



**CORE**

Public Health Functions for BC

**Evidence Review:**  
**Reproductive Health**

**Population Health and Wellness  
BC Ministry of Health**

*This paper is a review of the scientific evidence for this core program. Core program evidence reviews may draw from a number of sources, including scientific studies circulated in the academic literature, and observational or anecdotal reports recorded in community-based publications. By bringing together multiple forms of evidence, these reviews aim to provide a proven context through which public health workers can focus their local and provincial objectives. This document should be seen as a guide to understanding the scientific and community-based research, rather than as a formula for achieving success. The evidence presented for a core program will inform the health authorities in developing their priorities, but these priorities will be tailored by local context.*

*This Evidence Review should be read in conjunction with the accompanying Model Core Program Paper.*

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## EXECUTIVE SUMMARY

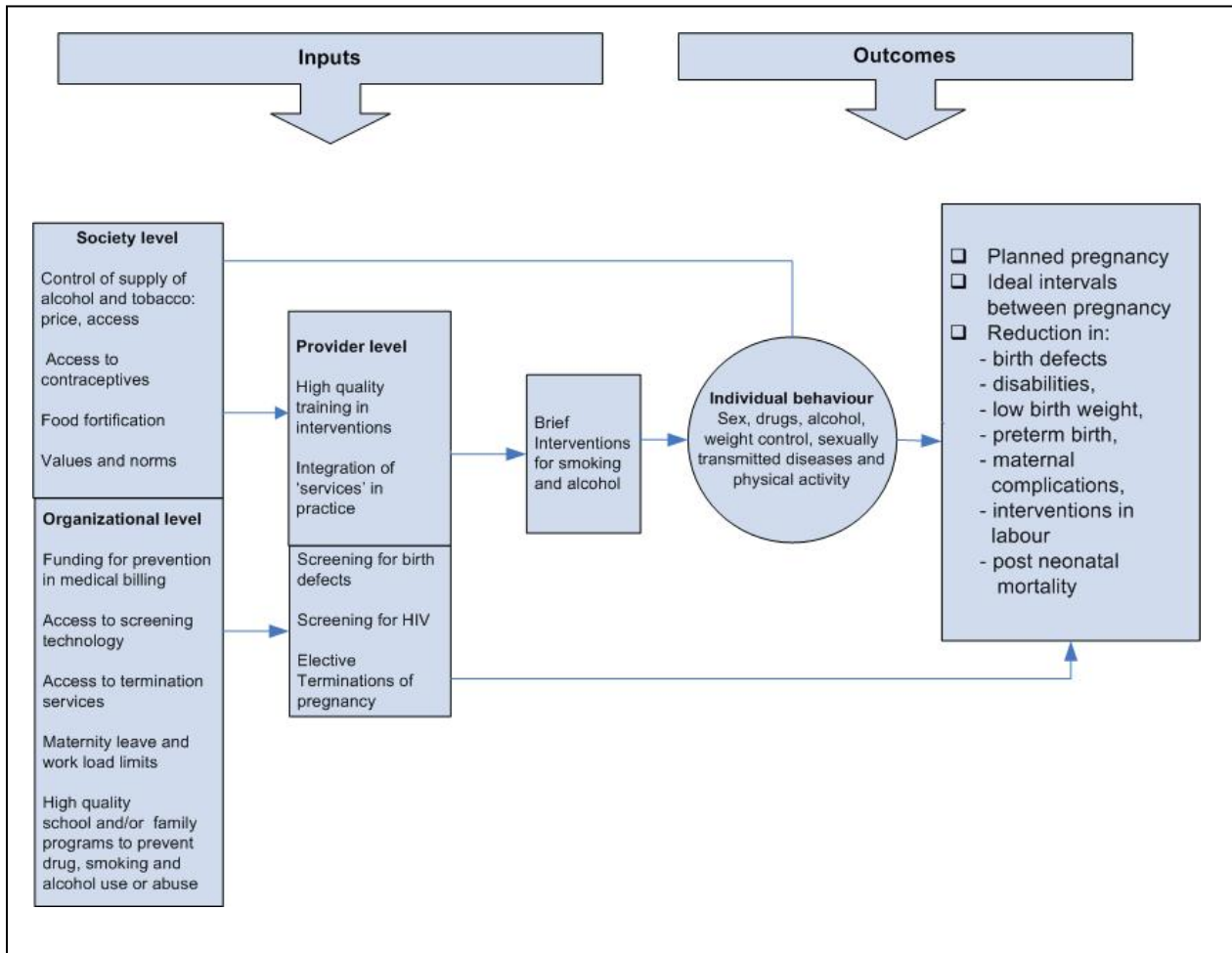
The following table summarize the strategies in this review that have the best quality of evidence.

Subject	Outcome	Intervention
<b>Chapter 3: Fertility and Contraception</b>		
Preconception/ Interconception Health	Reduction in infertility	Smoking cessation Reduction in percentage of trans fats in diet.
	Prevention of unwanted pregnancies	Access to contraception and abortion
	Reduction in neural tube defects and other congenital anomalies	Preconception screening of women seeking family planning for risk conditions Preconception folate supplements Fortification of food with folic acid Enhanced diabetic control and education.
<b>Chapter 4: Infectious Diseases</b>		
<i>Chlamydia trachomatis</i>	Reduction in pelvic inflammatory disease and infertility.	Screening for chlamydia for women under 25 in high risk situations Partner screening Expedited partner therapy
HIV/AIDS	Prevention of transmission of HIV to fetus.	HIV screening offered on an opt out basis at the first prenatal visit
	Strep B	The <i>Canadian Guidelines on Sexually Transmitted Infections</i> recommends screening and treatment at 12-16 weeks in high risk pregnancies (i.e., previous preterm labour/delivery or premature rupture of the membranes).
<b>Chapter 5: Teen Pregnancy</b>		
	Reduction in teen pregnancy	Access to contraception Multi-strategy country-wide strategies that include access to contraception, education, public awareness and education regarding sexual behaviour.
<b>Chapter 6: Healthy Lifestyle</b>		
	Reduction in smoking in pregnancy and alcohol consumption during pregnancy leads to reduction in fetal mortality, preterm birth and reduction in low birth weight.	High-quality family or school based programs targeted at adolescents Screening and brief interventions for smoking and alcohol consumption in primary care. Smoking cessation Quitlines
	Fewer complications during pregnancy and labour such as gestational diabetes and hypertension and therefore lower risk of preterm birth, caesarean delivery.	Weight gain during pregnancy within the guidelines of the Institute of Medicine
<b>Chapter 7: Maternal Age and Health Status</b>		
	Reduction in congenital anomalies Perinatal complications	Preconception care for diabetic women Lifestyle interventions and/or metformin to prevent diabetes in pre-diabetic people Diabetic management in pregnancy including dietary advice, blood glucose monitoring and insulin monitoring
	Lower blood pressure Lower risk of preeclampsia	Calcium supplement
Postpartum mental health	Reduction in Edinburgh Postnatal Depression Scale scores	Screening, support, interventions and home visitation by nurses for high risk women.
<b>Chapter 8: Prenatal Care</b>		
	Lower risk of congenital anomalies	Folic acid containing multivitamin in the preconception period and first trimester period
	Improved fetal growth and birth outcomes.	A balanced supplement of energy and protein
	Reduction of the risk of preterm birth, infants small for gestational age and stillbirths	Avoiding shift work, lifting loads and job psychological demands

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Subject	Outcome	Intervention
<b>Chapter 9: Other Conditions that Increase Vulnerability for Adverse Outcomes</b>		
	Improved quality of care	Adoption of best practices for women experiencing violence or abuse.
	Improved reproductive health outcomes	Provision of prenatal care to imprisoned women
	Possible reduction in preterm births	Provision of adequate prenatal leave for working women Limits to physical burdens in the workplace for pregnant women.
<b>Chapter 10: Aboriginal Women</b>		
▪		Adoption of best practices for providing care to Aboriginal women and women experiencing violence or abuse bases on the Guidelines by the SOGC.
<b>Chapter 11: Newborn and Postnatal Services</b>		
Breastfeeding	Improved childhood immunity and development Reduction in infant mortality Reduction in childhood obesity Postpartum weight loss	Support for breastfeeding in the postnatal hospital stay Breastfeeding counselling in primary care Media programs Unrestricted feeding, baby to mother contact and skin to skin contact from birth onwards. Avoiding supplementary formula Preventing discharge packs in the hospital
<b>Chapter 12: Use of the Internet and Technology</b>		
	Improved mental health	Computerized cognitive behaviour therapy
	Reduced alcohol consumption	Bibliotherapy
	A wide variety of health outcomes.	Phone contact
	Weight loss	Behaviour therapy + Internet support

**Figure A: Evidence-based Logic Model of Public Health Strategies to Improved Reproductive Health**





## **1.0 OVERVIEW/SETTING THE CONTEXT**

In 2005, the British Columbia Ministry of Health released a policy framework to support the delivery of effective public health services. The *Framework for Core Functions in Public Health* identifies reproductive health as one of the 21 core programs that a health authority provides in a renewed and comprehensive public health system.

The process for developing performance improvement plans for each core program involves completion of an evidence review used to inform the development of a model core program paper. These resources are then utilized by the health authority in their performance improvement planning processes.

This evidence review was developed to identify the current state of the evidence-based on the research literature and accepted standards that have proven to be effective, especially at the health authority level. In addition, the evidence review identifies best practices and benchmarks where this information is available.

### **1.1 An Introduction to This Paper**

The purpose of this paper is to summarize evidence within the scope of public health for the BC Ministry of Health and Health Authorities, to assist in policy, planning and service delivery of perinatal services. This review is part of a series of reports covering the major topics in public health in BC, including dental health, hearing, vision, safety/injury prevention, communicable disease control, food security, chronic disease, child abuse/neglect, environmental health, substance abuse, early childhood health and perinatal depression.

The goals of reproductive public health are to ensure that the mother and her fetus enter labour in good health and to minimize complications during pregnancy and delivery. Public health functions include support for breastfeeding, infant-maternal bonding and other health-enhancing factors of normal perinatal development. The scope of this review is limited to interventions that impact on reproductive health prior to conception and during in the prenatal and postpartum period.

The following items have been excluded from the scope of this review.

- Acute care services delivered in hospitals.
- Services provided by physicians since they are not, with few exceptions, employed by the Health Authorities and their activities are determined by the Medical Services Plan billing codes. However where evidence supports the role of physicians in a public health function such as screening, this intervention is included in the review. The Canadian College of Family Physicians (CCFP) has identified preventive strategies as part of their role and has published a preventive screening checklist (Milone & Milone, 2006). The CCFP has a long history of development of guidelines on preventive practices as part of routine medical care.
- Management or treatment of symptoms or complications of pregnancy.
- The management of labour and delivery

## **2.0 METHODOLOGY**

### **2.1 Grading of the Evidence**

The primary sources of evidence used for this review are graded reviews of the evidence, graded clinical practice guidelines, systematic reviews, meta-analysis and randomized controlled trials. Reviews use different grading systems and there is no consensus on the best grading system (Guyatt et al., 2006; Kemm, 2006). Grading of the evidence in this review follows the categories shown in Table 1. The reference list at the end of the review includes the coding for the type of study and the grading of the evidence. In order to consolidate grading into one system, studies coded as Ia, Ib, are graded as A, and studies coded as II, IIa or III are graded as B. Grading for the guidelines published by the Society of Obstetricians and Gynaecologists of Canada (SOGC) are based on the system used by the Canadian Task Force on Preventive Health Care (see Table 2 for the grading criteria).<sup>1</sup> Studies graded as A for this review are higher quality in terms of methods and provide the best evidence and merit consideration for replication. Studies graded as B provide “fair” evidence and may be considered for replication if further research or evaluation were conducted. Future reviews should consider the grading model developed by National Institute for Health and Clinical Excellence (NICE), which includes the dimensions of efficacy, salience, implementation and cost-effectiveness (Weightman, Ellis, Cullum, Sander, & Turley, 2005). Grading of clinical practice guidelines are moving toward adoption of the AGREE standards (AGREE Collaboration, 2003). The AGREE guidelines have been adopted by NICE in the United Kingdom, and so clinical practice guidelines from NICE were used as a principal resource for clinical practice guidelines in this review.

**Table 1: Types of Studies Reviewed and Grading System Used**

MA	Meta-analysis	Ia	A
RCT	Randomized controlled trial	Ib	
SR	Systematic review	Ia	B
CCS	Case-control study	IIa	
CCT	Controlled clinical trial	II	
COH	Cohort study	IIa	
COM	Comparative study	III	
GL	Clinical practice guidelines	IV	

**Source:** Canadian Task Force on Preventive Health Care [CTFPHC], n.d.

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<sup>1</sup> More information on the Canadian Task Force on Preventive Health Care can be found at <http://www.ctfphc.org>.

**Table 2: Society of Obstetricians and Gynaecologists of Canada Grading System**

<b>Criteria for Quality of Evidence Assessment and Classification of Recommendations</b>	
<b>Level of Evidence</b>	<b>Classification of Recommendations</b>
I: Evidence obtained from at least one properly designed randomized controlled trial.	A. There is good evidence to support the recommendation that the condition be specifically considered in a periodic health examination.
II-1: Evidence from well-designed controlled trials without randomization.	B. There is fair evidence to support the recommendation that the condition be specifically considered in a periodic health examination.
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group.	C. There is poor evidence regarding the inclusion or exclusion of the condition in a periodic health examination.
II-3: Evidence from comparisons between times or places with or without the intervention. Dramatic results from uncontrolled experiments (such as the results or treatment with penicillin in the 1940s) could also be included in this category.	D. There is fair evidence to support the recommendation that the condition not be considered in a periodic health examination.
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.	E. There is good evidence to support the recommendation that the condition be excluded from consideration in a periodic health examination.

Sources: Black et al., 2004; CTFPHC, n.d.

## 2.2 Methodological Limitations

- Good evidence is often available for single, targeted initiatives, such as smoking cessation; however, larger community- or population-wide programs do not include a control group, so evidence is not based on randomized controlled trials. Ways to use epidemiological studies as “evidence” needs to be developed.
- There are many studies that can point to an association between risk factors and reproductive health outcomes, but this does not infer causation.
- This evidence review is not systematic and may have omitted some important research.
- Many clinical guidelines summarize and grade the evidence, but are not clearly linked to citations of primary research or clinical outcomes.
- Reviews miss a large amount of detail about program components that may have been critical to the success of the program.
- Many strategies have been tested on high-risk or low socio-economic groups, and may not be generalizable to the general population.

## 2.3 Hierarchy and Criteria for Selection of Evidence or Reviews

1. Graded reviews of the evidence.

Reviews use a grading system to rank the evidence based on the quality or type of study. Reviews include citations to the original research.

Reviews are published by an “authority” (professional, academic or government agency).

2. Where no graded reviews were available, systematic reviews or meta-analysis are used.
3. Where no systematic reviews or meta-analysis were available, randomized controlled trials (RCT) are used.
4. Where no RCTs were available, the evidence is based on other types of studies. This includes non-randomized controlled trials, cohort studies reported in peer review literature and program evaluations or outcomes reported in the “non-published” literature (grey literature).
5. Population-level strategies, for example media campaigns, policy changes, legislation, and increased access to services are included if they are evaluated.

**Qualities sought for all evidence:**

- “Generic interventions” that have been tested in a number of clinical trials (replication).
- Standard outcomes measures used for similar interventions.
- The evidence or guidelines are drawn from a western country with a universal health care system and the population is similar in ethnic and socioeconomic status to Canada.
- The evidence was within the scope of public health, which is broadly defined as primary and secondary prevention, regardless of type of intervention. In some cases this includes primary care (physicians).
- If only one or few studies are published on an intervention, or outcome measures have been different from study to study, these studies are cited where they are unique, recent, have good quality methods and are an important area of prevention.
- The most recent interventions are assumed to be built on past evidence.
- Studies are available on internet search databases or through the UBC library online.
- Each section is approached in the following sequence if possible:
  - Incidence/prevalence/trends/risk factors and outcome/consequences to the mother and/or newborn.
  - Evidence that an intervention makes a difference on outcomes.
  - Evidence that an intervention doesn’t make a difference on outcomes.

**2.4 Newborn and Maternal Outcomes of Relevance to This Review**

One of the major challenges to this review is the diversity and volume of outcomes and interventions within the field of reproductive health. As an attempt to put some boundaries around the project, a list of important reproductive health outcomes was sought. Two lists were

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found (Table 3), which helped provide some standard outcomes. In addition, this review identified other outcomes of importance in reproductive health and these are included in the third column of Table 3. Incidence and prevalence of risk factors for poor reproductive outcomes have also been identified in epidemiological studies and are included in the fourth column of Table 3. No public health interventions were found for four outcomes in Table 3: post-term birth rate, maternal mortality ratios, multiple birth rate and urinary incontinence.

**Table 3: Reproductive Health Outcome Measures**

Canada, Top Ranked Indicators	European Core Indicators	Other Outcomes of Importance Found in This Review	Risk Factors for Poor Reproductive Health Outcomes
<ul style="list-style-type: none"> <li>• Fetal mortality rate</li> <li>• Infant mortality rate</li> <li>• Small-for-gestational-age rate</li> <li>• Large-for-gestational-age rate</li> <li>• Preterm birth rate</li> <li>• Post-term birth rate</li> <li>• Maternal mortality ratio</li> <li>• Rate of live births to teenage mothers</li> <li>• Prevalence of congenital anomalies at birth</li> <li>• Rate of maternal smoking during pregnancy</li> <li>• Severe maternal morbidity ratio</li> <li>• Rate of caesarean delivery</li> <li>• Rate of breastfeeding</li> <li>• Rate of maternal alcohol consumption during pregnancy</li> <li>• Multiple birth rate</li> </ul>	<ul style="list-style-type: none"> <li>• Acceptance of HIV testing among pregnant women</li> <li>• HIV seroprevalence among HIV-tested pregnant women (all ages)</li> <li>• Chlamydia prevalence</li> <li>• Reported condom use at last high-risk sexual contact</li> <li>• Median age at first intercourse</li> <li>• Proportion of contraceptive use at first intercourse</li> <li>• Age-specific birth rates in teenagers</li> <li>• Contraceptive prevalence</li> <li>• Maternal age at first childbirth</li> <li>• Fertility rate</li> <li>• Proportion of women trying to get pregnant for one year or more</li> <li>• Proportion of deliveries associated with assisted reproductive technology</li> <li>• Frequency of induced abortions</li> <li>• Proportion of women with urinary incontinence</li> </ul>	<ul style="list-style-type: none"> <li>• Children’s intellectual and behavioural development</li> <li>• Post-pregnancy weight retention</li> <li>• Post-pregnancy smoking relapse</li> <li>• Body mass index (BMI) at conception</li> <li>• Weight gain during pregnancy</li> <li>• Mental health</li> <li>• Access to prenatal care</li> <li>• Access to pregnancy termination services</li> </ul>	<ul style="list-style-type: none"> <li>• Low energy intake during pregnancy and consequent low gestational weight gain</li> <li>• Low pre-pregnancy BMI</li> <li>• Short stature</li> <li>• Primiparity</li> <li>• Pregnancy-induced hypertension</li> <li>• Short interval (&lt;6 months) between pregnancies (Klebanoff, 1999)</li> <li>• Genital tract infection</li> <li>• Multiple births</li> <li>• Incompetent cervix</li> <li>• History of prior preterm birth</li> <li>• Heavy work</li> </ul>

**Sources:** Top Ranked Indicators – Health Canada, 2003.  
European Core Indicators – Temmerman et al., 2006.  
Risk Factors for Poor Reproductive Health Outcomes – Tough et al., 2002.

#### 2.4.1 Temporal Trends in Birth Outcomes

Most birth outcomes have been improving during recent years. Infant mortality has been declining for decades in BC, similar to the rest of Canada. The rate declined from 8.4/1,000 births in 1987 to 4.4/1,000 births in 2002 in BC. The infant mortality rate rose in both 2001 and 2002—to 4.0 deaths per 1,000 live births in 2001 and to 4.4 deaths per 1,000 live births in 2002. Infant mortality in BC ranged from 2.3 in the East Kootenays to 5.9 in North Vancouver Island (Provincial Health Officer [PHO], 2003).

Factors attributed to changes in infant mortality include access to neonatal intensive care and an increase in screening, resulting in increased detection of congenital anomalies and an increase in induced abortions. A recent report has shown that screening for birth defects and termination of pregnancies with congenital anomalies has had a perceptible effect on overall infant mortality (Liu et al., 2002 **B**).

