54]

The Family Suite program in the Tampa General Hospital, Florida is a response to increasingly shortened hospital stays and subsequent reduction of time for education and medical observation. The program offers women requiring extra care the choice for an additional 48 hours of rest and access to support services. A Registered Nurse is available to provide medical and social support throughout their stay. The program has emerged as an effective care model and has begun to be implemented in hospitals throughout the United States.[62]

38. Utilize the interconception period to improve maternal health for future pregnancies.

Incorporating interconception care into postnatal period provides the opportunity to improve the health and well-being of women and work towards positive health outcomes for infants born in future pregnancies.

Promising Practices

The Grady Memorial Hospital Interpregnancy Care Program (IPC) in Atlanta aimed to improve the health status, pregnancy planning and child spacing of women at risk of a subsequent very low birth weight delivery. Women delivering live born or stillborn low birth weight infants were eligible for the program. The program provided 24 months of primary care and outreach services offered mainly by a nurse and lay resource mother. The team also included a family physician, nurse midwife/family nurse practitioner and periodontist. Due to the association of periodontal disease and preterm birth, dental screening and treatment were provided to participants. A 24 month care plan was developed with each participant, stressing particular risk factors associated with low birth weight delivery, specifically: pregnancy spacing of a minimum of 9 months, management of chronic disease, screening of nutritional deficiencies, treatment and referral for substance abuse issues when necessary, prevention, treatment and screening of STI's and other infections, screening, treatment and support for depression, stress and domestic violence and prevention, screening and treatment of periodontal disease. Resource mothers also provided identification and management of psychosocial stressors, parenting education, safe housing, skills training and relationship issues twice a month and were available to be contacted throughout the entire program for additional support. To date a full program evaluation has not been conducted; however the program was successful in identifying 7 out of 21 women with previously unrecognized or poorly managed conditions. All participants developed a personal reproductive care plan and none of the women became pregnant within a nine month period after their previous pregnancy.[39]

39. Policies, programs and services should support a seamless continuum of care from community to hospital to community.[4]

The continuum of care provides a structural means to reduce maternal and infant mortality worldwide. Continuity of care is defined as the degree to which interventions are provided without interruption or unnecessary delays in response to a woman's needs.[63] Continuum of care is a preventative concept that attempts to ensure linkages between care services provided to an individual in order to keep clients from getting lost in the process. The establishment of an effective continuum of care creates the opportunity for each woman's contact with the health care system to be used as a mechanism for health promotion in order to prevent adverse birth outcomes.[64]

Traditionally, care is provided in segments such as preconception, prenatal and obstetric care and pediatrics and postnatal care. Furthermore, a lack of integration between programs often results in the provision of unconnected services directed towards individuals. A key barrier cited to accessing to community support programs is the lack of knowledge of how to navigate the system.[61] This fragmentation affects the quality and delivery of care and results in missed opportunities for timely health promotion.[64] Research has also shown higher satisfaction levels with their postnatal experiences among women who receive continuity of care.[22]

Ideally, to generate improvements in maternal and infant health, each transition requires connections between care providers and programs extending from preconception through to the first year of life.[64,65] The Ontario Association of Public Health urges the integration of acute and community based maternal and infant health programs in order to meet women's needs throughout this period. Flexible and responsive services must be provided in collaboration in order to minimize gaps in service and provide an expected level of care during this period.[61]

Transitioning from hospital to home throughout the postnatal period requires the support of linkages for families to community services and programs.[4] Several strategies to strengthen linkages between all partners have been suggested: the provision of direct referral and follow-up of at-risk patients, consideration of barrier to care including transportation, the provision of services in a variety of settings (home, community center, telephone contact), promotion of evidence based guidelines, strengthening in-service training among providers, including women's perspectives, monitoring and following up on drop-out rates, and improving links with communities through open communication.[4,64] Recognizing and tightening the links between service providers provides a tangible means of retaining those women who might otherwise be lost to follow-up care.