One of the most significant variables indicative of infant morbidity is the preterm birth rate. Preterm birth appears to be on the rise (Kramer et al., 1998; Joseph, Demissie, & Kramer, 2002). Rates of preterm birth in Canada increased between 1981 and 2000 (from 6.4 per 100 deliveries to 7.5). The suggested reasons for the increased rates of preterm birth include increased rates of multiple births and increased use of obstetric interventions such as ultrasound. The rate of stillbirths has declined, suggesting that increasing use of ultrasound may save the lives of some babies, albeit at the risk of preterm delivery (Chalmers & Wen, 2003). According to Joseph et al. (2002), “the temporal increase in preterm birth is primarily due to an increase in obstetric intervention, which is often motivated by a desire to reduce the risk of stillbirth, maternal mortality and severe morbidity.” According to Blondel et al. (2002), “a rise in multiple births (attributable to hormonal treatments and assisted reproduction technologies for infertility) has also been an important cause of the trend toward increasing preterm birth.”

#### 2.4.2 Long-term Impact of Preterm or Growth-restricted Births

Preterm infants are at increased risk of death, short- and long-term pulmonary morbidity, ophthalmologic morbidity, neurologic morbidity and delayed psychomotor development (Kramer, 2003; Hack et al., 2000; Stewart et al., 1999; Hack, Stewart; McCormick, 1985). Severe growth-restricted fetuses are at increased risk of stillbirth and neonatal death, and of significant short-term morbidity from hypoglycemia, hypocalcemia and polycythemia (Froen et al., 2001; Huang et al., 2000; Kramer, Olivier, McLean, Willis, & Usher, 1990). Over the longer term, intrauterine growth-restricted (IUGR) infants tend to have small but permanent deficits in growth and neurocognitive development (Larroque, Bertrais, Czernichow, & Leger, 2001; Strauss, 2000; Albertsson-Wikland & Karlberg, 1994). Such infants may be at an increased risk of Type 2 diabetes, hypertension and coronary artery disease when they reach middle age many decades later (Barker, 1998; Leon, 1998).

Detailed reports on incidence prevalence and trends related to reproductive health are available in the British Columbia Reproductive Care Program (BCRCP) Annual Report (2005), as well as the British Columbia Vital Statistics Agency Annual Report (2005). The relative importance of all interventions needs to be assessed in the context of the size of the “problem,” current trends and costs and benefits of interventions.

### **3.0 FERTILITY AND CONTRACEPTION**

This chapter reviews the evidence regarding the prevention of infertility and conception and interventions in the preconception period to improve reproductive health outcomes. Evidence regarding the impact of lifestyle factors on reproductive health outcomes, including prevention of low birth weight, are covered in Chapters 6 and 8.

#### **3.1 Fertility and Delayed Childbearing**

##### **3.1.1 Incidence and Risk Factors for Infertility**

Reproductive health, in terms of fertility, seems to be improving. Infertility has declined from 8.5 per cent to 7.4 per cent of couples from 1982 to 2002 in the United States, despite increased age at conception (Stephen & Chandra, 2006). No recent data was found for Canada. This decline runs counter to popular opinion regarding trends in infertility, perhaps due to the media exposure of in vitro fertilization (IVF).

About 30–50 per cent of infertility is attributed to male infertility. Factors that can affect fertility in men include nutrition, endocrine disorders, genetic disorders, psychological disorders and sexually transmitted infections (STI), some antihypertensives that may cause impotence, structural or hormonal disorders, mumps, exposure to workplace hazards, exposure of the scrotum to high temperatures, organic solvents, amyl nitrate, butyl nitrate, ethyl chloride and methaqualone (used to prolong orgasm), agricultural pesticides, alcohol abuse, use of heroin, marijuana and cigarette smoking (Luderer et al., 2004; Swan, 2006; Lowdermilk & Perry, 2004; Augood, Duckitt, & Templeton, 1998 **A**). Other findings contradict the evidence regarding risks of occupational exposure and infertility (Gracia et al., 2005). It is possible that workplace protection and the decline in smoking have contributed to the decline in infertility, but this is just speculation. Further research is needed.

A study published in 2007 found a higher risk of infertility with a higher percentage of energy intake from trans unsaturated fats by women (Chavarro, Rich-Edwards, Rosner, & Willett, 2007 **B**). The same longitudinal study found women who consumed iron supplements had a significantly lower risk of ovulatory infertility than women who did not use iron supplements (RR 0.60, 95% CI 0.39–0.92), after adjusting for potential confounders (Chavarro, Rich-Edwards, Rosner, & Willett, 2006 **B**).

##### **3.1.2 Fertility and Obesity**

Fertility can be negatively affected by obesity. In women, early onset of obesity favours the development of menses irregularities, chronic oligo-anovulation and infertility as an adult. Obesity in women can also increase risk of miscarriages and impair the outcomes of assisted reproductive technologies and pregnancy, when the body mass index exceeds 30 kg/m. The main factors implicated in the association may be insulin excess and insulin resistance. These adverse effects of obesity are specifically evident in polycystic ovary syndrome (PCOS). Approximately half of women with PCOS are overweight or obese, but it is not clear whether obesity leads to PCOS or if the opposite is true (Gambineri, Pelusi, Vicennati, Pagotto, & Pasquali, 2002; Linné, 2004).

In men, obesity is associated with low testosterone levels. In massively obese individuals, reduced spermatogenesis associated with severe hypotestosteronemia may favour infertility. Moreover, the frequency of erectile dysfunction increases with increasing body mass index (Pasquali, Patton, & Gambineri, 2007).

### 3.1.3 Fertility and Polycystic Ovary Syndrome

Polycystic ovary syndrome is a heterogeneous endocrine disorder that affects about 1 in 15 women worldwide. The major endocrine disruption is excessive androgen secretion or activity, and a large proportion of women also have abnormal insulin activity. Many body systems are affected in PCOS, resulting in several health complications, including menstrual dysfunction, infertility, hirsutism, acne, obesity and metabolic syndrome (Norman, Dewailly, Legro, & Hickey, 2007; Linne, 2004; Norman et al., 2004; Gambineri, et al., 2002). The cause of ovulatory dysfunction is not well understood, but is linked to abnormal follicle growth and development within the ovary. As a result, infertility is common among women with PCOS and, in many instances, is the initial presenting complaint. Insulin resistance and obesity are frequently associated with PCOS and probably contribute to the severity of symptoms (Chang, 2007).

### 3.1.4 Fertility and Sexually Transmitted Infections

The most common cause of tubal factor infertility is occlusion of the fallopian tubes due to an infection by a sexually transmitted agent, by *Chlamydia trachomatis* or *Neisseria gonorrhoeae*. Related to a delay in childbearing in many Western countries, there is often a time lag between the acute primary pelvic inflammatory disease (PID) and when women first consult because of fertility problems (Mardh, 2004). Chlamydia serology is useful mainly as a screening test for the likelihood of tubal damage in infertile women and may facilitate decisions on which women should proceed with further investigations without delay (Akande et al., 2003).

### 3.1.5 Interventions to Prevent Infertility

Few studies were found that prevent infertility or increase fertility in men or women. One program reduced smoking among infertile women through education and exhaled CO<sub>2</sub> monitoring (Hughes et al., 2000 A). Further evidence of the prevention of infertility is covered in Section 4.2.

## 3.2 **Contraception**

Contraception has benefited society in more ways than just pregnancy prevention. “The pill has had a dramatic impact on social life in the United States, affecting women's health, fertility trends, laws and policies, religion, interpersonal relations, family roles, careers, gender relations, and premarital sexual practices” (Tyrer, 1999).

The most frequently used methods of contraception in Canada are oral contraceptives (32 per cent), condoms (21 per cent), male sterilization (15 per cent), female sterilization (8 per cent) and withdrawal (6 per cent). Nine per cent of couples use no method of contraception. Condom use has increased significantly, from 6.2 per cent in 1984 to 21 per cent in 1998. In the 1998 *Canadian Contraception Study*, 16 per cent of youth aged 15 to 19 reported not using a condom



during their last intercourse, and 8 per cent reported never using a condom (Fisher, Boroditsky, & Bridges, 1999; Statistics Canada, 1999). However, a 2005 report by the McCreary Centre Society reported that the percentage of youth using no reliable form of contraception had not changed between 1992 and 2003 (21 per cent of boys in 1992 and 2003 using no method, and 26 per cent of girls in 1992 and 25 per cent in 2003 using no method). Between 1988 and 1995, the proportion of contraceptive users in the United States relying on the pill decreased from 31 per cent to 27 per cent, while condom use rose from 15 per cent to 20 per cent, suggesting a change in behaviour relating to the risk of HIV/AIDS (Piccinino, 1998).

Alcohol use poses a significant barrier to effective contraceptive use at all ages (Black et al., 2004).

### 3.2.1 Limitations of the Evidence

The Fertility Regulation Group of the Cochrane Collaboration has been assessing the best available evidence on fertility regulation, family size and birth spacing. The finding that most trials of oral contraceptives were conducted by pharmaceutical companies raises concerns about potential commercial bias. Most studies on fertility regulation effectiveness and adverse effects come from observational studies, which vary widely in quality. Future systematic reviews based on randomized controlled trials, when available, will improve the level of evidence (Helmerhorst et al., 2006). Evidence regarding the effectiveness of fertility awareness is lacking, due to methodological limitations of studies (Grimes et al., 2004 **A**).

### 3.2.2 Society of Obstetricians and Gynaecologists of Canada Guidelines on Contraception

The Society of Obstetricians and Gynaecologists of Canada (SOGC) has published guidelines on contraception. Selected guidelines are reproduced below (Black et al., 2004).

#### **Access**

- Comprehensive family planning services, including abortion services, should be freely available regardless of geographic location. These services should be confidential and respect an individual's privacy. (**A**)
- Hormonal emergency contraception should be available without a prescription in pharmacies, family planning clinics, emergency rooms, walk-in clinics, and school health programs. (**B**)
- The established program which allows compassionate provision of oral contraceptives to patients in need must be maintained. (**B**)
- Health promotion, emergency contraception counselling, and the prevention of STIs, sexual violence, and cervical cancer should be integrated into contraceptive care.
  - Health care providers should assist women and men in developing the skills necessary to negotiate the use of contraception, as well as the correct and consistent use of a chosen method of contraception.

- The SOGC should continue the Contraception Awareness Project (CAP) to promote safer sex and effective contraception for Canadian women and men and to continue professional education for health care providers who are active in this field.
- Women and men should receive practical information about a wide range of contraceptive methods so that they can select the method most appropriate to their needs and circumstances.

### **Natural Methods**

- Natural family planning methods may provide effective contraception when used diligently and selectively. **(B)**
- Coitus interruptus (“withdrawal”) is preferable to no contraception at all, but failure rates may be high and it does not provide protection against STIs. **(B)**
- The lactational amenorrhea method is an effective method of contraception for the first 6 months postpartum in women who are exclusively breastfeeding and have not yet resumed menstrual cycling. **(B)**
- Fertility awareness may be used in combination with non-hormonal methods of contraception to enhance the effectiveness.
- Health care providers should respect the choice of a natural family planning method and be able to provide resources to support the correct use of this method.
- The use of coitus interruptus (“withdrawal”) should be recognized as a risk-reduction strategy. When couples use coitus interruptus or other natural family planning methods, health care providers should provide information about emergency contraception.

### **The Role of Health Care Providers**

- Health care providers should be able to counsel postpartum women about the contraceptive efficacy and correct use of the lactational amenorrhea method. **(A)**  
Conflicting evidence has been reported on the value of providing support for women to use the lactational amenorrhea method of birth control versus no support (Van de Wijden, Kleijnen, & Van den Berk, 2006 **A**).
- Family planning counselling should include counselling on the decline in fertility that is associated with increasing female age. **(A)**
- Health care providers should acknowledge and legitimize abstinence as a valid contraceptive choice. **(B)**
- Health care providers should include sexual health in the counselling of women and men with intellectual disabilities, explore potential coercion and abuse and should provide counselling to help them avoid coercive and abusive situations. **(B)**

- Health care providers should be proactive in counselling and should provide accurate information. They should be approachable partners in a professional relationship. **(B)**
- Health care providers should promote the use of latex condoms in combination with another method of contraception (dual protection). **(B)**

### **Prevention of Sexually Transmitted Infections**

- Testing for sexually transmitted infections (STIs) and prevention counselling should not be restricted to young or high-risk individuals. **(B)**
- Comprehensive sex education should be available to all Canadians. Education programs should provide information on abstinence as well as on contraception and STI prevention. **(B)**
- Questions about sexuality should be incorporated into a general assessment.
- Canadian women and men, with their health care providers, should address both the prevention of unintended pregnancy and STIs.

### **Adolescents**

- Adolescents should have ready access to contraception and methods of STI prevention. **(A)**
- Health care providers should respect a patient's right to confidentiality. **(A)**
- The health care provider should help to ascertain that sexually active adolescents are involved in a consensual relationship that is free of coercion and abuse. **(B)**

#### **3.2.3 Evidence Regarding Different Forms of Contraception**

A summary of current contraceptive methods has recently been published by Fisher and Black (2007). The summary covers the current available contraceptive options in Canada, side effects and time to resume contraception, and advantages and disadvantages. A table of this information is included in Appendix 2.

#### **3.2.4 Male Sexual Behaviour**

Danielson et al. (1990) investigated the impact of a reproductive health program on sexual behaviour among men 15–18 years of age receiving care from a health maintenance organization (HMO). The program involved a “highly explicit,” half-hour slide-tape program followed by a personal health consultation by specially trained non-physician providers. On the basis of self-report, the association between the intervention and use of effective contraception was statistically significant among the young men who were sexually active at follow-up (OR 1.51;  $p < 0.05$ ); the finding was even stronger among young men who had not been sexually active at baseline (OR 2.53;  $p < 0.01$ ). Knowledge about sexually transmitted infections and the fertility cycle was also significantly different in the intervention group ( $p < 0.001$  and  $p < 0.01$ ) (Danielson et al., 1990).

### 3.2.5 Where Evidence is Lacking

Table 4 summarizes interventions for fertility and contraception where evidence is lacking.

**Table 4: Interventions Where Evidence is Lacking – Fertility and Contraception**

<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Compliance with contraceptive use following group motivation; structured, peer, or multi-component counselling; and intensive reminders of appointments	Only one out of six RCTs showed a statistically significant benefit of the experimental intervention. In that trial, women who received repeated, structured information about the injectable contraceptive were less likely to discontinue the method by 12 months than women who had routine counselling. The intervention group was also less likely to discontinue due to menstrual disturbances.	Halpern, Grimes, Lopez, & Gallo, 2006 A
Clinical counselling for pregnancy prevention	“No experimental or observational literature reliably answers questions about the effectiveness of counselling in the clinical setting to reduce rates of unintended pregnancies. Existing studies suffer from appreciable threats to internal validity and loss to follow-up and are extremely heterogeneous in terms of the populations studied and outcomes measured.”	Moos, Bartholomew, & Lohr, 2003 A
Postpartum education for contraceptive use	Women in the intervention groups were more likely to use contraceptives than women in the comparison groups. This benefit was not apparent following analysis of data from the better quality studies. An apparent benefit of contraceptive use at six-months postpartum was not apparent following sensitivity analyses.	Hiller, Griffith, & Jenner, 2006 A
Fertility awareness-based methods for contraception	The comparative efficacy of fertility awareness-based methods of contraception remains unknown. Despite intensive training and ongoing support, most participants in these trials discontinued prematurely.	Grimes et al., 2006a A
Hormonal versus non-hormonal versus progestin-only contraception and the effect on lactation	The existing trials are insufficient to establish any effect of hormonal contraception on milk quality and quantity.	Truitt et al., 2006 A
Support for using lactational amenorrhea method for family planning.	No clear difference in pregnancy rates was found between women having support in using the lactational amenorrhoea method and breastfeeding women not using any method of support.	Van der Wijden et al., 2006 A
Steroid hormones for contraception in men	No male hormonal contraceptive is ready for clinical use. All trials published to date have been small exploratory studies.	Grimes et al., 2006b A
Strategies to increase access to emergency contraceptive pills	Strategies to increase access to emergency contraceptive pills had no effect on pregnancy or abortion rates.	Raymond, Trussell, & Polis, 2007 A

## 3.3 **Emergency Contraception**

Emergency contraception (EC) is a method of post-coital contraception that has become more widely available in Canada since 2000. There are two methods of emergency contraception: hormonal methods, which involve the use of emergency contraceptive pills (ECP), and the post-coital insertion of a copper intrauterine device (IUD). Two hormonal preparations are used as EC in Canada: one contains only the progestin levonorgestrel, while the other is a combined preparation containing both ethinyl estradiol and levonorgestrel (Yuzpe) (Black et al., 2004). The Yuzpe method prevents about 75 per cent of the pregnancies which would have occurred if EC

had not been used. The levonorgestrel regimen prevents 85 per cent of expected pregnancies (Davis & Dunn, 2000). In order to enhance access to EC, BC granted prescriptive authority to pharmacists with special training, in 2000. ECPs are currently available from pharmacies in BC as well as from some family planning or health clinics.

A 2004 population-based cohort study of women, aged 10–59, noted that the granting of prescriptive authority to BC pharmacists increased overall utilization of ECPs in the cohort (Soon, Levine, Osmond, Ensom, & Fielding, 2005). This is the first study of its kind in North America.

ECPs should be seen as an essential drug to which all women should have access in a timely manner and in a way that is not restricted by their income level. Timely access to ECPs has the potential to reduce unplanned pregnancies and subsequent abortions (Soon et al., 2005) In BC, identified barriers to access include lack of knowledge, reluctance of young women to request medication from their physicians, denial of risk of pregnancy and lack of timely access to a physician or family planning clinic. Mechanisms for prescription and dispensing that are convenient to women are imperative so that this preventative therapy's time-dependent effectiveness is not jeopardized (Soon et al., 2005).

### 3.3.1 Society of Obstetricians and Gynaecologists of Canada Guidelines

(Black et al. 2004; Dunn et al., 2003 **A**)

- Because the efficacy of hormonal emergency contraception may be higher if used sooner, it should be started as soon as possible after an act of unprotected intercourse. (**A**)
- Users of emergency contraception should be evaluated for pregnancy if menses have not begun within 21 days following treatment. (**A**)
- Hormonal emergency contraception should be available without a prescription in pharmacies, family planning clinics, emergency rooms, walk-in clinics, and school health programs. (**B**)
- Women and men of reproductive age should be counselled about emergency contraception. Women should be offered a prescription in advance of need. (**B**)
- Women who have had unprotected intercourse and wish to prevent pregnancy should be offered hormonal EC up to five days after intercourse. (**B**)
- A copper IUD can be used up to seven days after intercourse in women who have no contraindications. (**B**)
- Women should be advised that the levonorgestrel EC regimen is more effective and causes fewer side effects than the Yuzpe regimen. (**A**)
- Either 1 double dose of the levonorgestrel EC regimen (1.5 mg) or the regular 2-dose levonorgestrel regimen (0.75 mg each dose) may be used, as they have similar efficacy with no difference in side effects. (**A**)

- Hormonal EC should be started as soon as possible after unprotected sexual intercourse. **(B)**
- Women of reproductive age should be provided with a prescription for hormonal EC in advance of need. **(A)**
- The woman should be evaluated for pregnancy if menses have not begun within 21 days following EC treatment.
- A pelvic examination is not indicated for the provision of hormonal EC.

### **3.4 Abortion**

#### **3.4.1 Incidence Rates and Outcomes of Abortion**

In 2003, there were 38.3 abortions per 100 live births in BC, while for Canada the rate was 31.0 per 100 live births (Statistics Canada, 2006). Abortion rates provide an indirect measure of unintended pregnancy.

#### **3.4.2 Society of Obstetricians and Gynaecologists of Canada Guidelines on Abortion**

(Black et al., 2004)

- Contraceptive counselling should be offered at the time of abortion, and contraceptive methods should be provided immediately following the procedure. **(A)**
- Canadian women should have access to safe abortion procedures regardless of geographical location. **(A)**
- Legalized abortion is associated with a lower incidence of abortion-related maternal mortality. **(B)**

Abortion in Canada was decriminalized on January 28, 1988. A 2003 study found that only 17.8 per cent of hospitals in Canada provide abortion services (Canadian Abortion Rights Action League, 2003). Access to abortion services varies widely from province to province and region to region. Prince Edward Island does not provide any abortion services. Newfoundland, Ontario, British Columbia and Alberta fully cover the cost of abortions performed in clinics. A very small number of clinics in several provinces are providing medical (non-surgical) abortions using the drugs methotrexate and misoprostol.

### **3.5 RU-486 Medical Early Abortion**

Mifepristone (formerly known as RU-486) is a medication that blocks the action of the hormone progesterone. Progesterone is needed to sustain a pregnancy. Mifepristone has been used, in combination with other medications called prostaglandins, for medical abortion since 1988 in France and China, and since the early 1990s in the United Kingdom and Sweden. It has been licensed for use in 33 countries, including the United States, where it was approved in September 2000.

The Society of Obstetricians and Gynaecologists of Canada (SOGC) supports the approval and availability of mifepristone and other anti-progestins, as well as their appropriate prostaglandin counterparts, for appropriate research and clinical use in Canada. The SOGC urges Health Canada to work with professional organizations and industry to make this product available to Canadian women (SOGC, 2003). As of July 2007, this drug was not approved for use in Canada for medical early abortion.

### **3.6 Preconception/Interconception Health**

Clinical guidelines for preconception health have been published by the United States Centers for Disease Control and Prevention (Johnson et al., 2006). These guidelines are discussed in more detail in the BC Ministry of Health evidence review on prevention of disabilities (congenital and genetic) (MOH, PHW, 2007). Additionally, maternal serum screening should be offered for fetal aneuploidy (Barclay & Lie, 2007).

#### **3.6.1 Interventions That Work**

A systematic review of preconception care found evidence of effectiveness improved pregnancy outcomes by (1) screening women for high-risk conditions in a primary care or public health setting; (2) providing folic acid supplements prior to conception; and (3) providing enhanced preconception education, screening and counselling to women with diabetes and hyperphenylalanemia (PKU). In all cases, the interventions were associated with a lower risk of congenital anomalies. Counselling of women with diabetes and PKU was provided by endocrinologists, family physicians, diabetes educators and dietitians specialized in these areas. This evidence suggests an opportunity exists for these professionals to offer “prevention services” (Korenbrod, Steinberg, Bender, & Newberry, 2002 A). See other chapters for preconception-related prevention of sexually transmitted infections, teen pregnancy, diabetes and obesity, hypertension, smoking and alcohol.

#### **3.6.2 Preconception Folic Acid Supplementation**

Unambiguous evidence of the effectiveness of preconception folic acid supplementation in preventing the majority of neural tube defects has been available since 1991. Preconception folate supplementation reduces the incidence of neural tube defects (RR 0.28, 95% CI 0.13–0.58) (Lumley, Watson, Watson, & Bower, 2001 A).

A meta-analysis of changes in neural tube defects (NTD) prevalence between 1989–1991 and 2000–2002 was done to compare rates before and after policy recommendations in 34 European countries. By 2005, 13 countries had a government recommendation that women planning a pregnancy should take 0.4 mg folic acid supplement daily and 7 countries had health education initiatives. In the United Kingdom and Ireland, countries with a folic acid supplement policy, there was a 30 per cent decline in NTD total prevalence (95% CI 16–42%), but it was difficult to separate the change from the pre-existing decline. In other European countries with preconception folic acid supplementation policy, there was virtually no decline in NTD prevalence, whether a policy was in place by 1999 or not. Only a public health policy including folic acid fortification of staple foods is likely to result in large-scale prevention of NTDs, according to the authors (Busby et al., 2005). The provision of printed material increased the

awareness of the folate/neural tube defects association by 4 per cent, (OR 1.37, 95% CI 1.33–1.42) (Lumley et al., 2001 A).

### 3.6.3 Food Fortification with Folic Acid

Evidence regarding the impact of fortification of food with folic acid on prevention of NTD has been reported in several studies (Liu & Longerich, 2003; Mills & Signore, 2004; Olney & Mulinare, 2002; De Wals et al., 2007). In Newfoundland, the total annual incidence of NTDs fell by 78 per cent after the implementation of folic acid fortification, from an average of 4.36 per 1,000 births during 1991–1997 to 0.96 per 1,000 births during 1998–2001 (RR 0.22, 95% CI 0.14–0.35,  $p < 0.0001$ ). It is worthwhile to note that there has been no significant increase in the proportion of NTDs from terminated pregnancies since 1994. The increase in the proportion of women in Newfoundland who were taking vitamin supplements containing folic acid, from 17 per cent in Phase I to 28 per cent in Phase II, suggests that an increasing trend in folic acid supplementation may have played a role in the declining NTD rate in Newfoundland. In this study it was not possible to determine the individual contribution of supplementation and fortification to the trend in NTDs (Liu & Longerich, 2003).

A Canadian study has tracked the incidence of neural tube-affected pregnancies before and after fortification of wheat with folic acid (1997). The prevalence of NTDs decreased from 1.58 per 1,000 births before fortification to 0.86 per 1,000 births during the full-fortification period, a 46 per cent reduction (95% CI 40–51). The magnitude of the decrease was proportional to the pre-fortification baseline rate in each province. Differences in incidence of NTDs among provinces almost disappeared after fortification. The observed reduction in rate was greater for spina bifida (a decrease of 53 per cent) than for anencephaly and encephalocele (decreases of 38 per cent and 31 per cent, respectively) (De Wals et al., 2007). Rates in BC showed a decline in incidence of some congenital anomalies since fortification, especially hydrocephalus and other neural tube defects. See Section 8.9 regarding further evidence on prevention of birth defects during the prenatal period. Further discussion of folic acid, as well as more detailed tables on incidence, are included the evidence review on prevention of disabilities (MOH, PHW, 2007).

## 3.7 Summary

This chapter includes evidence regarding the prevention of infertility and conception and interventions during preconception to improve reproductive outcomes.

- There was little evidence found on interventions to prevent infertility or increase fertility. Most of the evidence is based on epidemiological studies that estimate risk versus exposure.
- Increased access to oral contraceptives and abortion has made a major impact on prevention of unwanted pregnancy.
- Folic acid consumption in the preconception period and fortification of food with folic acid has contributed to a reduction in neural tube defects and possibly other congenital anomalies. Food supplementation with folic acid should continue.



## **4.0 PREVENTION OF TRANSMISSION OF INFECTIOUS DISEASES TO THE NEWBORN**

This section provides an overview of the evidence regarding sexually transmitted infections (STIs) of significance to reproductive health. Topics of relevance include screening for STIs and behaviour and educational interventions to modify sexual behaviour. The reader is referred to the communicable disease evidence paper for further information, and to the *Canadian Guidelines on Sexually Transmitted Infections* (Public Health Agency of Canada [PHAC], 2006a).

Table 5 provides some recent data on the incidence of STIs in BC. Pelvic inflammatory disease, ectopic pregnancy, tubal pregnancy, and HIV and AIDS have declined, while chlamydia, syphilis and gonorrhoea have increased.

**Table 5: Sexually Transmitted Infection Rates, Females**

	1996	2004	2005	% Change	Note
Pelvic inflammatory disease hospitalization rate	138.8	69.5		-49.9%	
Ectopic pregnancy rate	109	62.4		-42.7%	
Tubal pregnancy rates	66.8	27.9		-58.2%	
Chlamydia	164		284.7	73.6%	Highest in age group 15–24 Widespread through all areas of BC
Syphilis	0.2		4.1	1950%	70% of all cases in Vancouver 34% of female cases Aboriginal
Gonorrhoea	8.7		13.6	56.3%	44% of cases in Vancouver Highest in age group 15–24
AIDS new cases	1.5	0.7		-100%	
HIV new cases	8.6		3.8	-55.8%	

**Note:** Rates per 100,000 in BC.

**Source:** British Columbia Centre for Disease Control, 2005.

### **4.1 Screening for Sexually Transmitted Infections in Pregnancy**

According to the *Canadian Guidelines on Sexually Transmitted Infections* (PHAC, 2006a)

- At the first prenatal visit, all pregnant women should be:
  - Evaluated for STI risk factors prior to and during pregnancy. Any woman with ongoing risk factors for STI acquisition during pregnancy should be considered for rescreening each trimester.
  - Offered HIV testing and counselling.
  - Screened for hepatitis B surface antigen (HBsAg).
  - Screened for *Chlamydia trachomatis*, *Neisseria gonorrhoeae* and syphilis.
- If an STI is diagnosed in pregnancy, treatment specific to the disease should be initiated, taking the pregnancy into consideration. Follow-up after treatment of STIs for both the patient and her sexual partner(s) is important to ensure therapeutic success.

## **4.2 Chlamydia Trachomatis**

### **4.2.1 Outcomes From Chlamydia**

Based on the available evidence, approximately 20 per cent of women with chlamydial lower genital tract infection will develop pelvic inflammatory disease (PID); approximately 4 per cent develop chronic pelvic pain, 3 per cent infertility and 2 per cent adverse pregnancy outcome (Paavonen & Eggert-Kruse, 1999). However, these estimates are based on relatively weak evidence. Vertical transmission of chlamydia occurs in 50 per cent of infants born vaginally to infected mothers. Vertical transmission can occur with caesarean section where membranes are intact. Of those neonates who acquire infection, at least 20 per cent develop conjunctivitis, and 20 per cent develop pneumonia (Nadisauskiene, 2005). The incidence of long-term sequelae of PID (tubal factor infertility, ectopic pregnancy, chronic pelvic pain) has been related to the number of episodes of PID (Ecker, Chen, Cohen, Riley, & Lieberman, 2001).

### **4.2.2 Incidence**

As shown in Table 5, annual incidence rates for chlamydia infection have increased 73 per cent since 1996 in BC. Despite the increase in chlamydia infections, the rates of pelvic inflammatory disease (PID) have decreased in BC, although chlamydia infections are one of the causes of PID and ectopic pregnancies. The speculation about this apparent contradiction is that PID and ectopic pregnancies are reported by hospital cases and exclude outpatient cases. There has been a trend for PID cases to be treated on an outpatient basis, but the number of patient visits to physician offices for PID has remained stable in Canada (Low, 2007; Yudin, 2006).

Rates in BC do not follow the pattern seen in Sweden, where a decline in chlamydia incidence was correlated with a decline in PID (Kamwendo, Forslin, Bodin, & Danielsson, 1996). In 1989, chlamydia became a reportable disease in Sweden and access to testing and treatment was increased. The initial decline in chlamydia in Sweden has been attributed to their screening system, although an alternative explanation is that changes in sexual behaviour were due to an HIV campaign. The rates of chlamydia in Sweden started to increase in 1995.

There are geographic differences in rates of chlamydia in the United States, with some areas increasing and others decreasing, but overall, rates have been increasing since 1984, despite increased awareness since the emergence of HIV/AIDS in the early 1980s (Centers for Disease Control and Prevention [CDC], 2004b).

Up to two-thirds of cases go unrecognized, and underreporting is common. It is estimated that 10–15 per cent of women of reproductive age have had one episode of PID. One study in Baltimore found an estimated 5.3 per cent of the population aged 18–35 years has an untreated gonococcal infection, and 3.0 per cent has an untreated chlamydial infection (CDC, 2004a).

Chlamydia rates are higher in prison populations. In one American facility, 27 per cent of adolescent females were positive for chlamydial infection and 11 per cent were positive for gonococcal infection. In Birmingham, 22 per cent and 17 per cent of the prison population studied were positive for chlamydial and gonococcal infections, respectively; in San Francisco, 16 per cent and 6 per cent respectively were positive. In another study of incarcerated women,

the overall *C. trachomatis* prevalence was 8.9 per cent among women aged 18 to 25 years, and 3.3 per cent (95% CI=2.0%, 5.1%) among women overall (Bernstein et al., 2006; CDC, 1999). It would seem that screening of prison populations merits consideration as a public health intervention, although no clinical trials were found.

#### 4.2.3 Prevention of Pelvic Inflammatory Disease (PID)

A systematic review of the literature to assess the effectiveness of screening asymptomatic young women for *Chlamydia trachomatis* (*C. trachomatis*) suggests that screening for chlamydia is an effective intervention in the prevention of PID. However, there are large gaps in the literature. Only small numbers of women were studied and the follow-up periods were short. There is evidence to support a level B recommendation that screening for chlamydia using culture is effective in preventing PID in the short term. Further randomized controlled trials are required to assess screening using nucleic acid-based tests and involving longer follow-up periods (Honey & Templeton, 2002 **B**).

#### 4.2.4 Screening

Controversy exists on the merits of universal versus high-risk or opportunistic screening for chlamydia (Low, 2007; Catchpole, Robinson, & Temple, 2003; Low et al., 2007). The classic study on screening for chlamydia was done by Howell in 1996. In Howell's study, 152 cases of pelvic inflammatory disease would occur at a cost of \$676,000 without screening. If screening done was by using the CDC criteria, 64 cases of pelvic inflammatory would be prevented at a cost savings of \$231,000. Screening all women younger than 30 years of age would prevent an additional 21 cases of pelvic inflammatory disease and save \$74,000. Universal screening would prevent an additional 6 cases of pelvic inflammatory disease, but would cost \$19,000 more than age-based screening, or approximately \$3,000 more per case of pelvic inflammatory disease prevented. If the prevalence of *C. trachomatis* is more than 10.2 per cent, or if less than 88.5 per cent of infections occur in women younger than 30 years of age, universal screening provides the greatest cost savings (Howell, Quinn, & Gaydos, 1998). A study in the Netherlands found that during the first 10 years of screening, a screening program yielded savings of US\$492 or US\$1,086 per major outcome averted. Benefits accrued in areas with high prevalence of chlamydia and with strategies that included partner referral (Welte et al., 2000). Low (2007; Low et al., 2007) found the evidence was not sufficient to merit a universal screening program. Trials of opportunistic screening have shown positive effects in terms of case finding and treatment, but the effects cannot be extrapolated to universal screening. Low's recommendation was for further research to demonstrate the benefits and harms of chlamydia screening.

There is some diversity in opinion on screening. The most recent *Canadian Guidelines on Sexually Transmitted Infections* (PHAC, 2006a) make the following recommendations regarding chlamydia screening:<sup>2</sup>

- When a patient is asymptomatic for *C. trachomatis* and has no risk factor or other reason to suggest the need for an invasive sample (pelvic exam), non-invasive specimens such as urine tests should be used (this will make screening more acceptable to patients).

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<sup>2</sup> No grading was included in the recommendations.

- Screen all sexually active girls and women under 25 years of age (also USPSTF, 2007 A).
- Screen males and females of any age who have *C. trachomatis* risk factors.
- Repeat screening 6 months after chlamydia treatment, in light of the risk of reinfection.
- Sexual partners should be treated and undergo follow-up testing to ensure cure.
- Screening for *C. trachomatis* early in pregnancy and repeat screening in the third trimester for women at continuing risk of *C. trachomatis*.
- All pregnant women should be retested after treatment.

The 2001 United States Preventive Services Task Force (USPSTF) recommendations have been recently updated, as follows (USPSTF, 2007):

- Screening for chlamydial infection in all sexually active, non-pregnant young women age 24 years or younger, and for older, non-pregnant women who are at increased risk. (A)
- Screen for chlamydial infection in all pregnant women age 24 years or younger and in older pregnant women who are at increased risk. (B)
- Do not routinely screen for chlamydial infection in women age 25 years or older, regardless of whether they are pregnant, if they are not at increased risk.
- Current evidence is insufficient to assess the balance of benefits and harms of screening for chlamydial infection in men.

Expedited partner therapy (EPT) is the practice of treating the sex partners of persons with sexually transmitted infections without an intervening medical evaluation or professional prevention counselling. The usual implementation of EPT is through patient-delivered partner therapy (PDPT). Both clinical and behavioural outcomes of the available studies indicate that EPT is a useful option to facilitate partner management among heterosexual men and women with chlamydial infection or gonorrhoea, based on 4 RCTs (CDC, 2006). Furthermore, including partners lowers screening costs (Postma et al., 2001).

#### 4.2.5 Interventions to Increase Screening

If screening is to be implemented, strategies will be needed to increase uptake. One project evaluated a broad-based approach to uptake including leadership engagement, identification of the gap between best practice and current practice, creation of a team to champion the project, identification of barriers and monthly meetings. Progress was monitored with site-specific screening. At baseline, the proportion screened was 0.05 (95% CI 0.00–0.17) in the intervention and 0.14 (95% CI 0.01–0.26) in the control clinics. By months 16 to 18, screening rates were 0.65 (95% CI 0.53–0.77) in the intervention and 0.21 (95% CI 0.09–0.33) in the control clinics. The average infection rate for the experimental clinics was 5.8 per cent versus 7.6 per cent in controls (Brunham, Pourbohloul, Mak, White, & Rekart, 2005).

#### 4.2.6 Comprehensive Chlamydia Prevention Programs

The United States Centers for Disease Control and Prevention is funding a multi-state chlamydia prevention program including online tutorials for health professionals that includes continuing medical education credits. The modules cover standards for laboratory testing, patient education, counselling and standards on reporting (New Mexico Department of Health Family Planning Program, n.d.). Chlamydia rates for those regions are still increasing slightly from year to year. No evaluation of the impact of the program on rates of chlamydia has been reported to date.

### **4.3 Gonorrhea and Congenital Syphilis**

#### 4.3.1 Incidence and Outcomes

Between 1994 and 2003, 77 per cent of mothers had prenatal syphilis tests. A diagnosis of syphilis was made in 183 mothers, resulting in 5 cases of congenital syphilis. Four of these were in infants whose mothers did not undergo prenatal syphilis testing. A review of historical studies indicates that untreated maternal syphilis results in congenital syphilis in 67 per cent of those pregnancies, whereas with treatment, congenital syphilis occurs in only 1.8 per cent (Alexander, 1999, as cited in PHAC, 2005).

#### 4.3.2 Interventions That Work

In Rotterdam in January 1997, prophylactic treatment for syphilis was given to most street prostitutes in a cruising zone during a screening program for STIs. Follow-up STI checkups were performed regularly through the following year. The prevalence of early syphilis in the cruising zone dropped to 1.3 per cent in 1998. The total number of reported cases of syphilis in Rotterdam also decreased sharply in 1998 (Bosman et al., 1999).

A program using street nurses in British Columbia resulted in a significant increase in the number of cases of STIs identified ( $p = 0.01$ ), and an increase in the percentage of cases linked to a previous case ( $p = 0.03$ ). This preliminary study confirms that street nurses can increase the case finding in an epidemic of a sexually transmitted infection in a vulnerable, hard-to-reach population (Ogilvie et al., 2005).

### **4.4 HIV/AIDS**

The rate of transmission of HIV to newborns has declined since 1997, due to the declining rate of HIV, screening, anti-retroviral therapy, elective caesarean section and formula feeding for babies of infected women. Yet new infant infections continue to occur, primarily among women who do not obtain prenatal care or who were not offered HIV testing during pregnancy. The rate of HIV prevalence in pregnant women in BC is estimated to be 9.0/10,000 pregnant women in BC in 2003. About 56 per cent of HIV+ women were from an HIV-endemic country. Although the number of infants exposed to HIV in utero has increased from about 100 year in 1997 to about 170 in 2005, the number of infants with documented HIV+ status decreased from about 20 per year to about 5 per year in Canada. During 2003–2004, about 83 per cent of pregnant women in BC who had prenatal blood work had an HIV test (PHAC, 2006b). Thus, the greater impact of screening programs will be on detecting HIV+ women and admitting them to treatment.

#### 4.4.1 Screening During Pregnancy

Screening pregnant women for HIV infection clearly represents an important opportunity to prevent the transmission of the virus to infants. Even in populations with a low prevalence of HIV-infected pregnant women, screening is cost-effective (Postma et al., 1999; Postma et al., 2000; Samson & King, 1998). Testing should be done as early in pregnancy as possible to allow for timely decisions regarding the pregnancy. Uninfected women and their partners who continue high-risk behaviour during pregnancy should be encouraged to be retested later in the pregnancy. Targeted testing of only pregnant women considered at high-risk of HIV infection is no longer recommended, because it fails to identify a substantial proportion of HIV-positive pregnant women (Samson & King, 1998).

#### 4.4.2 Opt-in Versus Opt-out Screening

(Walmsley, 2003)

Voluntary testing strategies are of two types: opt-in and opt-out. Under the opt-in approach, HIV testing can be done only once the physician has formally obtained informed consent. Under the opt-out approach, prenatal HIV testing is part of routine screening for infections, including hepatitis B, syphilis and rubella. The physician is required to inform the woman that this testing is considered routine, but there is no requirement for formalized counselling or written informed consent. The woman, however, can opt-out of testing. The proportion of pregnant women undergoing testing under an opt-out approach has increased from a range of 33 per cent–74 per cent untested to 81 per cent–88 per cent tested in several jurisdictions (Simpson et al., 1999; Stringer et al., 2001a; Stringer et al., 2001b). Rates of testing in Canada are higher in the provinces and territories that have adopted the opt-out approach (Health Canada, 2002). After Alberta implemented an opt-out policy, only 4.7 per cent of eligible pregnant women declined testing in 1998, 3.3 per cent in 1999 and 1.7 per cent in 2000 (Jayaraman, Preiksaitis & Larke, 2003). The United States Institute of Medicine has recommended a national policy of universal HIV testing using opt-out testing (Institute of Medicine, 1999), and these guidelines are supported by the American College of Obstetricians and Gynecologists, the American Academy of Pediatrics and the United States Centers for Disease Control and Prevention (Branson et al., 2006; American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 1999).

Should fathers also be tested? In two recent cases of mother-to-child transmission of HIV in Ontario, the women had been screened in pregnancy and had a negative test result. Throughout the pregnancy, they continued to have unprotected intercourse with their partners and seroconverted unknowingly during the pregnancy from their HIV-positive partners (Walmsley, 2003). In light of this observation, consideration must also be given to counselling and testing of the paternal partners, with or without repeat testing during pregnancy. In conclusion, rates of testing for HIV infection appear to be markedly increased in jurisdictions that have adopted an opt-out strategy.