Promising Practices

Family-Centered Maternity and Newborn Care Guidelines (2000) stress the importance of postpartum care as central to the successful transition of families to the community, allowing for maternal and infant health promotion. This set of national guidelines suggests the use of a care plan as a means of ensuring the effective care of women's and infants' needs throughout the postnatal period. It is recommended that the care plan be individualized and based on identified needs in the following areas: physiologic stability, monitoring of infant feeding/nutrition and growth, psychosocial issues, attachment, building on capacities and strengths, family access to community supports, the transition process home and back into the community, and healthy lifestyles and environments. The care plan should include discussions about how to access medical, community and emergency supports. The use of a care plan presents a means of providing a continuum of care that allows for the continued support and monitoring of the health and well-being of women, families and their infants.[4]

The BC Reproductive Care Program has suggested a similar proposal in their recommendation for the use of a single documentation tool to support an effective continuum of care. This proposed initiative would be in the form of a woman-carried communication passport. Effective communication among health care professionals and agencies (both clinical and community based) could assist in the sharing of appropriate and timely information and reduce the incidence of cross-over and overlooked services.[1]

4.4 Conclusion

The goal of postpartum care is to achieve optimal health for all mothers and infants. Given the apparent discrepancy in the provision of postnatal care, health care providers face many challenges in the implementation and provision of effective care in this period. The following considerations provide a foundation to enhance the quality and effectiveness of postnatal care:

- care should be offered in partnership with women and never imposed
- care should be individualized through education and discussion to meet the needs of each woman
- women's views, beliefs and circumstances must be respected
- interventions offered should be evidence-based and have known benefits[22]

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Appendix A

*Selected Preconception Risk Factors for Adverse Pregnancy Outcomes**

Alcohol misuse. It is not safe to drink alcohol at any time during pregnancy, and harm can occur early, before a woman realizes that she is or might be pregnant. Fetal alcohol syndrome and other alcohol-related birth defects can be prevented if women stop drinking alcohol before conception.

Anti-epileptic drugs. Certain anti-epileptic drugs (e.g., valproic acid) are known teratogens. Recommendations suggest that women who are on a regimen of these drugs and who are contemplating pregnancy should be prescribed a lower dosage of these drugs.

Diabetes (preconception). The threefold increase in the prevalence of birth defects among infants of women with type 1 and type 2 diabetes is substantially reduced through proper management of diabetes.

Folic acid. Daily use of vitamin supplements containing folic acid has been shown to reduce the occurrence of neural tube defects by as much as two thirds.

Hepatitis B. Vaccination is recommended for men and women who are at risk for acquiring Hepatitis B virus (HBV) infection. Preventing HBV infection in women of childbearing age prevents transmission of infection to infants and eliminates risks to the women of HBV infection and sequelae, including hepatic failure, liver carcinoma, cirrhosis, and death.

HIV/AIDS. If HIV infection is identified before conception, timely antiretroviral treatment can be administered, and women (or couples) can be given additional information to help prevent mother-to-child transmission.

Hypothyroidism. The dosages of thyroxine (e.g., Levothyroxine) need to be adjusted for proper neurologic development of the fetus.

Isotretinoins. Use of isotretinoins (e.g., Accutane®) to treat acne during pregnancy can result in miscarriage and birth defects. Effective pregnancy prevention should be implemented to avoid unintended pregnancies among women with childbearing potential who use this medication.

Maternal phenylketonuria (PKU). Women diagnosed with PKU as infants have an increased risk for delivering infants with mental retardation or birth defects. However, this adverse outcome can be prevented when mothers adhere to a low-phenylalanine diet before conception and continue it throughout their pregnancy.

Rubella seronegativity. Rubella vaccination provides protective seropositivity and prevents congenital rubella syndrome.

Obesity. Adverse perinatal outcomes associated with maternal obesity include neural tube defects, preterm delivery, diabetes, cesarean delivery, and hypertensive and thromboembolic disease. Appropriate weight loss and nutritional intake before pregnancy reduces these risks.

Oral anticoagulants. Warfarin, which is used to control blood clotting, has been shown to be a teratogen. To avoid exposure to warfarin during early pregnancy, medications can be changed to a nonteratogenic anticoagulant before conception.