4.4.3 Society of Obstetricians and Gynaecologists of Canada Recommendations Regarding HIV Screening

(Keenan-Lindsay & Yudin, 2006)

- Women should be offered HIV screening at their first prenatal visit. (A)
- All pregnant women should be offered HIV screening with appropriate counselling. This testing must be voluntary. Screening should be considered a standard of care, although women must be informed of the policy, its risks and benefits, and the right of refusal. Women must not be tested without their knowledge. (B)
- Women who test negative for HIV and continue to engage in high-risk behaviour should be retested in each trimester. (B)
- Pre-test counselling and the patient’s decision about testing should be documented in the patient’s chart.
- Women with no prenatal care and unknown HIV status should be offered testing when admitted to hospital for labour and delivery. Women at high risk for HIV and with unknown status should be offered HIV prophylaxis in labour, and HIV prophylaxis should be given to the infant postpartum.

4.4.4 Examples of Interventions to Modify Sexual Behaviour

A meta-analysis of behavioural and social interventions on sexual risk of HIV among sexually experienced adolescents in the United States showed a significant protective effect on sexually experienced adolescents (k, 16; OR 0.65; CI 0.50–0.85), although there was a suggestion of publication bias (Mullen et al., 2002 A).

## 4.5 Summary Table of Screening for Infections

Table 6 summarizes guidelines for infectious disease screening as graded by National Institute for Health and Clinical Excellence (NICE) (2003, updated in 2008).

**Table 6: Summary Table – Screening for Infections**

Infection	Grade	Reference
<b>Hepatitis B virus</b> Serological screening for hepatitis B virus should be offered to pregnant women so that effective postnatal intervention can be offered to infected women to decrease the risk of mother-to-child-transmission. <sup>3</sup>	A	Bhakoo, & Ganguly, 1992 Nair et al., 1984 Sehgal, Sehgal, Gupta, Wong et al., 1984 Xu et al., 1985
<b>HIV</b> Pregnant women should be offered screening for HIV infection early in antenatal care because appropriate antenatal interventions can reduce mother-to-child-transmission of HIV infection.	A	Brocklehurst, 2006 European Mode of Delivery Collaboration, 1999 Kind et al., 1998 Mandelbrot et al., 1998

<sup>3</sup> Hepatitis B immunization in Grade 6 began in BC in 1992.

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<b>Infection</b>	<b>Grade</b>	<b>Reference</b>
<p><b>Rubella</b>  Rubella-susceptibility screening should be offered early in antenatal care to identify women at risk of contracting rubella infection and to enable vaccination in the postnatal period for the protection of future pregnancies. (Rubella immunization is routinely offered to children in BC, so few women who attended school in Canada should need immunization).</p>	B	Miller, Cradock-Watson, & Pollock, 1982
<p><b>Syphilis</b>  Screening for syphilis should be offered to all pregnant women at an early stage in antenatal care because treatment of syphilis is beneficial to the mother and fetus.</p>	B	Alexander, Sheffield, Sanchez, Mayfield, & Walker, 2001 Wendel, 1999
<p><b>Asymptomatic bacteriuria</b>  Pregnant women should be offered routine screening for asymptomatic bacteriuria by midstream urine culture early in pregnancy. Identification and treatment of asymptomatic bacteriuria reduces the risk of preterm birth.</p>	A	CDC 2002 Gulmezoglu, 2001 Smaill, 2002 A USPSTF, 1990 Villar, Lydon-Rochelle, &
<p><b>Herpes</b> (not included in NICE Antenatal Guidelines)  All patients and their partners should be asked about a history of genital and orolabial herpes simplex virus (HSV) infection. Those with an HSV-positive partner should consider abstinence, condom use, antiviral therapy in the HSV-positive partner, and avoidance of oral-genital contact if the partner has orolabial HSV infection. Women with recurrent HSV infection should be counselled about the use of acyclovir (Zovirax) at term to decrease the risk of caesarean delivery, the role of caesarean delivery in decreasing vertical transmission, and avoiding postpartum transmission to the infant through direct contact.</p>		RCOG, 2005 Sheffield, Hollier, Hill, Stuart, & Wendel, 2003 A
<p><b>Varicella Zoster Chickenpox</b> (not included in NICE Antenatal Guidelines)  <u>Screening:</u> All women of childbearing age should be asked about their history of chickenpox. Women with no history of exposure can have serologic testing for varicella zoster IgG to determine immunity (80 to 90 per cent of these women are found to be immune). If testing is done in the preconception period, women can be offered two doses of varicella vaccine at least one month apart. Pregnancy should be delayed one month after vaccination. Varicella vaccine is contraindicated in pregnant women.  <u>Immunization:</u> Women found to be non-immune during pregnancy should be counselled to avoid exposure to chickenpox and to report exposure immediately. Susceptible pregnant women who are exposed are candidates for varicella zoster immune globulin. Non-immune women should be offered postpartum varicella vaccination. The vaccine is considered safe in breastfeeding women. Immunization should be delayed for three months in women who have received RhoD immune globulin (Rhogam).</p>		Canadian Task Force on Preventive Health Care, 2005 CDC, 1999 National Advisory Committee on Immunization, 2004
<p><b>Hepatitis C High-Risk Screening</b>  Hepatitis C antibody screening should be offered to women with risk factors (e.g., prison inmates, injection drug users, women exposed to blood or blood products, HIV-positive women, women with elevated aspartate transaminase levels, multiple sexual partners, or tattoos). Vertical transmission of hepatitis C is estimated to be 8 per cent. Aside from vertical transmission, there does not appear to be an increased risk of adverse pregnancy outcomes in women infected with hepatitis.</p>	B	Boucher & Gruslin, 2000 CDC, 2002
<p><b>Recommendations Against Universal Screening</b></p>		
<p><b>Hepatitis C virus</b>  Pregnant women should not be offered routine screening for hepatitis C virus because there is insufficient evidence on its effectiveness and cost-effectiveness.</p>	C	Ketzinel-Gilad et al., 2000 Okamoto et al., 2000 Tajiri et al., 2001 Whittle, 2002



<b>Infection</b>	<b>Grade</b>	<b>Reference</b>
<p><b>Asymptomatic bacterial vaginosis</b>  Pregnant women should not be offered routine screening for bacterial vaginosis because the evidence suggests that the identification and treatment of asymptomatic bacterial vaginosis does not lower the risk for preterm birth and other adverse reproductive outcomes.</p>	C	<p>Brocklehurst &amp; Rooney, 2000  Flynn, Helwig, &amp; Meurer, 1999  Gratacos et al., 1998  McDonald, Brocklehurst, Parsons, &amp; Vigneswaran, 2003</p>
<p><b><i>Chlamydia trachomatis</i></b>  Pregnant women should not be offered routine screening for asymptomatic chlamydia because there is insufficient evidence on its effectiveness and cost-effectiveness. However, this policy is likely to change in the United Kingdom with the implementation of the national opportunistic chlamydia screening program.</p>	A	<p>Brocklehurst &amp; Rooney, 2002  Johns Hopkins Study of Cervicitis and Adverse Pregnancy Outcome, 1989  Ketzinel-Gilad et al., 2000  Preece, Ades, Thompson, &amp; Brooks, 1989  Preece, Anderson, &amp; Thompson, 1989</p>

#### 4.6 Group B Streptococcal Infections

The presence of heavy colonization with group B streptococcus (GBS) has been associated with preterm labour and preterm premature rupture of membranes (Feikin et al., 2001; Regan et al., 1996). Group B streptococcal bacteriuria occurs in 2–4 per cent of pregnancies, and is associated with maternal urinary tract disease and an increased risk of neonatal morbidity (Wood & Dillon, 1981). Table 7 summarizes screening recommendations for Group B streptococcal infections.

**Table 7: Summary Table – Screening for Group B Streptococcal Infections**

<b>Recommendations</b>	<b>Reference</b>
<p>Recommendations on screening for GBS vary among organizations. The Centers for Disease Control and Prevention, the American College of Obstetricians and Gynecologists, the Society of Obstetricians and Gynaecologists of Canada, the Canadian Task Force on Preventive Health Care and the BC Reproductive Care Program recommend that all women be offered GBS screening at 35 to 37 weeks' gestation and that colonized women be treated with intravenous antibiotics at the time of labour or rupture of membranes.</p>	<p>Money &amp; Dobson, 2004  Smail, 1999 <b>A</b>  Schrag, Gorwitz, Fultz-Butter, &amp; Schuchat, 2002 <b>D</b>  Canadian Task Force on Preventive Health Care, 2002</p>
<p>The United Kingdom guidelines recommend against routine prenatal screening for GBS because evidence of its clinical effectiveness and cost-effectiveness remains uncertain.</p>	NICE, 2003 <b>A</b>
<p>The <i>Canadian Guidelines on Sexually Transmitted Infections</i> recommends screening and treatment at 12–16 weeks in high-risk pregnancies (i.e., previous preterm labour/delivery or premature rupture of the membranes).</p>	PHAC, 2006a

#### 4.7 Summary

This section has provided an overview of the evidence regarding prevention of infections of significance to reproductive health. Topics of relevance include screening for sexually transmitted infections (STIs) and interventions to modify sexual behaviour.

For all pregnant women evidence supports:

- Routine serological screening at the first prenatal visit for hepatitis B and HIV.
- Opt-out screening for HIV.
- History taken on risk status of rubella, herpes and chickenpox .
- Urine screening for asymptomatic bacteriuria.

For high-risk women

- Screening for hepatitis C
- While the research on screening for chlamydia is extensive, costs and benefits depend on the underlying prevalence. Rates of chlamydia are increasing, so guidelines are important to validate. The evidence leans toward routine screening for chlamydia in sexually active women under 25 and partner screening and treatment.
- Outreach to high-risk populations can control the spread of syphilis.

Further details on prevention of STIs, including human papillomavirus (HPV), are included the evidence review on communicable disease.

## **5.0 TEEN PREGNANCY**

### **5.1 Trends, Outcomes and Risk Factors of Teen Pregnancy**

Teen pregnancy and birth rates have been declining over the past decades. There has been a steady decline in the age-specific teen (age 15–19) pregnancy and birth rates in BC. The teen pregnancy rate has decreased from approximately 44/1,000 in 1997 to 24/1,000 in 2006.<sup>4</sup> The teen birth rate has decreased from approximately 17/1,000 in 1997 to 10/1,000 in 2006;<sup>5</sup> this decline has been seen in other western countries as well (BC Stats, 2008). BC has one of the lowest teen pregnancy rates in western countries, but the rates are even lower in the Netherlands (Advocates for Youth, 2001). The greatest potential for improvement in BC is in the rural and northern areas, where current rates exceed 30/1,000. In BC, the ratio of abortions per 1,000 live births in women age 15–17 increased from 105 in 1994 to 178 in 2003 (Statistics Canada, 2003c). The impact of increased access to higher education of women has not been factored into the analysis of trends in teen pregnancies and births.

Traditionally, birth outcomes of teen pregnancies have been poorer than outcomes for older women. However, in Finland, no evidence was found for increased risk of preterm delivery, fetal growth restriction, low birth weight, or fetal or perinatal death in teenage mothers (Raatikainen, Heiskanen, Verkasalo, & Heinonen, 2006). The authors concluded that high quality prenatal care overcomes pre-existing risk factors. In Missouri, after adjusting for race, marital status, education, parity, smoking, prenatal care and poverty, the risk of post-neonatal mortality remained significantly higher for young adolescent mothers (Markovitz, Cook, Flick, & Leet, 2005 **B**). A similar finding was observed in the United States as a whole (Phipps, Blume, & DeMonner, 2002). The increased risk of post-neonatal mortality speaks to the need to examine postnatal screening, assessment and home-visiting programs and monitor post-neonatal mortality as an outcome.

In a United Kingdom study of children born to teen mothers, children at age 5 scored significantly lower on a standardized vocabulary test, scored higher on the Rutter Child Scale and were shorter in height. At age 10, children were more likely not to have a father figure in the home, and to have higher residential mobility and poorer quality housing. The children were more likely to have been in care and were significantly shorter in height. Also at age 10, the children's teachers were more likely to rate them as below average on general knowledge, less popular with their peers, less co-operative and less able to concentrate. In adulthood, both men and women born to younger mothers were more likely to have had a child themselves before the age of 20 and were less likely to achieve high school graduation or equivalent (Pevalin, 2003).

In addition to the negative impact of teen pregnancy on birth outcomes and child growth and development, maternal outcomes may not be optimal. Statistics Canada (Dryburgh, 2007) reported that pregnant teens were at greater risk for health problems including anemia,

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<sup>4</sup> Teen Pregnancy Rate (2006): Live births and stillbirths: From British Columbia Vital Statistics Agency; Abortive outcomes: From Information Systems Inpatient Programs, BC Ministry of Health; Population Data: PEOPLE 31. From BC STATS Ministry of Labour and Citizens' Services.

<sup>5</sup> Teen Live Birth Rate (2006): Live births : From British Columbia Vital Statistics Agency; Population Data: PEOPLE 31. From BC STATS Ministry of Labour and Citizens' Services.

hypertension, eclampsia, renal disease and depressive disorders. The risk of sexually transmitted infection is increased, due to a tendency for teens to engage in unprotected sex. Economic consequences of teen pregnancy due to reduced education and employment prospects can have long-term negative effects on the social determinants of health for the parent and offspring. Young teenage mothers are often single, especially at ages 15–17, and will lack a partner to contribute to the family income (Dryburgh, 2007).

## **5.2 System-wide Interventions**

Trends in several countries show declines in teen pregnancy, and there are a variety of explanations for this. However, all countries attribute a large share of the decline to the increased use of contraception.

### **5.2.1 Policy and Contraceptive Use in the United States**

In the United States, the overall teen pregnancy risk index declined 38 per cent, with 86 per cent of the decline attributable to improved contraceptive use (Santelli, Lindberg, Finer, & Singh, 2007). Fifty-three per cent of the decline in teen pregnancy rates has been attributed to decreased sexual experience (95% CI 26%–79%) and 47 per cent to improved contraceptive use (95% CI 21%–74%) (Brindis, 2006). Over the past decade, the United States has put policies in place regarding comprehensive family life education, access to contraceptive care and youth development, which have resulted in delays in sexual debut, improved contraceptive use, and a reduction in teen pregnancies, abortions and births (Brindis, 2006).

### ***Decline in Abortion in the Netherlands***

In the Netherlands, Ketting and Visser (1994) reviewed the main factors related to the low abortion rate in that country. Social change has been a contributing factor to the increased uptake of family planning. The strong acceptance of family planning was influenced by changing values regarding sexuality and the family, the transition from an agricultural to a modern industrial society, rapid economic growth, a declining influence of the church, introduction of mass media and increased education. The introduction of modern contraceptives (mainly the pill and contraceptive sterilization) was stimulated by a strong voluntary family planning movement, fear of overpopulation, a positive role of general practitioners and the public health insurance system. A reduction of unwanted pregnancies has been accomplished in the Netherlands through sex education, open discussions on sexuality in the mass media, educational campaigns, low barrier services and wide acceptance of sterilization. The Dutch experience reflects an intention to reduce reliance on abortion by providing sexual and contraceptive education programs and low barrier family planning services (Ketting & Visser, 1994).

### ***Sex Education in the United Kingdom***

In 1999, the United Kingdom implemented country-wide strategies to reduce teen pregnancy. The first strategy was a national media awareness campaign including youth magazines and radio, and the availability of confidential advice on sexual relationships and contraception. The second strategy was coordination across relevant statutory and voluntary agencies. The third component was improvements in education on sex and relationships and access to sexual health services. The last strategy was support for teenage parents to return to education, training or employment. The campaign is backed by a dedicated telephone helpline to provide information,

including details of local services, and a supporting website. The number of teenage conceptions peaked in 1998, and then declined after the implementation of the teenage pregnancy strategy in 1999 (Wilkinson et al., 2006).

### **5.3 Interventions That are Not Effective**

In a meta-analysis of primary prevention strategies, no impact was observed on initiation of sexual intercourse, use of birth control or number of pregnancies. Four abstinence programs and one school-based sex education program resulted in an increase in pregnancies. One study showed significantly fewer pregnancies in young women who received a multifaceted program, but the baseline differences in the program participants favoured the intervention (DiCenso, Guyatt, Willan, & Griffith, 2002 A). Other reviews of prevention of teen pregnancy through primary prevention (mainly education) arrived at similar conclusions (Bennett & Assefi, 2005 A; Kirby, 2002; Thomas, Micucci, Ciliska, & Mirza, 2005 A).

#### **5.3.1 Limitations**

As a result of differences in economic and social status, access to services, attitudes, values and different health care systems, evidence from American and United Kingdom studies may not be generalizable to Canada. There is a risk of bias in the publication of studies around teen pregnancy and many methodological limitations. Furthermore, just because a program is mounted nationwide does not mean the program was successful, evidence-based or replicated according to the original plan (Ormerod, 2005). Also, randomized controlled trials may not adequately report the outcomes of complex interventions (Oakley et al., 2006 A).

### **5.4 Summary**

Reductions in teen pregnancy and births in the past decades have been attributed to increased use of contraceptives, increased access to abortion and possibly changes in sexual behaviour. Large, comprehensive, system-wide programs may have been effective in changing sexual behaviour and increasing access to contraceptives and abortion. In spite of the large number of studies, programs targeting sexual behaviour seem to have mixed results. Increased tracking of policy interventions and outcomes is needed to evaluate outcomes.

Chapter 6 discusses school- and family-based programs to modify tobacco, drug and alcohol behaviour. It also outlines data regarding adolescent sexual health behaviour from the McCreary Centre Society *Adolescent Health Surveys* (1992–2003), and implications for population health interventions.

## **6.0 HEALTHY LIFESTYLE**

### **6.1 Tobacco Use**

#### **6.1.1 Prevalence, Risk Factors and Outcomes of Tobacco Use in Pregnancy**

Canada is one of the few countries that has shown a decline in adolescent smoking (Hublet et al., 2006). The decline has been attributed to taxes, prices, restricting advertising, media campaigns and access to cessation treatment (Joosens, 2004).

Smoking during pregnancy also appears to be on the decline. Data for BC show that the prevalence of women reporting smoking during pregnancy (for singleton pregnancies) decreased from 13.2 per cent in 2000/2001 to 10.9 per cent in 2003/2004 (BCRCP, 2005). In the United States, smoking during pregnancy has declined from 18.4 per cent to 11.4 per cent, a decrease of 38 per cent from 1990 (Martin et al., 2003).

Smoking during pregnancy is more than twice as high in the Interior and Northern Health Authorities (>20 per cent) as in Vancouver Coastal Health Authority (6 per cent) (BCRCP, 2005).

Maternal and paternal smoking are risk factors for spontaneous abortion, intrauterine growth restriction, low birth weight infant, preterm birth and sudden infant death syndrome (SIDS) (United States Department of Health and Human Services [USDHHS], 2001).

#### **6.1.2 Smoking Cessation During Pregnancy**

Smoking cessation programs during pregnancy have been shown to reduce the number of women who smoke during pregnancy. Fifty-one randomized controlled trials and six cluster-randomized trials provide results of smoking cessation interventions and in some cases perinatal outcomes. These studies showed a significant reduction in smoking in the intervention groups (RR 0.94, 95% CI 0.93–0.95), an absolute difference of 6 in 100 women continuing to smoke. The 36 trials with smoking cessation outcomes had a similar reduction (RR 0.94, 95% CI 0.92–0.95). Groups that underwent smoking cessation interventions showed reported fewer low birth weight infants (RR 0.81, 95% CI 0.70–0.94), fewer preterm births (RR 0.84, 95% CI 0.72–0.98) and a 33 g (95% CI 11 g–55 g) increase in mean birth weight. One intervention strategy—rewards plus social support (two trials)—resulted in a significantly greater smoking reduction than other strategies (RR 0.77, 95% CI 0.72–0.82). Five trials of smoking relapse prevention (over 800 women) showed no statistically significant reduction in relapse (Lumley, Oliver, Chamberlain, & Oakley, 2006 A).

#### **6.1.3 Quitlines for Pregnant Smokers**

A meta-analysis of quitlines conducted for the United States Public Health Service guidelines found that:

- Proactive telephone counselling (defined as the process wherein once a smoker makes an initial call to a quitline, all subsequent calls are made on a proactive, outbound basis) increases the odds of quitting by 20 per cent (USDHHS, 2000)

- Proactive telephone counselling has an estimated abstinence rate (defined as abstinence at least 5 months after designated quit day) of 13.1 per cent.

There have been three published studies that have looked at smoking cessation rates among pregnant women who have used a quitline. In the first study, the abstinence rate was 18.2 per cent, which is consistent with outcomes observed in other smoking cessation trials with pregnant women (Solomon, Secker-Walker, Flynn, Skelly, & Capeless, 2000). The second study conducted included pregnant smokers attending the Women, Infants, and Children (WIC) program (Solomon & Flynn, 2005). Of the 948 pregnant smokers who were referred for telephone peer support, 25 per cent reported they were abstinent at their last telephone contact (defined as had not smoked in the past 24 hours). Of the smokers who attended their postpartum WIC visit (n = 625), 20 per cent reported not smoking in the last 3 months of their pregnancy and 14.6 per cent reported they were currently abstinent (defined as smoking zero cigarettes per day). The third trial was of pregnant callers (n = 1,195) to the California Smokers' Helpline, a statewide quitline. Results showed that at the third trimester, 21 per cent of the counselling group had not smoked for 30 days, compared to 13.5 per cent of the self-help group (p = 0.002). Although there was no significant difference in the quit attempt rate (56.8 per cent and 52.1 per cent for counselling and self-help, respectively), counselling subjects were more successful than self-help subjects in avoiding relapse (Zhu, Cummins, Anderson, & Tedeschi, 2003).

#### 6.1.4 Smoking Cessation Relapse Prevention

A systematic review of relapse prevention after pregnancy did not find any evidence of effective programs (Fang et al., 2004).

## **6.2 Alcohol and/or Drug Use**

Excess alcohol consumption during pregnancy is common in Canada. The Canadian Community Health Survey in 2000/2001 reported that 16.1 per cent of women age 15–44, and 26 per cent age 20–24 reported binge drinking 12 or more times in the previous year (Statistics Canada, 2003d). The use of alcohol and illicit drugs is associated with risky sexual behaviour, including poor and inconsistent condom use, sex with multiple partners, early sexual debut, trading sex, buying sex, sex with known injection drug users, elevated hepatitis C, and STI transmission (including herpes simplex virus type 2, hepatitis B, syphilis, HIV, chlamydia and gonorrhoea) (Bachmann et al., 2000; Baseman, Ross, & Williams, 1999; Hwang et al., 2000).

The United States Preventive Services Task Force (USPSTF) has published recommendations on screening and behavioural counselling interventions to reduce alcohol misuse (Whitlock et al., 2004). The USPSTF found good evidence that screening in primary care settings can accurately identify patients whose levels or patterns of alcohol consumption do not meet criteria for alcohol dependence, but place them at risk for increased morbidity and mortality. They also found good evidence that brief behavioural counselling interventions with follow-up produce small to moderate reductions in alcohol consumption that are sustained over 6–12 months or longer. They found that the evidence of counselling to reduce alcohol consumption during pregnancy is

limited; however, studies in the general adult population show that behavioural counselling interventions are effective among women of childbearing age (Colonge, 2004).<sup>6</sup>

The United States Substance Abuse and Mental Health Services Administration (SAMHSA) maintains an extensive website with links to programs that have been evaluated and graded. Many of these programs are targeted at school-age populations and families.<sup>7</sup> The SAMHSA site includes materials for implementing screening and brief intervention programs. The BC Reproductive Care Program has published clinical practice guidelines for health professionals including guidelines for screening.<sup>8</sup>

### 6.2.1 Alcohol Consumption During Pregnancy

A review has recently been published of the available evidence on studies in humans on the effects on pregnancy outcome of low-moderate levels of prenatal alcohol consumption (up to 10.4 UK units or 83 g alcohol/week; < 7 half pints of beer or 7 small glasses of wine) compared with consumption of no alcohol. Outcomes considered were miscarriage, stillbirth, intrauterine growth restriction, prematurity, birth weight, small for gestational age at birth, and birth defects (including fetal alcohol syndrome). The search resulted in 3,630 titles and abstracts, which were narrowed down to 46 relevant articles. At low-moderate levels of consumption, there were no consistently significant effects of alcohol on any of the outcomes considered. Many of the reported studies had methodological weaknesses. This systematic review found no convincing evidence of adverse effects of prenatal alcohol exposure at low-moderate levels of exposure. However, weaknesses in the evidence preclude the conclusion that drinking at these levels during pregnancy is safe (Henderson, Gray, & Brocklehurst, 2007 A).

## 6.3 **Interventions Shown to be Ineffective in Improving Reproductive Health**

### 6.3.1 Screening and Brief Interventions to Reduce Alcohol Consumption

For screening for problem alcohol use, the USPSTF recommends the following screening tools: AUDIT and CAGE for screening for the general public in primary care and the TWEAK and T-ACE for screening pregnant women (USDHHS, 2005).<sup>9</sup>

A recent review of brief interventions for alcohol use included 19 trials and 5,639 individuals. Seventeen trials reported a measure of alcohol consumption, of which eight reported a significant effect of intervention. The adjusted intention-to-treat analysis showed a mean pooled difference of -38 g of ethanol (approximately 4 drinks) per week (95% CI -51 to -24g/wk) in favour of the brief alcohol intervention group. Focusing on patients in primary care, this systematic review and

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<sup>6</sup> The complete review of the alcohol prevention guidelines by the USPSTF is available online at <http://www.ahrq.gov/clinic/3rduspstf/alcohol/alcomissum.pdf> (Whitlock et al., 2004).

<sup>7</sup> The Substance Abuse and Mental Health Services Administration website can be found at <http://www.samhsa.gov/index.aspx>.

<sup>8</sup> The BC Reproductive Health Program's clinical practice guidelines can be found at <http://www.rcp.gov.bc.ca/guidelines.htm>.

<sup>9</sup> The screening tools are available online at <http://www.niaaa.nih.gov>.



meta-analysis indicated that brief alcohol intervention is effective in reducing alcohol consumption at 6 and 12 months (Bertholet, Daepfen, Wietlisbach, Fleming, & Burnand, 2005 A).

### 6.3.2 Preconception

A randomized controlled trial has recently been published of a brief motivational intervention to reduce the risk of an alcohol-exposed pregnancy (AEP) in preconceptional women by focusing on both risk drinking and ineffective contraception use. Participants were randomized to receive information plus a brief motivational intervention (n = 416) or to receive information only (n = 414). The brief motivational intervention consisted of four counselling sessions and one contraception consultation and services visit. Women consuming more than five drinks on any day or more than eight drinks per week on average, were considered risk drinkers; women who had intercourse without effective contraception were considered at risk of pregnancy. Reversing either or both risk conditions resulted in reduced risk of an AEP. Across the follow-up period, the odds ratios (OR) of being at reduced risk for AEP were twofold greater in the intervention group: 3 months, 2.31 (95% CI 1.69–3.20); 6 months, 2.15 (CI 1.52–3.06); 9 months, 2.11 (CI 1.47–3.03). Between-groups differences by time phase were 18.0 per cent, 17.0 per cent, and 14.8 per cent, respectively (Floyd et al., 2007 A).

### 6.3.3 Interventions During Pregnancy

Screening and brief interventions for alcohol use can be delivered effectively within a routine prenatal care visit. One study of a primary care office screening intervention resulted in 95 per cent of pregnant women being screened for alcohol use; 77 per cent of those who screened positive received a brief intervention (Kennedy, Finkelstein, Hutchins, & Mahoney, 2004). Another study of brief interventions in pregnancy included subjects who were participants in the United States Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Brief intervention consisted of 10–15 minute sessions of counselling by a nutritionist, who used a scripted manual to guide the intervention. Newborn outcomes of gestation, birth weight, birth length and viability were assessed. Women in the brief intervention condition were 5 times more likely to report abstinence after intervention compared with women in the assessment-only condition. Newborns whose mothers received brief intervention had higher birth weights and birth lengths, and fetal mortality rates were 3 times lower (0.9 per cent) compared with newborns in the assessment-only condition (2.9 per cent). The success of brief intervention conducted in a community setting by non-medical professionals has significant implications for national public health policies (O'Connor & Whaley, 2007 A).

A randomized trial of a brief intervention to target alcohol consumption of pregnant women found lower subsequent alcohol consumption for women with the highest consumption initially (regression coefficient,  $b = -0.163$ , standard error (b) = 0.063,  $P < .01$ ). The effects of the brief intervention were significantly enhanced when a partner participated ( $b = -0.932$ , standard error (b) = 0.468,  $P < .05$ ) (Chang et al., 2005 A).

### 6.3.4 School Programs

A recent systematic review of long-term outcomes of school-based alcohol prevention programs was done by Foxcroft et al. (2003 A). Of the 56 studies reviewed, 20 showed no evidence of effectiveness. No firm conclusions about the effectiveness of prevention interventions in the

short- and medium-term were possible. Over the longer-term, the Strengthening Families Program (SFP) showed promise as an effective prevention intervention. The Number Needed to Treat (NNT) for the SFP over four years for three alcohol initiation behaviours (alcohol use, alcohol use without permission and first drunkenness) was nine (for all three behaviours). One study also highlighted the potential value of culturally focused skills training over the longer-term (NNT=17 over 3.5 years for 4+ drinks in the last week). The authors' conclusions were:

- Research into important outcome variables needs to be undertaken.
- Methodology of evaluations needs to be improved.
- The Strengthening Families Program needs to be evaluated on a larger scale and in different settings need to be improved.
- Culturally-focused interventions require further development and rigorous evaluation.
- An international register of alcohol and drug misuse prevention interventions should be established and criteria agreed upon for rating prevention intervention in terms of safety, efficacy and effectiveness.

Other studies that have reviewed school-based programs (Cuijpers, 2002 A; Gottfredson & Wilson, 2003 A; McBride, 2003 A; Thomas, 2002 A) conclude that school-based programs are more effective when they meet high-quality standards for education programs such as:

- The inclusion of community-based intervention.
- The inclusion of interactive programs that target tobacco or alcohol specifically rather than general substance abuse.
- Good design with clear objectives.
- The inclusion of school-wide/community-based intervention.
- Include use of the social influence model as a framework.
- Focus on norms, commitment not to use and intention not to use.
- Are peer-led programs rather than adult-led programs.
- Are delivered immediately prior to initial experimentation/initial use. This means programs should focus on students in Grades 6 to 8.
- Focus on behaviour change and not on knowledge improvement or attitude change.
- Focus on social influences, knowledge, drug refusal skills and generic competency skills that use participatory or interactive teaching strategies, rather than knowledge, attitudes and didactic instruction.
- Teach evidence-based programs.
- Teachers have current training in substance use prevention and are comfortable using interactive teaching methods.

Ennett (2003 A) suggest the transfer of best practices to school-based substance use prevention programming has been limited.

The USDHHS maintains an online database of substance abuse prevention and treatment programs that are graded for effectiveness. SAMHSA-rated programs are well-implemented, well-evaluated programs that produce a consistent positive pattern of results across domains and/or replications. These programs described were graded based on the National Registry of Evidence-based Programs and Practices (NREPP) review.<sup>10</sup> Intervention results have been published in a peer-reviewed publication or documented in a comprehensive evaluation report, and documentation of the intervention and its proper implementation (e.g., manuals, process guides, tools and training materials) are available to the public to facilitate dissemination.

### ***Project EX***

Project EX is a school-based, smoking-cessation clinic program for adolescents, which stresses motivation, coping skills and personal commitment.<sup>11</sup> Consisting of 8, 40–45 minute sessions delivered over a 6-week period, the program curriculum includes strategies for coping with stress, dealing with nicotine withdrawal and avoiding relapses. Project EX uses engaging and motivating activities such as games and yoga to reduce or stop smoking among adolescents and teach self-control and anger management.

At follow-up (about 3 months post-intervention), the 30-day abstinence rate for those completing the clinic and measured at follow-up was 30 per cent, compared to 16 per cent for the control group (OR 2.21,  $P < .05$ ). Using a more conservative "intent-to-treat" analysis that includes those who dropped out of the clinic yields similar results (30 per cent and 16 per cent for the clinic and control groups respectively; OR 2.20,  $P < .05$ ). Using the most conservative approach and treating all those not contacted at follow-up as still using tobacco (which controls for differential loss at follow-up) produces a 30-day quit rate of 19 per cent across all clinic participants, compared to the 10 per cent found in the control group.

The results indicate that motivation to quit smoking changed significantly ( $F = 48.11$ ,  $p < .01$ ) as a function of undergoing the treatment, even taking into account the observed differences in motivation at the pre-test. In addition, post-treatment motivation (level of motivation at post-test) significantly predicted non-use of tobacco in the last 30 days ( $F = 7.75$ ,  $p < .05$ )

### ***Project Towards No Drug Abuse***

Project Towards No Drug Abuse (Project TND) is a drug use prevention program for high school youth designed to help students develop self-control and communication skills, acquire resources that help them resist drug use, improve decision-making strategies and develop the motivation to not use drugs.<sup>12</sup> It is packaged in 12, 40-minute interactive sessions to be taught by teachers or health educators. The TND curriculum was developed for high-risk students.

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<sup>10</sup> The National Registry of Evidence-based Programs and Practices can be found at <http://nrepp.samhsa.gov/>.

<sup>11</sup> More information on Project EX can be found at [http://tnd.usc.edu/ex/index.php?sub\\_flag=3](http://tnd.usc.edu/ex/index.php?sub_flag=3).

<sup>12</sup> More information on Project Towards No Drug Abuse can be found at <http://www.colorado.edu/cspv/blueprints/model/programs/TND.html>

At a one-year follow-up across three studies, students in Project TND schools who used alcohol prior to the intervention exhibited a reduction in alcohol use prevalence of between 7 per cent and 12 per cent ( $p < .05$ ) when compared with similar students in control schools. At a one-year follow-up of a study using an expanded 12-session TND curriculum, students in Project TND schools exhibited a reduction in cigarette use of 27 per cent ( $p < .05$ ) when compared with students in control schools. At two-year follow-up, students in Project TND schools were about half as likely to use tobacco (OR 0.50,  $p = 0.016$ ) when compared with students in control schools.

In a one-year follow-up across three studies, students in Project TND curriculum schools exhibited a 25 per cent reduction in hard drug-use prevalence rates on average ( $p < .05$ ) relative to students in control schools. At a one-year follow-up of a study using an expanded 12-session TND curriculum, students in Project TND schools exhibited a reduction in marijuana use of 22 per cent ( $p < .05$ ) relative to students in control schools. At two-year follow-up, students in Project TND schools were about one-fifth as likely to use hard drugs (OR 0.20,  $p = .02$ ) and, among male non-users at pre-test, about one-tenth as likely to use marijuana (OR 0.12,  $p = .03$ ), relative to similar students in control schools.

### ***keepin' it REAL***

Another study examined the effectiveness of a universal youth substance use prevention program called “keepin' it REAL”.<sup>13</sup> Among youth who reported use of alcohol in wave 1 ( $n = 1,028$ ), the rate of reducing use for program participants was 72 per cent higher than the rate for control students. The rate of discontinuing use was 66 per cent higher than the rate for control students. Among youth who reported use of one or more of the three substances in wave 1 ( $n = 1,364$ ), the rate of discontinuing all use was 61 per cent higher for program participants than for control students (Kulis, Nieri, Yabiku, Stromwall, & Marsiglia, 2007).

### **6.3.5 Family-based Programs**

#### ***Family Matters***

Family Matters is a family-directed program to prevent adolescents 12–14 years of age from using tobacco and alcohol.<sup>14</sup> The intervention is designed to influence population-level prevalence and can be implemented with large numbers of geographically dispersed families. The program encourages communication among family members and focuses on general family characteristics (e.g., supervision and communication skills) and substance-specific characteristics.

When looking at adolescents who reported being non-users at baseline, a statistically significant difference in onset between treatment and the non-intervention control groups suggests that the program decreased smoking onset (OR 1.30,  $p = .04$ , lower-bound CI = 1.02). At the 12-month follow-up, 16.4 per cent fewer adolescents had initiated smoking in the intervention group compared to the control group. The program effect was moderated by race/ethnicity, with non-Hispanic White adolescents participating in the program having 25.0 per cent fewer smoking initiators than adolescents of other race/ethnicity participating in the program. These reductions

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<sup>13</sup> More information on keepin' it REAL can be found at <http://keepinitreal.asu.edu/>.

<sup>14</sup> More information on Family Matters can be found at <http://familymatters.sph.unc.edu/index.htm>.

translate into effect sizes of 0.15 (small) for the total sample and 0.25 (medium) for non-Hispanic Whites.

When analyzing smoking prevalence among participants who were users and non-users at baseline, the odds of smoking for the non-intervention control group was 1.36 ( $p = .014$ , lower bound CI = 1.08), relative to the treatment group at follow-up interviews when adjusting for baseline use and demographic variables. The program effect sizes at 3-month and 12-month post-intervention were 0.19 (small) and 0.17 (small), respectively, for smoking.

When analyzing the prevalence of drinking among users and non-users, the odds of drinking for the control group was 1.34 ( $p = .022$ , lower bound CI = 1.06), relative to the treatment group at follow-up interviews when adjusting for baseline use and demographic variables. The program effect sizes at 3-month and 12-month follow-ups were 0.32 (medium) and 0.12 (small), respectively, for alcohol use.

### ***Iowa Strengthening Families Program***

In addition to the programs graded above, the Iowa Strengthening Families Program (ISFP)<sup>15</sup> and Preparing for the Drug Free Years have also been shown to be effective in the long-term at preventing methamphetamine use. In study 1, schools were assigned to the Iowa Strengthening Families Program (ISFP), or a control condition. In study 2, schools were assigned to a revised ISFP plus Life Skills Training (LST), LST alone, or a control condition. Self-reports of lifetime and past-year methamphetamine use were collected at 1/2/6 years past baseline (study 1) and at 1/2/4/5 years past baseline (study 2). In study 1, the ISFP past-year rate was 0.0 per cent compared with 3.2 per cent in the control condition ( $P = .04$ ). In study 2, SFP + LST showed significant effects on lifetime and past-year use at the 4(1/2) year follow-up (e.g., 0.5 per cent lifetime use in the intervention condition versus 5.2 per cent in the control condition,  $P = .006$ ); SFP + LST and LST alone had significant lifetime use effects at the 5(1/2) year follow-up (Spoth, Clair, Shin, & Redmond, 2006 A).

#### **6.3.6 Adolescent Sexual Health Behaviours**

The 2005 McCreary Centre Society report entitled *British Columbia Youth Health Trends: A Retrospective, 1992–2003*, summarizes three large-scale surveys of over 73,000 youth in Grades 7–12 (1992, 1998, and 2003) in BC. The Adolescent Health Surveys provide a consistent data source for policy and planning. The focus is on health behaviours of BC youth, but the report makes general comparisons with youth in other jurisdictions. Summary information of sexual health behaviours includes:

- Evidence of positive trends over the decade: reduced risky sexual behaviour, delayed initiation of sexual activity, and decreased adolescent sexual activity reported overall, since 1992.
- When adolescents felt closely connected to families and schools, rates of high-risk behaviours were lower.

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<sup>15</sup> More information on the Iowa Strengthening Families Program can be found at <http://www.strengtheningfamiliesprogram.org/>.

- Trends for marginalized youth or sub-groups were somewhat different, but still showed a reduction in sexual behaviour.
- Percentage of youth using no reliable form of contraception has not changed (21 per cent of boys in 1992 and 2003 using no method, and 26 per cent of girls in 1992 and 25 per cent in 2003 using no method).
- The overall percentage of youth engaging in sexual intercourse declined overall from 30 per cent in 1992 to 24 per cent in 2003. An especially encouraging finding was the decrease in sexual intercourse in early adolescence (12–14 years), from 15 per cent in 1993 to 8 per cent in 2003.
- Factors found to increase the likelihood of becoming sexually active:
  - Alcohol use.
  - Marijuana use.
  - Sexual abuse.
  - Date rape.
  - Emotional distress.
  - Looking older than same-age peers.
- Factors that decreased the likelihood of becoming sexually active:
  - Family connectedness.
  - School connectedness.
  - Having educational aspirations.

The reduction in early sexual activity is encouraging from a health status perspective, as early initiation of sexual activity is a known health risk factor, including risk of early pregnancy.

## **6.4 Pre-Pregnancy Obesity**

### **6.4.1 Incidence, Risk Factors and Outcomes**

More women are becoming pregnant at a weight above their ideal body mass index (BMI) than in the past. In a sample of nine American States, pre-pregnancy obesity increased 69 per cent between 1993 and 2003 (from 13 per cent to 22 per cent) (Kim et al., 2007). A 15-year, population-based cohort study in Nova Scotia reported that the proportion of pregnant women classified as obese increased from 3.2 per cent in 1988 to 10.2 per cent in 2002 (Robinson, O’Connell, Joseph, & McLeod, 2005 **B**). Data from BC reports an obesity rate in pregnancy at 7.3 per cent in 2000–2003 (BCRCP, 2005).