Sexually transmitted infections (STIs). Chlamydia trachomatis and Neisseria gonorrhoeae have been strongly associated with ectopic pregnancy, infertility, and chronic pelvic pain. STIs during pregnancy might result in fetal death or substantial physical and developmental disabilities, including mental retardation and blindness. Early screening and treatment prevents these adverse outcomes.

Smoking. Preterm birth, low birth weight, and other adverse perinatal outcomes associated with maternal smoking in pregnancy can be prevented if a woman stops smoking before or during early pregnancy. Because only 20% of women successfully control tobacco dependence during pregnancy, cessation of smoking is recommended before pregnancy.

** CDC. Recommendations to Improve Preconception Health and Health Care – United States. MMWR Recommendations and Reports 2006;55(RR-06):1-23. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5506a1.htm.*

Appendix B

Million Messages Resource Tool

Million Messages

Contact	Key Messages	Handout
Prenatal	• Injuries are the leading cause of death and hospitalization for children. • Injuries are predictable and preventable. **Baby Furniture** • A car seat that is less than 10 years old, has not been involved in a car crash, and is rear-facing is needed. • The crib needs to be made after 1986 (to ensure it meets safety standards).	Protect Your Child - Prenatal
Newborn	**Motor Vehicle Collisions** • Infants must use a rear-facing car seat until they are one year old and 20 lbs and can pull themselves to a standing position. **Shaken Baby Syndrome** • Many caregivers and parents become frustrated and angry when caring for a crying baby. Have a plan to recognize and deal with frustration. It is more important to stay calm than to stop the crying. Never Shake a Baby.	Protect Your Child - Birth to 6 Months
2 Month Visit	**Drowning and Suffocation** • Never leave a baby alone while he or she is being bathed. • Remove the plastic wrapping on cribs, make sure the mattress fits snugly, and do not place pillows, stuffed toys, or bumper pads in the crib. **Scalds and Burns** • Always test the temperature of bath water with your elbow and make sure the hot water temperature at the taps is set at no more than 49°C (120°F).	Protect Your Child - Birth to 6 Months
4 Month Visit	**Falls** • Stairs and open areas may become a risk for falling. Use baby gates. • Children are beginning to learn to roll; they need supervision on surfaces above the floor. **Choking** • Keep small objects out of a child's reach.	Protect Your Child - Birth to 6 Months

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RESOURCE 4-350

For more information contact:

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Website: www.preventioninstitute.sk.ca

Million Messages

Contact	Key Messages	Handout
6 Month Visit	**Falls** • Infants are becoming mobile and curious. Once children can stand, the crib mattress should be lowered and the crib should be kept away from windows. **Poisoning** • Store chemicals and poisons out of reach of infants. • Be aware of any poisonous plants in the house.	Protect Your Child - 6 to 12 Months
12 Month Visit	**Motor Vehicle Collisions** • Once children are one year of age, 20 lbs, and can pull themselves to a standing position, they can use a forward-facing seat that has a tether strap until they are 40 lbs. **Poisoning** • Keep all medicine and cleaning products locked away in the kitchen and bathroom.	Protect Your Child - 12 to 18 Months
18 Month Visit	**Falls** • Keep the child's furniture, including his or her bed, away from the windows. **Drowning** • Never leave a child alone near or in water. This includes pools (including paddling pools), lakes, bathrooms, and other sources of water.	Protect Your Child - 18 Months to 4 Years
Pre-school Booster	**Motor Vehicle Collisions** • Children are not capable of safely crossing a street alone until they are about 9 years old. • Booster seats allow the seat belt to work much more effectively on small bodies. Children must pass the three-point test on the handout before a seat belt alone will protect them. **Falls** • Always supervise children at the playground; this is the age when they start to engage in more risky behaviour. • Children must always wear a helmet when bicycling, scootering, rollerblading, and skateboarding.	Protect Your Child - Preschool

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Appendix C

Evidence Based Recommendations for Reducing SIDS Risk

Sleeping on the back carries the lowest risk of SIDS.[1, 3, 4]

- **In the first year of life normal, healthy infants should be placed on their backs to sleep.[1, 2, 3, 4]**

Room-sharing lowers the risk of SIDS. Room-sharing is protective against SIDS and a safer alternative to bed sharing. The issue of bed-sharing has emerged as a controversial subject. Bed-sharing has been shown to increase the risk of SIDS under certain circumstances including: multiple bed-sharers, consuming alcohol, drugs or other medications that may reduce responsiveness, being overtired, the duration of bed sharing, infants being under duvets, sleeping on a couch, bed-sharing with people other than the parents or usual caregivers, and a young infant. There has been no increase in risk shown for adults who bed-share for short periods of time for feeding and comfort.[1, 2, 3, 4] Side sleeping is not as safe as placing an infant to sleep on their backs.[3]

- **A room-sharing arrangement is recommended. [30]**

The risk of SIDS is increased when infants bed share with mothers who smoke cigarettes. Exposure to Environmental Tobacco Smoke (ETS) is also associated with an increased risk of SIDS.[1, 4] Bed-sharing with an adult who is extremely fatigued or impaired by alcohol, drugs or medications that impair arousal can be hazardous to the infant.[1, 4]

- **Infants should be cared for in a smoke/drug free environment.[2] Environmental Tobacco Smoke (ETS) should be kept out of an infant's sleeping environment. Mothers who smoke should be informed during pregnancy of the increased risk for SIDS.[4]**

The use of soft bedding, pillows and blankets that can cover the head increase the risk of death in all sleeping environments. A covered face is considered a risk factor for SIDS.[5]

- **Use firm, flat bedding with light/thin blankets as needed. Sleeping environments should be free of soft objects and loose bedding.[3, 4]**
- **Avoid the use of products to maintain sleeping position.[3]**

Sleeping with an infant on a sofa is associated with a particularly high risk of sudden unexpected death in infancy.[4]

- **Infants should not sleep alone or with adults on couches, chairs or any other makeshift bed.[4]**

Infants should be dressed and covered to avoid overheating. Avoid over-bundling.[3]

- **Infants who become overheated have an increased risk of SIDS.[2]**

Pacifier use may reduce the incidence of SIDS. The exact mechanism for this effect is unknown; however, evidence demonstrates a strong protective effect.[3]

- **There is evidence to show that the use of pacifiers may provide protective effects against SIDS. Concerns about the effects of pacifier use on breastfeeding have resulted in limited recommendations being made for their use to reduce the incidence of SIDS.[3]**

Research has shown an increase in the development of positional plagiocephaly (PWS) or 'flat head' due to the increased practice of placing infants to sleep on their backs. Infants with reported PWS were more likely to have limited tummy time, less likely to have their head position changed and less likely to be held in an upright position when awake.

- **To avoid the development of PWS, place infants' heads in different positions on alternate days and provide supervised tummy time for infants when awake.[3, 6]**

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Appendix D

Saskatchewan Infant Mortality Data provided by Saskatchewan Health

Purpose:

The purpose of this document is to provide information on infant mortality and stillbirth, looking at variables including age, sex, cause of death, Regional Health Authority of residence, gestational age at birth, mother's age and birth weight.

Methodology:

The birth and stillbirth data were extracted from the Saskatchewan Health Vital Statistics database for events occurring in Saskatchewan, Alberta Vital Statistics database for events occurring in Alberta, and CIHI Hospital Separations for events occurring elsewhere in Canada.

Infant death data includes all deaths occurring between 2001 and 2007 to Saskatchewan residents aged less than one year at the time of death, regardless of where in Canada they occurred. Data for 2006 and 2007 are preliminary data. Birth data includes all births that were matched to infant death records that occurred between 2000 and 2007; 41 of 534 infant deaths do not have a corresponding birth record due to the birth occurring out of province, missing information, or the identity of the mother and/or baby being unknown. Stillbirth data includes all stillbirths that occurred to Saskatchewan residents in Alberta or Saskatchewan between 2000 and 2007. Stillbirth information is unavailable for the rest of Canada. Simple descriptive frequencies and percents were used to describe the data. Where the number of live births was available for a cell, the infant mortality rate was calculated as the number of deaths per 1000 live births.