In 1990, the Institute of Medicine (IOM) issued weight-gain recommendations with the primary goal of preventing low birth weight. Studies show that pregnancy weight gain within the IOM’s

recommended range is associated with the best outcome for both mothers and infants. However, only 30–40 per cent of women have weight gains within these guidelines (Abrams, Altman, & Pickett, 2000). Obese women are more likely than women of lower BMI to exceed the guidelines (Olafsdottir, Skuladottir, Thorsdottir, Hauksson, & Steingrimsdottir, 2006). Women who are obese during pregnancy run an increased risk of complications during pregnancy. In the Nova Scotia study, rates of gestational diabetes were 13.6 per cent in the obese group compared to 5 per cent in the normal weight group. Gestational hypertension was also higher in the obese group (10.2 per cent compared to normal weight 3.2 per cent). Caesarean deliveries were higher in the obese (36.5 per cent) compared to normal weight (22.6 per cent). The risk of preterm birth was 3.0 (CI 2.6–3.9) for gestational hypertension and 5.4 (CI 3.6–8.0) for pre-existing diabetes and 1.4 (CI 1.2–1.7) for gestational diabetes (Robinson et al., 2005 **B**). Studies in other populations have found similar results (Callaway, Prins, Chang, & McIntyre, 2006; Cedergren, 2006 **B**). The risk of stillbirth increases with BMI (Salihu et al., 2007). A high BMI among women is also associated with reduced breastfeeding initiation and duration (Li, Jewell, & Grummer-Strawn, 2003). Infants of obese mothers are at higher risk of being overweight at 12 months of age than infants of normal weight mothers. Macrosomic infants were particularly likely to become overweight (Catalano, Kirwan, Haugel-de Mouzon, & King, 2003; Galtier-Dereure, Boegner, & Bringer, 2000).

#### 6.4.2 Interventions That Work

The Weight Loss Registry of self-reported weight loss indicates that men and women who are successful at maintaining long-term weight loss share common behaviours, including a diet low in fat, frequent self-monitoring of body weight and food intake, and high levels of regular physical activity (Wing & Hill, 2001). Over 20 per cent of overweight or obese persons are successful at long-term weight loss maintenance (defined as intentional loss of at least 10 per cent of initial body weight and keeping it off for at least one year) (Hill, Thompson, & Wyatt, 2005).

#### 6.4.3 Promising Interventions

One possible model program being evaluated is the New Life(style) intervention program that compares usual care by midwives and counselling at 18, 22, 30 and 36 weeks of pregnancy and at 8 weeks postpartum on individual weight gain, in relation to guidelines outlined by the Institute of Medicine. Counsellors coach the women to maintain or optimize a healthy lifestyle (Althuisen, van Poppel, Seidell, van der Wijden, & van Mechelen, 2006 **A**).

In another program, women in the intervention group received written and oral information about healthy eating, exercise and appropriate weight gain; biweekly newsletters prompting healthy eating and exercise habits; and feedback on weight gain. If women exceeded IOM recommendations, a stepped-care approach was used with increasingly structured goals and individualized counselling sessions by telephone and in person that focused on healthy eating and exercise. The intervention was effective at controlling excessive weight gain among normal-weight women. Among overweight women, there was a non-significant trend in the opposite direction, with fewer women in the control group experiencing excessive weight gain. Fewer women in the intervention group exceeded the expected amount of weight gain at any time during their pregnancy, which suggests that the individualized stepped-care intervention may

have been less effective than the prevention component given to all women in the intervention group, and that the intervention was more effective at preventing excessive weight gain than at treating it (Polley, Wing, & Sims, 2002).

Workplace health programs may be able to help women with weight management prior to pregnancy. A review of Workers Health Promotion Programs found that methodological quality of most trials was poor. Strong evidence was found for a beneficial effect of programs on dietary intake, inconclusive evidence for physical activity and no evidence for an effect on health risk indicators (Engbers, van Poppel, Chin, Paw, & van Mechelen, 2005 A).

## **6.5 Physical Activity**

The Society of Obstetricians and Gynaecologists of Canada have published guidelines on physical activity in pregnancy (Davies et al., 2003).

- All women without contraindications should be encouraged to participate in aerobic and strength-conditioning exercises as part of a healthy lifestyle during their pregnancy. **(B)**
- Women should be advised that adverse pregnancy or neonatal outcomes are not increased for exercising women. **(B)**

## **6.6 Summary**

- Strategies to reduce tobacco and alcohol use by screening and brief interventions are effective at reducing tobacco- and alcohol-exposed pregnancies.
- School- and family-based alcohol and tobacco prevention programs must be sophisticated in delivery methods in order to be effective. A list of “best programs” has been established by the United States Department of Health and Human Services based on standard criteria for effectiveness. Some examples of these highly rated programs are described in this section.
- There is evidence that women can lose weight and be successful in maintaining their weight loss. A diet low in fat, frequent self-monitoring of body weight and food intake, and high levels of regular physical activity all contribute to successful weight loss and can contribute to a healthy pre-pregnancy weight.
- Workplace health programs may be helpful in modifying food intake.
- Physical activity in pregnancy should be promoted.



## **7.0 MATERNAL AGE AND HEALTH STATUS**

A woman's health status entering pregnancy can have an impact on complications of pregnancy and newborn outcomes. Women with diabetes, mental illness, hypertension, pelvic inflammatory disease, infectious diseases and complications of previous pregnancies are at greater risk of complications of pregnancy. Increases in pre-pregnancy BMI and prevalence of diabetes are creating a higher risk for complications or birth defects. Greater attention to pre-existing health status can improve reproductive health outcomes.

### **7.1 Effect of Advanced Age on Fertility and Pregnancy in Women**

#### **Outcomes**

Fretts, 2007

Advanced maternal age is associated with reduced fertility and an increased risk of some adverse pregnancy outcomes. The UK National Institute for Health and Clinical Excellence uses age 40 as the level at which there is a higher risk for complications (NICE, 2008).

Women who have pregnancies at an advanced age are at increased risk for fetal loss (Fretts, 2007). Fretts reported that 13.5 per cent of the pregnancies intended to be carried to term ended with fetal loss. The risk of a spontaneous abortion was 8.9 per cent in women aged 20–24 years and 74.7 per cent in those aged 45 years or older. High maternal age was a significant risk factor for spontaneous abortion irrespective of the number of previous miscarriages, parity or calendar period. The risk of an ectopic pregnancy and stillbirth also increased with increasing maternal age (Nybo, Wohlfahrt, Christens, Olsen, & Melbye, 2000). The risk of Downs syndrome starts to increase each year after age 27: the risk at 30 ranges from 0.9–1, at 35 from 2.5–3, and at 40 from 7.5–10.5 (Huether et al., 1998). However, the majority of concerns are related to maternal complications, often as a result of pre-existing health conditions.

Delaying childbearing significantly increases a women's risk of infertility and of developing a chronic medical disease that might complicate her pregnancy. If conception has not occurred after six months of actively attempting pregnancy, the couple should have expedited referral to a clinician who can initiate an infertility evaluation and help formulate a plan to optimize the establishment of pregnancy (Practice Committee of the American Society for Reproductive Medicine, 2002).

Older women should be made aware that they are more likely to be induced and undergo a caesarean birth.

See Section 8.9 for information on prenatal screening guidelines that apply to women with a pregnancy at an advanced age. Greater detail on the evidence for the prevention of birth defects through prenatal screening is included in the core evidence review on prevention of disabilities (MOH, PHW, 2007).

## **7.2 Mental Health During Pregnancy and Postpartum**

### **7.2.1 Prevalence and Risk Factors**

Rates of major depression during pregnancy ranged from 3.1 per cent to 4.9 per cent at different times during pregnancy, and from 1.0 per cent to 5.9 per cent at different times during the first postpartum year (Gaynes et al., 2005 A). Prevalence of perinatal depression is not significantly different from the prevalence of depression among women of similar age who were not pregnant and had not recently given birth (Cooper, Campbell, Day, Kennerley, & Bond, 1988; Cox, Murray, & Chapman, 1993; O’Hara et al., 1990). A study of women in a risk prenatal outreach program in Saskatchewan found a prevalence rate of 27 per cent using the Edinburgh Postnatal Depression Scale (EPDS) with higher rates among Aboriginal women (Bowen & Muhajarine, 2006).

### **7.2.2 Risk Factors for Postpartum Depression**

A systematic review of risk factors for postnatal depression found that there are few reliable risk factors (National Health and Medical Research Council [NHMRC], 2000 A). Although risk factors can predict the likelihood of developing postnatal depression, they are not necessarily causal factors. Confirmed risk factors, with agreement from approximately 75 per cent of reported studies, include a personal history of depression, depression during pregnancy, difficulties in the marital relationship, lack of support and stressful life events. Probable risk factors, with agreement from 40–60 per cent, include a family history of psychopathology, single parenthood, severe maternity blues, personality characteristics, negative cognitive style, birth experiences and obstetric complications, partner’s level of depression, infant health, temperament and behaviour problems, genetic vulnerability and neurotransmitters. Possible protective factors include optimism and self-esteem, having a good marital relationship, increased availability of social support, and adequate preparation for the physical and psychosocial changes of parenthood. The development of postnatal depression cannot be predicted accurately at present; therefore, pregnant women and their families need information about postnatal emotional disorders, useful self-help strategies, and how to find appropriate professional help.

### **7.2.3 Screening for Depression in the General Public**

A systematic review of depression screening in the general public found that feedback of depression screening results to providers generally increased recognition of depressive illness in adults. Studies examining the effect of screening and feedback on treatment rates and clinical outcomes had mixed results. Many trials lacked the power to detect clinically important differences in outcomes. Meta-analysis suggests that overall, screening and feedback reduced the risk for persistent depression (summary RR 0.87, 95% CI 0.79–0.95). Programs that integrated interventions aimed at improving recognition and treatment of patients with depression and that incorporated quality improvements in clinic systems had stronger effects than programs of feedback alone. The study concluded that, compared with usual care, screening for depression can improve outcomes, particularly when screening is coupled with system changes that help ensure adequate treatment and follow-up (Pignone et al., 2002 A).

#### 7.2.4 Screening Tools for Postpartum Depression

A number of scales have been tested to detect postpartum depression. The Postpartum Depression Predictors Inventory-Revised yielded a sensitivity of 0.76 and a specificity of 0.54 at a cutoff score of 10.5, and explained 67 per cent of the variance of postpartum depressive symptomatology as measured by the EPDS scores (Beck, Records, & Rice, 2006). The Agency for Healthcare Research and Quality did a systematic review of screening tools for postpartum depression. While the evidence base remains quite limited and any conclusions are preliminary, the most valid, reliable and sensitive instruments were the EPDS, the Beck Depression Inventory or the Postpartum Depression Screening Scale (PDSS) (Gaynes et al., 2005 A). The Antenatal Psychosocial Health Assessment (ALPHA) form identifies prenatal risk factors for postpartum depression. In a randomized controlled trial, providers randomized to the ALPHA group identified a statistically significantly higher proportion of women with prenatal psychosocial risk factors for postpartum depression (36 per cent versus 26 per cent) and a significantly higher number of risk factors per woman compared with the control group (mean 2.1 versus 1.8;  $z = .96$ ,  $P = 0.05$ ) (Blackmore et al., 2006). The General Health Questionnaire has also been found to be a reliable screening tool for postpartum depression (Navarro et al., 2007).

#### 7.2.5 The Evidence Regarding Prevention of Postnatal Depression

National Health and Medical Research Council [NHMRC], 2000 A

The review by the NHMRC (2000) found little evidence to support any specific interventions to prevent postnatal depression. The conclusions of the review found:

- The effectiveness of biological methods (e.g., progesterone, oestrogen or antidepressant medication) to prevent postnatal depression needs to be properly examined in well-controlled clinical trials. To date, no data is available to support the use of these approaches.
- Much of the psychosocial research concerning prevention of postnatal depression has targeted contributing factors such as postnatal distress, parent-infant attachment, couple communication and interactions, and availability of support.
- The effectiveness of psychosocial approaches in preventing postnatal depression has not been satisfactorily demonstrated, and larger samples with well-designed studies are required.
- Providing training in childbirth-related mental health issues for health professionals has been shown to increase detection rates and improve patient care and may aid development of primary and secondary prevention strategies.
- According to Lumley (2001), there is no evidence to support routine prenatal screening to predict possible postnatal depression.
- Seven new primary preventions/early intervention trials have added evidence on a wide range of interventions ranging from practical support to individual interpersonal therapy, but without identifying significant differences in depression as an outcome.

- Two new trials of secondary prevention, one involving interpersonal therapy and the other including partners in a series of psycho-educational visits, show promise, but neither trial is large enough to form a basis for adoption in clinical practice.
- Novel interventions, or promising findings, with a strong basis in theory need to be tested in trials that are appropriately sized and comply with internationally accepted design and reporting guidelines.

Since the NHMRC review was completed in 2000, further systematic reviews found some evidence of therapeutic value of screening of high-risk women, of intensive support by a health professional and of individual therapy in the postnatal period (Dennis, 2005 A; Ogrodniczuk & Piper, 2003 A). Exercise has also been shown to help with treatment of postpartum depression (Daley, Macarthur, & Winter, 2007).

- Intensive postpartum support provided by a health professional reduced the risk of postpartum depression. (RR 0.68, CI 0.55–0.84)
- Identifying women "at risk" assisted in the prevention of postnatal depression (RR 0.67, CI 0.51–0.89).
- Interventions with only a postnatal component were more beneficial (RR 0.76, CI 0.58–0.98) than interventions that incorporated a prenatal component.
- Individually based interventions were more effective (RR 0.76, CI 0.59–1.00) than group-based interventions (RR 1.03, CI 0.65–1.63).

Another recent systematic review found support for a midwife delivered intervention for postnatal depression. There are also some data that support brief psychotherapy in primary prevention. Unfortunately, many of the studies suffer from shortcomings that may limit their generalizability (Ogrodniczuk & Piper, 2003 A).

In women at high risk for family dysfunction and child abuse, nurse home visits combined with case conferencing produced a statistically significant improvement in home environment quality using the HOME (Home Observation for Measurement of the Environment) program. Similarly, in women at high risk for either family dysfunction or postpartum depression, home visitation or peer support, respectively, produced a statistically significant reduction in EPDS scores (difference -2.23, 95% CI -3.72 to -0.74,  $p = 0.004$ ; and 15.0% versus 52.4%, OR 6.23, 95% CI 1.40–27.84,  $p = 0.01$ , respectively). No randomized controlled trial evidence was found to endorse universal provision of postpartum support to improve parenting, maternal mental health, maternal quality of life or maternal physical health. There is some evidence that high-risk populations may benefit from postpartum support (Shaw, Levitt, Wong, & Kaczorowski, 2006 A).

A structured program of home visits with women screened soon after birth as “vulnerable” and at risk of initiating child abuse, found there was a significantly lower proportion of women identified as “depressed” compared to a non-intervention group (Armstrong, Fraser, Dadds, & Morris, 1999 A).

A review of the literature on exercise and postpartum depression found two small randomized controlled trials conducted in Australia that supported exercise as a useful treatment for women with postpartum depression. Results from uncontrolled studies and observational evidence suggest that postpartum women, some of whom were depressed, benefit from participation in exercise programs. Further research using well-designed randomized controlled trial methodologies is warranted (Daley et al., 2007).

#### 7.2.6 Treatment

Although treatment is outside the scope of public health, it is important to examine the evidence for treatment, as the value of screening is dependent on treatment being available and effective.

- In the systematic review by Gaynes et al. (2005 A) of treatment for postpartum depression, six studies found a significant benefit for treatment. The interventions included a home nurse visiting program, support group, peer support, infant sleep intervention and a brief psycho-educational group (Armstrong et al., 1999 A; Chabrol et al., 2002 A; Chen, Tseng, Chou, & Wang, 2000; Dennis, 2003 A; Hiscock & Wake, 2002 A; Honey, Bennett, & Morgan, 2002).

Further information on this topic is available in the report entitled *Perinatal Depression: A Framework for BC's Health Authorities*, by the BC Reproductive Mental Health Program (2006).

#### 7.2.7 Perinatal Loss

The risk of psychiatric hospitalization and mortality is increased among parents, especially mothers, who lost a child (Li, Precht, Mortensen, & Olsen, 2003).

Randomized trials were reviewed of any form of general support aimed at encouraging acceptance of loss, specific bereavement counselling, or specialized psychological support/counselling, including psychotherapy for women and families experiencing perinatal death. No information is available from randomized trials to indicate whether there is or is not a benefit from providing specific psychological support or counselling after perinatal death (Chambers & Chan, 2006 A).

### **7.3 Hypertension**

#### 7.3.1 Incidence, Risk Factors and Outcomes

The BC rates for hypertensive disorders of pregnancy by fiscal year were 5.5 per cent in 2001/2002 and 5.7 per cent in both 2002/2003 and 2003/2004 (BCRCP, 2006).

Women with any hypertension in pregnancy were 1.6 times (95% CI 1.5–1.6) more likely to have a baby small for gestational age and 1.4 times (95% CI 1.1–1.8) more likely to have a stillbirth as compared with normotensive women. Adjusted analyses showed that women with gestational hypertension without proteinuria (mild PIH) and with proteinuria (severe PIH, HELLP, or eclampsia) were more likely to have infants that were small for gestational age (RR 1.5, 95% CI 1.4–1.6 and RR 3.2, 95% CI 2.8–3.6, respectively). Women with pre-existing hypertension were also more likely to give birth to an infant that was small for gestational age

(RR 2.5, 95% CI 2.2–3.0) or to have a stillbirth (RR 3.2, 95% CI 1.9–5.4) (Allen, Murphy, Magee, & Ohlsson, 2004).

Independent risk factors for hypertensive disorders of pregnancy include older maternal age at first pregnancy, frequency of multiple births, obesity, hypertension, collagen vascular disease, black race, insulin resistance, diabetes, increased circulating testosterone and thrombophilias (Roberts, Pearson, Cutler, & Lindheimer, 2003). The risk of preeclampsia typically doubles for each 5–7 kg/m<sup>2</sup> increase in body mass index (O’Brien, Ray, & Chan, 2003 **A**). Smoking is associated with a reduced risk of hypertension during pregnancy, contrary to what is expected. The protective effect appears to continue even after cessation of smoking. Further basic research on this issue is warranted (Zhang et al., 1999 **B**).

The epidemiological factors of preeclampsia suggest a genetic basis for the disorder. Preeclampsia is more common in daughters of preeclamptic women and in pregnancies fathered by sons of preeclamptic women, suggesting the involvement of both maternal and paternal genes in the syndrome (Roberts et al., 2003).

### 7.3.2 Where Evidence Shows a Preventive Effect on Hypertension

Table 8 summarizes interventions where there is evidence of a preventive effect on hypertension.

**Table 8: Interventions Where Evidence Shows a Preventive Effect on Hypertension**

<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Hypertensive disorders and calcium supplements	<ul style="list-style-type: none"> <li>A systematic review found the risk of high blood pressure was reduced with calcium supplementation compared to placebo (11 trials, 14,946 women: RR 0.70, 95% CI 0.57–0.86).</li> <li>There was also a reduction in the risk of preeclampsia associated with calcium supplementation (12 trials, 15,206 women: RR 0.48, 95% CI 0.33–0.69). The effect was greatest for high-risk women (5 trials, 587 women: RR 0.22, 95% CI 0.12–0.42), and those with low baseline calcium intake (7 trials, 10,154 women: RR 0.36, 95% CI 0.18–0.70). The composite outcome maternal death or serious morbidity was reduced (4 trials, 9,732 women; RR 0.80 (95% CI, 0.65–0.97). Almost all the women in these trials were low-risk and had a low-calcium diet.</li> </ul>	Hofmeyr, Atallah, & Duley, 2006 <b>A</b>
Gestational hypertension and folic acid	<ul style="list-style-type: none"> <li>A retrospective study found that the multivariate-adjusted relative risk of developing gestational hypertension during the month after folic acid supplementation, compared with not using folic acid during that same month, was 0.55 (95% CI 0.39–0.79). This finding suggests that folic acid-containing multivitamins may reduce the risk of gestational hypertension.</li> </ul>	Hernandez-Diaz, Werler, Louik., & Mitchell, 2002

7.3.3 Evidence of No Effect on Risk of Hypertension

Table 9 summarizes interventions where the evidence shows no effect on the risk of hypertension.