Introduction and background:

Infant mortality corresponds to the death of a child under one year of age. Perinatal mortality includes stillbirths and early neonatal deaths. According to Statistics Canada, stillbirth means the complete expulsion or extraction from its mother, after at least 20 weeks' pregnancy, of a product of conception in which, after such expulsion or extraction, there is no breathing, beating of the heart, pulsation of the umbilical cord, or unmistakable movement of voluntary muscle. Early neonatal deaths are those that occur within the first seven days of life. Perinatal mortality is the summation of stillbirths and early neonatal deaths. Late neonatal deaths are those which occur within seven and 27 days of life. Post-neonatal infant death occurs between 28 days and 1 year of life. Infant mortality is recognized as an important indicator of health and health care in our society.

Saskatchewan Births

There was a 5.4% increase in the number of births registered in Saskatchewan, to Saskatchewan residents, from 12,477 in 2006 to 13,151 in 2007 (Table 1). This was the largest increase in numbers of births in this period (2001 to 2007).

Table 1. Saskatchewan Births, by Regional Health Authority, 2001 to 2007 [1]

RHA	Years						
	2001	2002	2003	2004	2005	2006	2007
Athabasca	62	62	58	70	74	66	73
Cypress	454	424	395	439	437	430	477
Five Hills	539	551	552	547	526	484	537
Heartland	456	434	437	422	425	432	479
Keewatin Yatthe	221	191	216	223	209	238	268
Kelsey Trail	477	487	483	483	464	446	456
Mamawetan Churchill River	339	419	430	445	455	493	433
Prairie North	1,165	1,112	1,083	1,164	1,165	1,204	1,267
Prince Albert Parkland	1,064	1,088	1,111	1,092	1,056	1,154	1,210
Regina Qu'Appelle	2,823	2,660	2,728	2,744	2,732	2,910	3,050
Saskatoon	3,429	3,209	3,363	3,255	3,276	3,410	3,720
Sun Country	607	578	590	555	576	624	610
Sunrise	545	508	526	533	533	540	565
Unknown	24	20	37	16	65	46	6
Saskatchewan	12,205	11,743	12,009	11,988	11,993	12,477	13,151

Saskatchewan Infant Deaths and Stillbirths

There were 534 infant deaths in Saskatchewan, from 2001 to 2007 (Table 2). This ranged from 66 in 2002 to 98 in 2005. Deaths here are listed as age at time of death, broken down by neonatal (first 27 days of life) and post-neonatal (28 days to under 1 year).

Table 2. Infant deaths, by Age at death and sex, 2001 to 2007

Age at death	2001	2002	2003	2004	2005	2006	2007	7 year Total
Male – Neonatal	27	22	27	24	35	26	12	173
Male – Post-neonatal	14	13	18	19	21	18	20	123
Male – Total	41	35	45	43	56	44	32	296
Female – Neonatal	20	17	15	18	27	20	36	153
Female – Post-neonatal	6	14	13	13	15	14	10	85
Female – Total	26	31	28	31	42	34	46	238
Total Neonatal	47	39	42	42	62	46	48	326
Total Post-neonatal	20	27	31	32	36	32	30	208
Total	67	66	73	74	98	78	78	534

Caution should be used when examining rates and numbers of infant deaths when broken down into sub categories. There are very small numbers of deaths and much variation between years of data. For example, infant mortality rate (IMR) for Athabasca ranges from 0 to 40.5 per 1000 live births over the seven year period. (Table 3)

Table 3. Infant mortality rate , Saskatchewan, by Regional Health Authority, 2001 to 2007

RHA	2001	2002	2003	2004	2005	2006	2007	7 year average
Athabasca	0	0	0	28.6	40.5	15.2	27.4	17.2
Cypress	0	0	5.1	6.8	6.9	2.3	6.3	3.9
Five Hills	5.6	9.1	9.1	9.1	5.7	6.2	0	6.4
Heartland	6.6	4.6	2.3	9.5	0	11.6	6.3	5.8
Keewatin Yatthe	9.0	5.2	9.3	4.5	4.8	8.4	11.2	7.7
Kelsey Trail	6.3	10.3	8.3	6.2	12.9	6.7	13.2	9.1
Mamawetan Churchill River	20.6	11.9	4.7	4.5	17.6	10.1	9.2	10.9
Prairie North	0	9.9	5.5	6.9	10.3	10.0	8.7	7.4
Prince Albert Parkland	7.5	5.5	6.3	5.5	8.5	4.3	8.3	6.6
Regina Qu'Appelle	6.0	4.1	7.7	6.6	6.6	5.2	6.6	6.1
Saskatoon	6.7	4.4	4.8	4.3	8.9	5.9	3.5	5.5
Sun Country	1.6	6.9	8.5	9.0	1.7	3.2	1.6	4.6
Sunrise	0	3.9	3.8	5.6	9.4	7.4	3.5	4.8
Saskatchewan	5.5	5.6	6.1	6.2	8.2	6.3	5.9	6.2

As stated previously, perinatal deaths include early neonatal deaths as well as stillbirths. They are found in Table 4.

Table 4. Saskatchewan Perinatal Deaths, 2001 to 2007

Perinatal deaths	Year of death						
	2001	2002	2003	2004	2005	2006	2007
Early Neonatal Deaths	41	35	38	33	55	40	39
Stillbirths	82	92	76	90	73	82	107
Total	123	127	114	123	128	122	146

Cause of death is an important variable when considering infant death. Table 5 examines cause of death by sex. Birth type and birth weight also effect birth outcome. These are examined in Tables 6 and 7.

Table 5. Infant deaths, by cause of death[2], 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007	7 year Total
Male – Perinatal conditions	14	18	20	16	22	17	8	115
Male – Congenital anomalies	14	5	8	7	12	10	7	63
Male – SIDS [3]	5	*	*	8	5	5	*	33
Male – Other	8	8	14	12	17	12	14	85
Male – Total	41	35	45	43	56	44	32	296
Female – Perinatal conditions	12	10	6	10	06	13	23	96
Female – Congenital anomalies	7	7	13	10	10	7	8	62
Female – SIDS [4]	*	*	*	*	*	*	*	19
Female – Other	5	11	6	8	9	11	11	61
Female – Total	26	31	28	31	42	34	46	238
Total	67	66	73	74	98	78	78	534

Table 6. Infant deaths, by birth type, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007	7 year Total
Single	56	43	57	69	78	64	61	428
Multiple	8	14	10	3	11	7	12	65
Unknown	3	9	6	2	9	7	5	41
Total	67	66	73	74	98	78	78	534

In Table 7.1, it should be noted that the groups are not mutually exclusive and therefore cannot be directly summed for a total. Extremely low birth weight includes births 500 to less than 1000 grams, very low birth weight includes births 500 to less than 1500 grams, and low birth weight includes births 500 to less than 2500 grams. From Tables 7.1 and 7.2, we can see that while there are fewer births at lower birth weights, the chance of survival is significantly decreased.

Table 7.1. Infant deaths, by birth weight, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007	7 year Total
<500 grams	5	7	5	9	14	7	2	49
Extremely low (500g - <1000g)	20	17	21	15	27	21	24	145
Very Low (500g - <1500g)	24	20	26	20	31	27	31	179
Low (500g - <2500g)	41	25	35	29	39	44	41	254
Normal (2500g to <4000g)	15	21	26	29	34	20	23	168
High (4000g+)	3	4	1	5	2	0	7	22
Unknown	3	9	6	2	9	7	5	41
Total	67	66	73	74	98	78	78	534

Table 7.2. Infant mortality rate, by birth weight, 2001 to 2007

	2001	2002	2003	2004	2005	2006	2007	7 year Total
Extremely low (500g - <1000g)	500.0	566.7	466.7	394.7	509.4	428.6	705.9	501.7
Very Low (500g - <1500g)	258.1	204.1	250.0	185.2	262.7	221.3	337.0	243.5
Low (500g - <2500g)	66.7	42.6	54.5	45.2	58.5	63.7	56.9	55.7
Normal (2500g to <4000g)	1.6	2.3	2.8	3.1	3.6	2.0	2.2	2.5
High (4000g+)	1.5	2.2	0.5	2.7	1.0	0.0	3.5	1.7
Total (excluding <500gms)	5.5	5.7	6.2	6.2	8.2	6.3	5.9	6.3

Factors regarding the mother also impact on infant death. Tables 8.1 and 8.2 examine mother's age as a factor in infant death. It should be noted that values for maternal age are missing for a number of records. It should be noted the rates for 40+ should be interpreted with caution due to small cell size.