**Table 9: Interventions Where Evidence Shows No Effect on Risk of Hypertension**

<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Marine oil, and other prostaglandin precursors and preeclampsia	<ul style="list-style-type: none"> <li>There is not enough evidence to support the routine use of marine oil, or other prostaglandin precursor supplements, during pregnancy to reduce the risk of preeclampsia.</li> </ul>	Makrides, Duley, & Olsen, 2006
Antioxidants for the prevention of preeclampsia and other reproductive health outcomes	<ul style="list-style-type: none"> <li>Supplementing women with any antioxidants during pregnancy compared with control or placebo was associated with a 39 per cent reduction in the risk of preeclampsia (RR 0.61, 95% CI 0.50–0.75, 7 trials, and 6,082 women). Women receiving antioxidants compared with control or placebo also had a reduced risk of having a small-for-gestational-age infant (RR 0.64, 95% CI 0.47–0.87, 3 trials, 634 women), their infants had a greater mean birth weight (weighted mean difference 91.83 g, 95% CI 11.55–172.11, 3 trials, 451 women), but they were more likely to give birth preterm (RR 1.38, 95% CI 1.04–1.82, 3 trials, 583 women). According to the authors there were insufficient data to make recommendations for adoption of the intervention.</li> </ul>	Rumbold, Duley, Crowther, & Haslam, 2005
Progesterone and preeclampsia and other birth outcomes	<ul style="list-style-type: none"> <li>Assessing the effects of progesterone during pregnancy on the risk of developing preeclampsia and its complications. There was insufficient evidence to demonstrate any clear differences between the two groups on the risk of preeclampsia (1 trial, 128 women; RR 0.21, 95% CI 0.03–1.77), death of the baby (2 trials, 296 women; RR 0.72, 95% CI 0.21–2.51), preterm birth (1 trial, 168 women; RR 1.10, 95% CI 0.33–3.66), small-for-gestational-age babies (1 trial, 168 women; RR 0.83, 95% CI 0.19–3.57) or major congenital defects (1 trial, 168 women; RR 1.65, 95% CI 0.28–9.62).</li> </ul>	Meher & Duley, 2006c A
Garlic on prevention of preeclampsia	<ul style="list-style-type: none"> <li>Assessing the effects of garlic on prevention of preeclampsia and its complications. One trial (100 women) of uncertain quality compared garlic with placebo. Another study was excluded as 29 per cent of women were lost to follow-up. There was no clear difference between the garlic and control groups in the risk of developing gestational hypertension (RR 0.50, 95% CI 0.25–1.00) or preeclampsia (RR 0.78, 95% CI 0.31–1.93).</li> </ul>	Meher & Duley, 2006b A
Exercise and-preeclampsia	<ul style="list-style-type: none"> <li>Assessing the effects of exercise, or increased physical activity, on prevention of preeclampsia and its complications. Two small, good-quality trials (45 women) were included. Both compared moderate intensity regular aerobic exercise with maintenance of normal physical activity during pregnancy. The confidence intervals were wide and crossed the line of no effect for all reported outcomes including preeclampsia (RR 0.31, 95% CI 0.01–7.09).</li> </ul>	Meher & Duley, 2006a A

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<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Preeclampsia or gestational hypertension and rest	<ul style="list-style-type: none"> <li>Assessing the effects of rest or advice to reduce physical activity during pregnancy on preventing preeclampsia and its complications in women with normal blood pressure. There was a statistically significant reduction in the relative risk of preeclampsia with 4–6 hours rest per day (1 trial, 32 women; RR 0.05, 95% CI 0.00–0.83), but not of gestational hypertension (RR 0.25, 95% CI 0.03–2.00), compared to normal activity.</li> <li>Rest of 30 minutes per day plus nutritional supplementation (calcium, linoleic acid and soy protein) was associated with a reduction in the risk of preeclampsia (1 trial, 74 women; RR 0.13, 95% CI 0.03–0.51) and also of gestational hypertension (RR 0.15, 95% CI 0.04–0.63).</li> <li>Current evidence is insufficient to support recommending rest or reduced activity to women for preventing preeclampsia and its complications. Whether women rest during pregnancy should therefore be a matter of personal choice.</li> </ul>	Meher & Duley, 2006d <b>A</b>
Nitric oxide donors and precursors for preventing preeclampsia	<ul style="list-style-type: none"> <li>Assessing the effectiveness and safety of nitric oxide donors and precursors for preventing preeclampsia and its complications. There are insufficient data for reliable conclusions about the effects on preeclampsia (4 trials, 170 women; RR 0.83, 95% CI 0.49–1.41) or its complications. One trial (36 women) compared a nitric oxide donor with nifedipine, and another (76 women) compared it with antiplatelet agents. Both were too small for reliable conclusions about possible differential effects. Glyceryl trinitrate was associated with an increased risk of headache (2 trials, 56 women; RR 6.85, 95% CI 1.42–33.04), and of stopping treatment (2 trials, 56 women; RR 4.02, 95% CI 1.15–14.09) compared to placebo. However, the increase for both outcomes was due to an extreme result in one small trial (7/7 versus 0/9 for both outcomes).</li> </ul>	Meher & Duley, 2007 <b>A</b>
Blood pressure monitoring	<ul style="list-style-type: none"> <li>There is no randomized controlled trial evidence to support the use of ambulatory blood pressure monitoring during pregnancy.</li> </ul>	Bergel, Carroli, & Althabe, 2006 <b>A</b>
Reduced salt intake	<ul style="list-style-type: none"> <li>Two trials were included comparing advice about a low-salt diet with no dietary advice. None of the trials included women with preeclampsia, so this review provides no reliable information about changes in salt intake for treatment of preeclampsia.</li> </ul>	Duley, Henderson-Smart, & Meher, 2005

## **7.4 Diabetes During Pregnancy: Type 1, Type 2 and Gestational Diabetes**

### **7.4.1 Prevalence, Risk Factors and Outcomes**

Population rates in Canada for all types of diabetes are 1 per cent for women in the age group 20–34 and 1.9 per cent for women age 35–44 in 2005 (Statistics Canada, 2005). Estimates of gestational diabetes were 2.4 per cent versus 3.8 per cent in white women in an HMO in California, and 5.0 and 7.4 in Asians depending on criteria. The age- and ethnicity-adjusted yearly cumulative incidence of gestational diabetes increased steadily from 5.1 per cent in 1991 to 7.4 per cent in 1997, and levelled off through 2000 (6.9 per cent) (Ferrara, Hedderson, Quesenberry, & Selby, 2002; Ferrara et al., 2004 **B**). A study of pregnant women in Sweden



found 1.7 per cent with gestational diabetes, 1.3 per cent with impaired glucose tolerance (IGT) and 0.4 per cent with previously undiagnosed diabetes (Ostlund & Hanson, 2003). Risk factors of gestational diabetes include overweight or obese pre-pregnancy BMI, weight gain in early adulthood, weight gain during pregnancy above Institute of Medicine guidelines, previous gestational diabetes, history of macrosomia, previous stillbirth, maternal age > 25, newly detected glycosuria, polyhydramnios, short stature, smoking, family history of diabetes, and particular ethnicities including Hispanic, black, and Aboriginal from North America, Australia and Pacific Islanders (Tieu, Crowther, & Middleton, 2007).

#### 7.4.2 Outcomes – Short- and Long-term

Babies born to women with Type 1 or 2 diabetes are at higher risk of perinatal mortality and congenital anomalies (Macintosh et al., 2006). Perinatal mortality in babies of women with diabetes in the United Kingdom was 31.8/1,000 births. Perinatal mortality was similar in babies of women with Type 1 (31.7/1,000 births) and Type 2 diabetes (32.3/1,000) and was nearly four times higher than that in the general maternity population. The prevalence of major congenital anomaly in the United Kingdom was 46/1,000 births in women with diabetes (48/1,000 births for Type 1 diabetes; 43/1,000 for Type 2 diabetes), more than double the expected rate. This increase was driven by anomalies of the nervous system, notably neural tube defects (4.2-fold), and congenital heart disease (3.4-fold).

Women with gestational diabetes are more likely to develop diabetes within 10 years of the index pregnancy. In one follow-up study in Denmark, 18 per cent of women with gestational diabetes who delivered between 1978–1985 later developed diabetes and IGT, and 40 per cent of women who were followed up from 1987–1996 developed diabetes (Lauenborg et al., 2004 **B**). Other studies have reported that in the long term, about 70 per cent of women with gestational diabetes will develop diabetes (Kim, Newton, & Knopp, 2002 **A**). More details on the risks and outcomes of diabetes in pregnancy are included in the core evidence review on prevention of disabilities (MOH, PHW, 2007).

#### 7.4.3 Protective Factors

Physical activity appears to be protective for avoiding gestational diabetes. Women who engaged in any vigorous physical activity in the year before pregnancy experienced a reduced risk of gestational diabetes (OR 0.56, 95% CI 0.33–0.95) and abnormal glucose tolerance (OR 0.76, 95% CI 0.57–1.00). Women who reported vigorous activity before pregnancy and light-to-moderate or vigorous activity during pregnancy appeared to have a lower risk of both gestational diabetes mellitus (GDM) (OR 0.49, 95% CI 0.24–1.01) and abnormal glucose tolerance (OR 0.70, 95% CI 0.49–1.01) compared with women not reporting these activities. Walking and total physical activity provided modest benefits. The adjusted prevalence of gestational diabetes was 4.7 per cent among women not engaging in vigorous activity before pregnancy and 2.7 per cent among women engaging in vigorous activity. The adjusted prevalence of abnormal glucose tolerance was 17.6 per cent among women not engaging in vigorous activity before pregnancy and 13.9 per cent among women engaging in vigorous activity. One case of gestational diabetes could be prevented for every 49 women engaging in vigorous activity, and one case of abnormal glucose tolerance could be prevented for every 28 women engaging in vigorous activity. Vigorous activity was defined as jogging, swimming, cycling, aerobic class, skiing or other

similar activities. Benefits increase with duration of activity for nulliparous women, but there were no benefits for women with a pre-pregnancy BMI > 25 (Oken et al., 2006).

#### 7.4.4 Diabetic Control in the Preconception Period

A meta-analysis of the effect of preconception care in reducing congenital malformations in women with diabetes has shown that the pooled rate of major anomalies was lower among preconception care recipients (2.1 per cent) than non-recipients (6.5 per cent). In nine studies, the risk for major and minor anomalies was lower among women who received preconception care (RR 0.32, 95% CI 0.17–0.59), as was the early first-trimester mean glycosylated hemoglobin value (pooled mean difference: 2.3%, 95% CI 2.1–2.4) (Ray, O'Brien, & Chan, 2001 **A**).

#### 7.4.5 Prevention of Diabetes

A systematic review and meta-analysis has shown evidence of prevention or delay of the onset of diabetes, although none of the studies were specific to pregnancy or preconception. Lifestyle and pharmacological interventions reduce the rate of progression to Type 2 diabetes in people with IGT. Lifestyle interventions were nearly as effective as drug treatment (Gillies et al., 2007 **A**). From the meta-analyses the pooled hazard ratios were:

- 0.70 (95% CI 0.62–0.79) for oral diabetes drugs versus control.
- 0.51 (95% CI 0.44–0.60) for lifestyle interventions versus standard advice.
- 0.44 (95% CI 0.28–0.69) for orlistat versus control.
- 0.32 (95% CI 0.03–3.07) for the herbal remedy jiangtang bushen versus standard advice.

#### 7.4.6 Prevention of Poor Reproductive Health Outcomes for Women With Diabetes

Recent clinical trials have shown that improved diabetic management improves outcomes for all types of diabetes (Jovanovic & Nakai, 2006; McElvy et al., 2000). A randomized controlled trial of dietary advice, blood glucose monitoring and insulin therapy versus routine care during pregnancy showed the rate of serious perinatal complications was significantly lower among the infants in the intervention group compared to infants of the women in the routine-care group. However, more infants of women in the intervention group were admitted to the neonatal nursery. Women in the intervention group had a higher rate of induction of labour than the women in the routine-care group, although the rates of caesarean delivery were similar. At three months postpartum, data revealed lower rates of depression and higher scores on quality of life in the intervention group (Crowther et al., 2005 **A**).

An association has been found between increased fat intake and the development of glucose abnormalities in pregnancy. Adding 100 kcal from carbohydrates to the diet was associated with a 12 per cent decrease in risk of IGT and a 9 per cent decrease in risk of GDM. Substituting fat for carbohydrates (per each 1 per cent of total calories) resulted in a significant increase in risk of both IGT and GDM (RR = 1.1, 95% CI 1.02-1.12; and RR = 1.1, 95% CI 1.02-1.10, respectively). Predicted probabilities of IGT and GDM were reduced by one-half with a 10 per cent decrease in dietary fat and a 10 per cent increase in carbohydrates (Saldana, Siega-Riz, & Adair, 2004 **B**).

#### 7.4.7 Screening for Gestational Diabetes

Screening for gestational diabetes in pregnancy has been the subject of controversy, with some organizations and reviews concluding that the evidence does not justify screening (Berger, Sermer, & Farine, 2006; NHS Health Technology Assessment Programme, 2002 A; Tuffnell, West, & Walkinshaw, 2003 A). A Cochrane review in 2003 determined there was not sufficient evidence to justify screening for gestational diabetes (Tuffnell et al., 2003 A). However, the same authors called for universal screening in a 2006 editorial in the *British Journal of Obstetrics and Gynaecology*, following a clinical trial that showed improved outcomes with intensive treatment for gestational diabetes (Tuffnell, West, & Walkinshaw, 2006a; Crowther et al., 2005 A). Other authors call for universal screening or a review of guidelines (Berger et al., 2006; Tuffnell, West, & Walkinshaw, 2006b A). Although screening has been recommended in Australia, it is not clear if it has been adopted in practice (McIntyre, Cheung, Oats, & Simmons, 2005). A large prospective study, the Hyperglycemia and Adverse Pregnancy Outcome (HAPO), study is currently underway, which will help establish whether screening for and treating gestational diabetes improves pregnancy outcomes (HAPO Study Cooperative Research Group, 2002).

The 2008 NICE guidelines recommend screening for gestational diabetes using risk factors in a healthy population.

Each of the following approaches is an acceptable screening protocol according to the SOGC guidelines (Berger, Crane, & Farine, 2002) (graded at the level of C).

- Routine screening of women at 24–28 weeks of gestation may be recommended with the 50 g glucose challenge test (GCT), using a threshold of 7.8 mmol/L (140 mg/dL), except in those women who fulfill the criteria for low risk.
- The diagnostic test can be the 100 g oral glucose tolerance test (OGTT), as recommended by the American College of Obstetricians and Gynecologists, or the 75 g OGTT, according to the American Diabetes Association (ADA) criteria.
- A small but significant number of Canadian obstetricians and centres have a policy of non-screening for GDM. Until evidence is available from large randomized controlled trials that show a clear benefit from screening for glucose intolerance in pregnancy, the option of not screening for GDM is considered acceptable. Conversely, there are no compelling data to stop screening when it is practiced.
- Women considered at high-risk for GDM should undergo a diagnostic test as early in pregnancy as possible, and that testing should be repeated at 24 to 28 weeks if initial results are negative.
- If GDM is diagnosed, glucose tolerance should be reassessed with a 75 g OGTT, 6 to 12 weeks postpartum, in order to identify women with persistent glucose intolerance.

The BC Reproductive Care Program has also published guidelines on screening for gestational diabetes. Their guidelines suggest screening high-risk women for gestational diabetes (BCRCP, 2001).

7.4.8 Areas Where Evidence is Lacking or Ambiguous

Table 10 summarizes interventions for gestational diabetes where evidence is lacking or ambiguous.

**Table 10: Interventions Where Evidence is Lacking/Ambiguous – Gestational Diabetes**

Intervention	Outcomes	Reference
Treatment for impaired glucose tolerance (IGT)	There are insufficient data for any reliable conclusions about the effect of treatments for IGT on perinatal outcome. This review suggests that treatment may be associated with a reduced risk of neonatal hypoglycemia (RR 0.25, 95% CI 0.07–0.86). No other statistically significant differences were detected.	Tuffnell et al., 2006b <b>A</b>
Control of hypoglycemia	Maternal hypoglycemia was more common among women whose diabetic control was very tight compared to tight control (OR 25.96, 95% CI 4.91–137.26), based on one trial. There was no difference detected in perinatal outcome between the groups.	Walkinshaw, 2006b <b>A</b>
Diet therapy for gestational diabetes	No differences were detected between primary dietary therapy and no primary dietary therapy for birth weight greater than 4,000 g or caesarean deliveries.	Walkinshaw, 2006a <b>A</b>
Gestational diabetes and physical activity	The reviewers concluded there is not enough evidence to support or prohibit exercise in the last trimester.	Ceysens, Rouiller, & Boulvain, 2006 <b>A</b>

**7.5 Screening for Thyroid Disorders**

Hypothyroidism during pregnancy can result in children developing neuropsychiatric disorders including attention deficit disorders and intellectual deficits up to 7–10 IQ points and is preventable by the detection and treatment of hypothyroidism at birth (Lazarus & Premawardhana, 2005).

The evidence and grading in Table 11 is adapted from The Endocrine Society’s Clinical Practice Guideline (Abalovich et al., 2007).

**Table 11: Summary Table – Screening for Thyroid Disorders**

Recommendations/Evidence	Grading
<b>Hypothyroidism and pregnancy: maternal and fetal aspects</b>	
Both maternal and fetal hypothyroidism are known to have serious adverse effects on the fetus. Therefore maternal hypothyroidism should be avoided.	Level A; evidence is fair (GRADE 1).
<p><b>Screening</b>                      Targeted case finding is recommended at the first prenatal visit and for women with autoimmune disorders when pregnancy is detected.</p> <p>Criteria for screening include:</p> <ul style="list-style-type: none"> <li>• Symptoms or clinical signs suggestive of thyroid underfunction or overfunction, including anemia, elevated cholesterol, and hyponatremia.</li> <li>• Type I diabetes. Women with Type 1 diabetes mellitus have a 25 per cent prevalence of postpartum thyroid disorders, according to one small Canadian study (Gerstein, 1993).</li> <li>• Infertility.</li> <li>• Previous therapeutic head or neck irradiation.</li> <li>• A history of miscarriage or preterm delivery).</li> </ul>	<p>Level B; evidence is fair (GRADE 2).</p> <p>Level is B; evidence is fair (GRADE 1)</p>

Recommendations/Evidence	Grading
<b>Gestational hyperemesis and hyperthyroidism</b>	
Thyroid function tests should be measured in all patients with hyperemesis gravidarum (5 per cent weight loss, dehydration, and ketonuria).	Level B; evidence is poor (GRADE 2).
<b>Iodine nutrition during pregnancy</b>	
Women of childbearing age should have an average iodine intake of 150 µg/d. During pregnancy and breastfeeding, women should increase their daily iodine intake to 250 µg on average.	Level A; evidence is good (GRADE 1).
To assess the adequacy of the iodine intake during pregnancy in a population, urinary iodine concentration should be measured in a cohort of the population. Urinary iodine concentration should ideally range between 150 and 250 µg/litre.	Level A; evidence is good (GRADE 1).
To reach the daily recommended nutrient intake for iodine, multiple means must be considered, tailored to the iodine intake level in a given population. Different situations must therefore be distinguished: 1) countries with iodine sufficiency and/or with a well-established universal salt iodization (USI) program; 2) countries without a USI program or an established USI program where the coverage is known to be only partial; and 3) remote areas with no accessible USI program and difficult socio-economic conditions.	Level A; evidence is good (GRADE 1).
Iodine intake during pregnancy and breastfeeding should not exceed twice the daily recommended nutritional intake for iodine (i.e., 500 µg iodine per day).	Level I; evidence is poor
<b>Postpartum thyroiditis</b>	
There is insufficient evidence to conclude whether an association exists between postpartum depression and either postpartum thyroiditis (PPT) or thyroid antibody positivity (in women who did not develop PPT). However, because hypothyroidism is a potentially reversible cause of depression, women with postpartum depression should be screened for hypothyroidism and appropriately treated.	Level B; evidence is fair (GRADE 2).
There are insufficient data to recommend screening of all women for PPT.	Level I; evidence is poor.

### 7.5.1 Commentary on Thyroid Screening

- The rationale for not recommending universal screening of pregnant women for thyroid disorders is based on the lack of clinical trials on treating women with hypothyroidism in pregnancy. Only one study has shown an impact of treatment. Negro et al. (2006) documented a significant decrease in the rate of spontaneous miscarriage and preterm delivery in euthyroid antibody-positive women treated with levothyroxine. Individual members of the Clinical Practice Guidelines review committee believe that evidence is sufficient to justify screening all women before or during pregnancy, and this is common practice in some areas (Negro et al., 2006). A large-scale, double-blind prospective study, entitled the “Controlled Antenatal Thyroid Screening Study,” has been initiated by Lazarus and Premawardhana (2005).
- A further challenge to in implementing routine screening is the difficulty in detecting hypo/hyperthyroidism based on clinical factors. Thus, women presenting with “vague” and “diverse” complaints during pregnancy may not trigger suspicion on the part of the doctor to test for thyroid levels. Screening requires a standardized tool for clinical assessment of hypo/hyperthyroidism, and there are currently no standardized tools. Screening for thyroid levels during pregnancy is a promising area for further research on the prevention of developmental disabilities.

## **7.6 Women with Disabilities**

The following information is based on evidence and on the opinions of experts in the area of women's health and disabilities at the BC Women's Hospital and Health Centre.

Riddell, Greenberg, Meister, & Kornelsen (2003) examined literature regarding women with disabilities and found that accurate information regarding the demographics of women with disabilities is difficult to obtain. A 2001 Statistics Canada survey reported 7.5 per cent of women aged 25–44 years were living with disability. This did not include any women living in institutional settings. Disabilities affecting health status may be physical, mental or a combination. Common reasons for inadequate health care services in this population include mobility and transportation issues, inaccessible office and health care facilities, limits to insurance coverage, negative attitudes and lack of knowledge and sensitivity in care providers, and perceived lack of physical and emotional safety in health care environments.