Table 8.1. Infant deaths, by mother's age 2001 to 2007

Mother's age	2001	2002	2003	2004	2005	2006	2007	7 year Total
10 to 19	12	8	10	9	12	13	8	72
20 to 24	19	11	17	19	28	21	23	138
25 to 29	25	16	14	22	24	17	20	138
30 to 34	5	14	16	15	17	10	13	90
35 to 39[5]	*	7	8	5	7	10	8	48
40+[6]	*	*	*	*	*	*	*	7
Missing values	*	*	*	*	*	*	*	41
Total	67	66	73	74	98	78	78	534

Table 8.2. Infant mortality rate, by mother's age 2001 to 2007

Mother's age	2001	2002	2003	2004	2005	2006	2007	7 year Total
10 to 19	9.8	6.9	8.5	7.5	10.3	10.3	6.2	8.5
20 to 24	6.0	3.8	5.8	6.5	9.4	6.8	7.5	6.6
25 to 29	6.4	4.2	3.7	5.8	6.4	4.2	4.6	5.0
30 to 34	1.9	5.2	5.8	5.6	6.3	3.6	4.2	4.6
35 to 39[7]	2.8	6.7	7.6	4.9	7.0	9.4	6.8	6.5
40+[8]	0.0	5.8	9.7	9.3	5.1	0.0	5.5	5.2
Total	5.5	5.6	6.1	6.2	8.2	6.3	5.9	6.2

Tables 9 and 10 examine infant death by cause and age at death. Table 11 and 12 examine infant death by mother's age and age at death and gestation. Small numbers continue to be a concern with this data.

Table 9. Infant deaths and infant mortality rate, total by cause, 2001 to 2007

Cause of Death	7 year Total Numbers	7 year Average rates (per 1000 live births)
Conditions arising in the perinatal period	211	2.5
Congenital anomalies	125	1.5
Sudden Infant Death	52	0.6
Unintentional and intentional injuries	14	0.2
Respiratory distress syndrome	6	0.1
Other	104	1.2
Unknown	22	0.3
Total	534	6.2

Table 10. Infant deaths, total by age at death, 2001 to 2007

Age at Death	7 year Total Numbers	7 year Average rates (per 1000 live births)
Early neonatal	281	3.3
Late neonatal	45	0.5
Post-neonatal	208	2.4
Total	534	6.2

Table 11.1. Infant deaths, by mother's age and age at death, 2001 to 2007

Mother's age	Neonatal	Post-neonatal	7 year Total
10 to 19	44	28	72
20 to 34	226	140	366
35+	37	18	55
Missing values	19	22	41
Total	326	208	534

Table 11.2. Infant mortality rate, by mother's age and age at death, 2001 to 2007

Mother's age	Neonatal	Post-neonatal	7 year Total
10 to 19	5.2	3.3	8.5
20 to 34	3.3	2.1	5.4
35+	4.2	2.1	6.3
Total	3.8	2.4	6.2

Table 12.1. Infant deaths, by mother's age and gestation, 2001 to 2007

Mother's age	Pre-term	Full term	Missing	7 year Total
10 to 19	42	30		72
20 to 34	235	131		366
35+	39	16		55
Missing values			41	41
Total	316	177	41	534

Table 12.2. Infant mortality rate, by mother's age and gestation, 2001 to 2007

Mother's age	Pre-term	Full term	7 year Total
10 to 19	5.0	3.5	8.5
20 to 34	3.5	1.9	5.4
35+	4.5	1.8	6.3
Total	3.7	2.1	6.2

The following tables (Table 13 to Table 16) have broken down factors for each of the Regional health authorities. Infant deaths have been tabulated by cause, by birth weight, by mother's age, and by gestation. As can be seen, small cell size is of concern at this level. To counteract this, the infant deaths have been left as totals for the seven-year period. Also, groupings have been enlarged where possible and numbers suppressed where required.

Table 13. Infant deaths, by cause and RHA of mother's residence, 2001 to 2007

RHA of residence	Conditions arising in the Perinatal period	Congenital anomalies	All Other	Total
Athabasca	*	*	6	8
Cypress	5	*	*	12
Five Hills	8	10	6	24
Heartland	*	*	*	18
Keewatin Yatthe	*	*	7	12
Kelsey Trail	12	5	13	30
Mamawetan Churchill River	7	11	15	33
Prairie North	28	11	21	60
Prince Albert Parkland	20	7	24	51
Regina Qu'Appelle	56	22	42	120
Saskatoon	43	37	39	129
Sun Country	10	*	*	19
Sunrise	11	*	*	18
Saskatchewan	211	125	104	534

Table 14. Infant deaths, by birth weight and RHA of mother's residence, 2001 to 2007

RHA of residence	<500gm	Low	Normal	High	Total
Athabasca	*	*	6	*	8
Cypress	*	6	*	*	12
Five Hills	*	11	10	*	24
Heartland	*	12	*	*	18
Keewatin Yatthe	*	*	5	*	12
Kelsey Trail	*	14	9	*	30
Mamawetan Churchill River	*	14	7	*	33
Prairie North	10	24	19	*	60
Prince Albert Parkland	*	21	21	*	51
Regina Qu'Appelle	14	63	34	*	120
Saskatoon	11	64	42	6	129
Sun Country	*	10	*	*	19
Sunrise	*	9	6	*	18
Saskatchewan	49	254	125	22	534

Table 15. Infant deaths, by mother's age and RHA of mother's residence, 2001 to 2007

RHA of residence	10 to 19	20 to 29	30 +	Missing	Total
Athabasca	*	6	*	*	8
Cypress	*	5	*	*	12
Five Hills	*	13	10	*	24
Heartland	*	9	6	*	18
Keewatin Yatthe	*	5	*	*	12
Kelsey Trail	5	12	9	*	30
Mamawetan Churchill River	*	13	7	9	33
Prince Albert Parkland	9	24	15	*	51
Regina Qu'Appelle	18	69	28	5	120
Saskatoon	15	69	39	6	129
Sun Country	*	10	7	*	19
Sunrise	*	11	*	*	18
Saskatchewan	72	276	145	41	534

Table 16. Infant deaths, by gestational age and RHA of mother's residence, 2001 to 2007

RHA of residence	Preterm	Full Term	Missing	Total
Athabasca	*	7	*	8
Cypress	7	*	*	12
Five Hills	14	12	*	24
Heartland	11	5	*	18
Keewatin Yatthe	8	*	*	12
Kelsey Trail	17	9	*	30
Mamawetan Churchill River	13	11	9	33
Prairie North	35	18	7	60
Prince Albert Parkland	28	20	*	51
Regina Qu'Appelle	82	33	5	120
Saskatoon	78	45	6	129
Sun Country	13	*	*	19
Sunrise	11	7	*	18
Saskatchewan	316	177	41	534

Endnotes

1. Saskatchewan Birth Report, 1997-2005, Ministry of Health, Government of Saskatchewan, Canada, 2008

2. Congenital Anomalies: ICD-9: 740-759 ICD-10: Q0 - Q99

   Conditions Arising in the Perinatal Period: ICD-9: 760-768, 770-779 ICD-10: P0 - P21, P23 - P96

   Sudden Infant Death Syndrome (SIDS): ICD-9: 798.0 ICD-10: R95

   Other: ICD-9: 001-739, 780-797, 799, 769, 800-999 ICD-10 P22, : S00 - T98, V01 - Y98
   Description: Other covers all other conditions not mentioned above, including infectious and parasitic disease, cancer, conditions of the respiratory system, injuries and respiratory distress syndrome.

3 * Suppressed due to small cell size.

4 * Suppressed due to small cell size.

5 * Suppressed due to small cell size.

6 * Suppressed due to small cell size.

7 Caution interpreting due to small cell size.

8 Caution interpreting due to small cell size.