The National Disability Authority in the United Kingdom (2007) reviewed research-based literature on women with disabilities, including examination of the relationship between disability and reproductive and sexual health and mothering. According to the authors, the main issues emerging from the literature are the existence of negative and ill-informed attitudes of care providers, lack of tolerance, limited access to information and services, and environmental barriers. They also reported a lack of information, education and support networks to support mothering and baby care for these women. Many women reported they were afraid their babies might be removed from their care as they could be deemed incapable of parenting.

Disabled women face barriers to contraception information and methods suitable to the unique needs arising from a particular disability. There is evidence of extremely low attendance at birth control clinics compared to non-disabled women. A study by Fiduccia (1994) in Los Angeles found that only 36 out of 162,006 family planning visits in a 6-month period were made by women with disabilities.

Historically, social fears and stereotypes have resulted in a wide array of controlling and limiting measures being imposed on disabled women. In American studies, disabled women most often report that their reproductive health care needs are not met by their doctors. They face isolation, invisibility, dependency and the expectation by themselves and others that they will not partake in intimate relationships or childbearing. Disabled feminist researchers have argued that existing barriers to reproductive health information and care violates basic human and civil rights. This view is echoed by the National Study of Women with Physical Disabilities (1992–1996), which concluded that in addition to obvious barriers related to specific disabilities, invisible barriers result from policies and practice that do not attend to rights to access and prevention of discrimination based on disability.

Carty (1998) emphasizes that disabled women share the hopes and worries of all women as they strive to achieve optimal prenatal and postnatal maternal and infant health. Where they differ is in the extraordinary challenges they can face in accessing suitable health care and support for childrearing.

## **7.7 Summary**

- Women who become pregnant at an advanced age should be informed about increased risks of complications or adverse pregnancy outcomes and be referred for prenatal screening for congenital anomalies and chromosomal defects.
- **Mental Health:** Although mental health issues are a serious concern during both the prenatal and postpartum period, no evidence of prevention was found. Universal screening in the general population and provider feedback may reduce the risk of persistent depression. Screening and provision of support to high-risk women postpartum may improve scores on the EPDS. Exercise may also be of benefit.
- **Hypertension:** Risk of hypertension and preeclampsia may be reduced with calcium supplements and a multivitamin with folic acid.
- **Diabetes:** The evidence supporting the impact of improved control of diabetes or prevention of diabetes on reproductive outcomes is strong. Improved glycemic control, diet, exercise, counselling, herbal supplements and metformin all show evidence of improvements in the reproductive health outcomes of women with diabetes, both in the preconception and prenatal period. Nevertheless, screening for gestational diabetes during pregnancy is controversial. While SOGC guidelines suggest screening protocols, the evidence is graded at the level of C. There is active research in this area with more evidence expected to validate screening.
- **Thyroid Disorders:** Targeted screening is recommended for women with autoimmune disorders and hyperemesis gravidarum, as well as depression.
- **Women with Disabilities:** There is a need for increased research, education and services sensitive to the complex reproductive health needs of women with disabilities.

## **8.0 PRENATAL CARE**

This chapter includes interventions during pregnancy provided by the public health system or primary care provider to prevent low birth weight, preterm birth and maternal complication.

With regard to informed care, the 2008 NICE Guidelines recommend that pregnant women should be offered information based on the current available evidence together with support to enable them to make informed decisions about their care. This information should include where they will be seen and who will undertake their care.

### **8.1 Prevention of Low Birth Weight**

- Low birth weight is a major indicator of perinatal health, and of population health status. It is defined as birth weight < 2,500 grams, and includes preterm births before 37 weeks gestation as well as small-for-gestational-age infants (< 10th percentile).
- Low birth weight babies are more likely than those with normal birth weight to have significant short- and long-term adverse effects on healthy growth and development, which in turn negatively impacts population health outcomes and health care costs.
- Costs are complex, but can be estimated in terms of financial impact (immediate and future medical costs) as well as psychosocial and emotional impact on families.
- Actual low birth weight trends may be masked by rates of preterm or small-for-gestational-age birth rates, and these should be included when examining risk associations.

#### **8.1.1 Preventable Conditions Associated with Low Birth Weight**

Evidence associating risk factors with low birth weight often do not meet the rigor that determines causation. However, moderate to strong evidence supports the following associations:

- Maternal age < 20 and > 35 years.
- Previous preterm or low birth weight baby.
- Assisted reproductive technologies.
- Poor prenatal weight gain or underweight preconception.
- Short (< 18 months) or long (> 60 months) birth intervals.
- Chronic maternal stress from any cause.
- Violence, abuse, maternal trauma.
- Poverty, isolation, social/cultural segregation.
- Maternal infection, including STIs.



- Exposure to environmental tobacco smoke, or tobacco, alcohol, narcotic or certain prescription medication use.
- Pre-existing or intrapartum medical conditions (e.g., short cervical length, Type 1 Diabetes, renal failure, asthma).
- Multiple births or medically indicated inductions.

In a review of studies of support and health education (Brunton & Thomas, 2001 A), five studies showed a statistically significant effect on birth weight if the program targeted adolescents (Clarke, Miller, Vogel, Davis, & Mahan, 1993; Covington, Carl, Daley, Cushing, & Churchill, 1988; Heins, Nance, & Ferguson, 1987; Olds, Henderson, Tatelbaum, & Chamberlin, 1986 A; Van Winter, Harmon, Atkinson, Simmons, & Ogburn, 1997). The programs were provided through a variety of health providers, time periods, venues and program delivery methods.

Significant results reported were:

- Improvements in birth weight by 227 grams (0.5 pounds) or more.
- A decrease in the rate of low birth weight.
- A decrease in the rate of small-for-gestational-age births.
- A reduction in the rate of preterm delivery.
- A reduction in birth weight below the 25th percentile.
- An increased rate of birth weight above the 75th percentile.

More recently in Canada, a consensus statement on *Healthy Mothers, Healthy Babies: How to Prevent Low Birth Weight* was developed from a conference in Alberta, Canada in May 2007 (Institute of Health Economics, 2007). Evidence informing the consensus statement was based on published research, expert presentations, presentations by parents of low birth weight babies, participant discussions during the conference and closed panel deliberations.

## **8.2 Prevention of Preterm Birth**

In July 2006, the Institute of Medicine published a review of the evidence regarding prevention of preterm births (Berhman & Stith Butler, 2006). In summary, apart from interventions to prevent contractions, there does not appear to be evidence to prevent prematurity. A review of the literature by the City of Toronto on prevention of low birth weight/preterm birth found some evidence of interventions to prevent preterm births, although the quality of the evidence was not graded (City of Toronto, 2002). The conclusions of their review suggested the following interventions have the potential to prevent prematurity:

- Smoking cessation and relapse prevention.
- Treatment of maternal infection.
- Screening mothers with previous history of preterm/low birth weight births for infection.
- Promotion of balanced, nutritious diet for all pregnant women.

- Administration of glucocorticoids to mothers with threatened preterm labour.

### **8.3 Prevention of Excess Weight Gain During Pregnancy**

The Institute of Medicine (2007) has published a review of the influence of pregnancy weight on maternal and child health. There are few controlled studies of interventions to prevent pregnancy-related weight gain or postpartum weight retention. Low-income women who had their gestational weight gains monitored by health care providers and also received patient education by mail had a significantly reduced risk of excessive gestational weight gain. Overweight women within this income sub-group were at a significantly lower risk of retaining more than 2.27 kg postpartum (OR 0.24, 95% CI 0.07–0.89). The intervention appeared to reduce the risk of excessive gestational weight gain only in the low-income sub-group (Olson, Strawderman, & Reed, 2004).

Polley et al. (2002) conducted a randomized controlled trial to prevent excessive gestational weight gain with women with low-risk pregnancies. The women were enrolled at less than 20 weeks gestation, with body mass index (BMI) greater than 19.8. The control group received the usual care during their pregnancy, while the intervention group received written and oral information about appropriate gestational weight gain, exercise and healthy eating during pregnancy. They received bi-weekly newsletters emphasizing these three messages. All women in the intervention received goal-setting assistance and feedback. If women continued to exceed the gestational weight gain goal, they received either face-to-face counselling at their clinic visits or phone-based counselling. They also received increasingly structured behavioural goals, both for physical activity and for diet. The study was statistically effective for the normal-weight women; in the control group, 58 per cent of the women exceeded the Institute of Medicine recommendations, compared with 33 per cent in the intervention group. In the overweight group, there was no statistically significant difference. There was a strong correlation between weight gain during pregnancy and weight retention one-year postpartum in normal-weight women, arguing for interventions during the pregnancy period to prevent weight retention one-year postpartum.

### **8.4 Universal Prenatal Education Programs**

A systematic review assessed the effects of prenatal education programs on knowledge acquisition, anxiety, sense of control, pain, support, breastfeeding, infant care abilities, and psychological and social adjustment. The Cochrane Pregnancy and Childbirth Group trials register, the Cochrane Controlled Trials Register, and other databases were searched to December 1999. Randomized controlled trials of any structured educational program provided during pregnancy by an educator to either parent, which included information related to pregnancy, birth or parenthood, were included. The educational interventions could have been provided on an individual or group basis. Educational interventions directed exclusively to either increasing breastfeeding success or reducing smoking were excluded, since reviews of these topics can be found elsewhere in the Cochrane Library. Six trials, involving 1,443 women, were included. Twenty-two trials were excluded. The largest of the included studies (n = 1,275) examined an educational intervention to increase vaginal birth after caesarean section. This high quality study showed similar rates of vaginal birth after caesarean section in “verbal” and

“document” groups, relative risk (RR) should read 1.1 (95% CI 1.0–1.2) 1.08 (95% CI 0.97–1.21). More general educational interventions were the focus of the other 5 studies (combined  $n = 168$ ). The methodological quality of these trials is uncertain, since details of the randomization procedure, allocation concealment and/or participant accrual/loss were not reported. No consistent results were found. The effects of general antenatal education for childbirth and/or parenthood remain unknown (Gagnon, 2000 A).

With regard to informed care, the 2008 NICE Guidelines recommend that pregnant women should be offered opportunities to attend participant-led antenatal classes, including breastfeeding workshops.

## **8.5 Group Prenatal Care**

Centering Pregnancy, a group prenatal care program, was developed from a research-based model of holistic prenatal care, incorporating “risk assessment, education, and support for pregnant women in gestational age cohort groups” (Carlson & Lowe, 2006, p. 218). In the United States, the role of prenatal education on pregnancy outcomes, psychosocial function and patient satisfaction has been examined using this program (Ickovics et al., 2007; Carlson & Lowe, 2006).

The findings associated with the group prenatal care revealed:

- Less preterm births. These findings are contrary to previous research that indicated this comparison was not statistically significant for participants in Centering Pregnancy (Carlson & Lowe, 2006).
- A reduced number of preterm babies among African-American participants (Ickovics et al., 2007).
- Statistically improved rates of breastfeeding and psychosocial outcomes (Ickovics et al., 2007).
- Group prenatal care costs did not represent a significant difference in raw costs relative to delivery care costs (Ickovics et al., 2007).

## **8.6 Enhanced Support During Pregnancy**

A search was done of the Cochrane Pregnancy and Childbirth Group trials register for randomized trials of additional support during at-risk pregnancy by either a professional (social worker, midwife or nurse) or specially trained lay person, compared to routine care. Additional support was defined as some form of emotional support (e.g., counselling, reassurance, sympathetic listening) and information or advice, or both, either in home visits or during clinic appointments, and could include tangible assistance (e.g., transportation to clinic appointments, assistance with the care of other children at home). Eighteen trials, involving 12,658 women, were included. The trials were generally of good to excellent quality, although 3 used an allocation method likely to introduce bias. Programs offering additional social support for at-risk pregnant women were not associated with improvements in any perinatal outcomes, but there was a reduction in the likelihood of caesarean birth and an increased likelihood of elective

termination of pregnancy. Some improvements in immediate maternal psychosocial outcomes were found in individual trials (Hodnett & Fredericks, 2003 A).

## **8.7 Access to Primary Maternity Care**

Lack of adequate obstetrical care presents a situation of vulnerability for pregnant women. In BC, there has been a decline in clinicians available to provide this specialized care (Ministry of Health, Chronic Disease Management, 2007). Rural BC women are particularly affected by the lack of obstetrical care, as seen in the increasing numbers who deliver their babies outside of their home community.

The Multidisciplinary Collaborative Primary Maternity Care Project (MCP2) is a multidisciplinary, collaborative program that supports improving accessibility and quality of maternal services for Canadian women. Funding for MCP2 is provided by the Primary Health Care Transition Fund of Health Canada. The multidisciplinary, collaborative, primary maternal care model

is designed to promote the active participation of each discipline in providing quality care. It is women-centered, respects the goals and values of women and their families, provides mechanisms for continuous communication among caregivers, optimizes caregiver participation in clinical decision-making (within and across disciplines) and fosters respect for the contributions of all disciplines (Multidisciplinary Collaborative Primary Maternity Care Project, 2006).

The MCP2 offers guidelines for evaluation. No evaluation report was available at the time of this review.

Potential positive outcomes identified from adopting this approach include improved:

- Family and provider satisfaction.
- Continuity of care.
- Health outcomes of mother and baby.
- Efficiency of time.
- Effective use of human resources.
- Working relationships.

Other outcomes include decreased:

- Length of hospital stay.
- Registered complaints (MCP2, 2006).

In BC, the South Community Birth Program (SCBP) was established in January 2004 as a primary maternity care program, to address the needs of a diverse, low-risk, childbearing population (MCP2, 2005). The program provides inclusive prenatal care, birth at BC Women's

Hospital and Health Centre, postpartum and infant care (up to six weeks), doula support and referral back to a family physician (MCP2, 2005).

## **8.8 Physiological Birth – Caesarean Section Consensus Statement Summary**

Normal physiological birth is a measurement of the process of labour. In defining normal birth, two factors should be taken into consideration: the risk status of the delivery and the course of labour and delivery. The World Health Organization, in efforts to promote, support and protect normal birth, defines it as “spontaneous in onset, low-risk at the start of labour and remaining so throughout. The infant is born spontaneously in the vertex position between 37 and 40 weeks gestation. After delivery, the mother and infant are in good condition” (World Health Organization, 1997).

A number of women, whose pregnancies are considered high risk, do proceed with a normal course of labour and delivery. This should be considered in education and service provision.

Historically, British Columbia has had the highest or second highest rate of caesarean birth in Canada. In 2005, the provincial rate reached a high of 30.4 per cent. Delivery by caesarean section poses specific risks to maternal and newborn health, uses considerable resources and strains the public health system. Caesarean deliveries are associated with higher costs than that of vaginal delivery. Technological and socio-economic changes play a significant role in maternal health care and attitudes about pregnancy and childbirth (British Columbia Perinatal Health Program, 2008). Increases in caesarean births are associated with a wide range of factors, including maternal age and health, present and past pregnancies and births, obstetric indication, type of provider and malpractice pressure (British Columbia Perinatal Health Program, 2008, p. 27).

The British Columbia Perinatal Health Program Caesarean Birth Task Force has published a report on caesarean birth. Selected guidelines are reproduced below:

- For the majority of women birth is a natural, physiologic process. Values of individual families, cultures and communities must be reflected in care models, respecting choice and autonomy.
- The best caesarean rate is one that is associated with optimal outcomes for mothers and for babies. It is a balance between established benefits and risks for mother and baby, and avoiding unnecessary interventions.
- The focus should not be on the caesarean birth rate, but on providing the best possible care and birth experience for individual women and their families.
- All women in BC should have access to comprehensive and culturally sensitive maternity care as close to their home community as possible.
- All women should understand the impact of age on childbearing, the importance of healthy weight and physical fitness. Care providers need to be able to discuss the risks and benefits of interventions and provide evidenced-based information.

- Care should be woman- and baby-centred to ensure that every family gets the best possible care. Collaborative models should be implemented across the province with priority to smaller centres.
- Follow the best practice guidelines (e.g., SOGC and BC Perinatal Health Program) to help achieve optimal outcomes.
- All care providers should regularly participate in ongoing continuous quality improvements local practice and audit reviews.

## **8.9 Interventions with Strong Evidence of Efficacy in the Prenatal Period**

### **8.9.1 Prenatal Screening for Birth Defects**

The National Institute for Health and Clinical Excellence (NICE) in the United Kingdom has recently published guidelines on routine antenatal care (2008) based on an extensive review of the evidence. Further details are included in the guidelines, including summaries of the studies and grading of the evidence. The guidelines are available online at <http://www.nice.org.uk/guidance/index.jsp?action=byID&o=11947#summary>.

In their review, NICE found evidence of a gap in women's knowledge about prenatal screening.

There is high-quality evidence to indicate that pregnant women do not have sufficient knowledge to make the informed decisions that need to be made regarding Down's syndrome screening and they find the concept of risk calculation particularly difficult to understand. Providing them with more information does not lead to an increase in their anxiety level. Good evidence from a cohort study shows that women taking part in prenatal screening programmes are inadequately informed regarding aspects of testing and the further pathway of management when an increased risk is identified. Results from a cross-sectional study indicate that women undergoing a serum screening test for Down's syndrome develop less attachment for the baby owing to the uncertainty surrounding interpretation of the test result. Evidence from a review of literature shows that pregnant women from South Asia have a lower rate of uptake, acceptance and utilisation of screening tests. For the screening tests in general, white women and women from socio-economically advantaged sections of society have a higher uptake, better knowledge, more consistency of actions related to positive attitude, and a higher rate of informed decision making when compared with women from South Asia and socio-economically disadvantaged sections of society (NICE, 2008).

### **8.9.2 Recommendations on Screening for Fetal Anomalies**

NICE, 2008 A

- Ultrasound screening for fetal anomalies should be routinely offered, normally between 18 weeks 0 days and 20 weeks 6 days.

- At the first contact with a health care professional, women should be given information about the purpose and implications of the anomaly scan to enable them to make an informed choice as to whether or not to have the scan. The purpose of the scan is to identify fetal anomalies and allow:
  - Reproductive choice (termination of pregnancy).
  - Parents to prepare (for any treatment/disability/palliative care/termination of pregnancy).
  - Managed birth in a specialist centre.
  - Intrauterine therapy.
- Women should be informed of the limitations of routine ultrasound screening and that detection rates vary by the type of fetal anomaly, the woman's body mass index and the position of the unborn baby at the time of the scan.
- If an anomaly is detected during the anomaly scan, pregnant women should be informed of the findings to enable them to make an informed choice as to whether they wish to continue with the pregnancy or have a termination of pregnancy.
- Fetal echocardiography involving the four-chamber view of the fetal heart and outflow tracts is recommended as part of the routine anomaly scan.
- Routine screening for cardiac anomalies using nuchal translucency is not recommended.
- When routine ultrasound screening is performed to detect neural tube defects, alpha-fetoprotein testing is not required.
- Participation in regional congenital anomaly registers is strongly recommended to facilitate the audit of detection rates.

### 8.9.3 Recommendations on Screening for Down's Syndrome

NICE, 2008 A

- All pregnant women should be offered screening for Down's syndrome. Women should understand that it is their choice to embark on screening for Down's syndrome.
- Screening for Down's syndrome should be performed by the end of the first trimester (13 weeks 6 days), but provision should be made to allow later screening (which could be as late as 20 weeks 0 days) for women booking later in pregnancy.
- The "combined test" (nuchal translucency, beta-human chorionic gonadotrophin, pregnancy associated plasma protein-A) should be offered to screen for Down's syndrome between 11 weeks 0 days and 13 weeks 6 days.

- For women who book later in pregnancy, the most clinically and cost-effective serum screening test (triple or quadruple test) should be offered between 15 weeks 0 days and 20 weeks 0 days.
- When it is not possible to measure nuchal translucency, owing to fetal position or raised body mass index, women should be offered serum screening (triple or quadruple test) between 15 weeks 0 days and 20 weeks 0 days.
- Information about screening for Down’s syndrome should be given to pregnant women at the first contact with a health care professional. This will provide the opportunity for further discussion before embarking on screening. Specific information should include:
  - The screening pathway for both screen-positive and screen-negative results.
  - The decisions that need to be made at each point along the pathway and their consequences.
  - The fact that screening does not provide a definitive diagnosis and a full explanation of the risk score obtained following testing.
  - Information about chorionic villus sampling and amniocentesis.
  - Balanced and accurate information about Down’s syndrome. If a woman receives a screen-positive result for Down’s syndrome, she should have rapid access to appropriate counselling by trained staff.
- The routine anomaly scan (at 18 weeks 0 days to 20 weeks 6 days) should not be routinely used for Down’s syndrome screening using soft markers.
- The presence of an isolated soft marker, with an exception of increased nuchal fold, on the routine anomaly scan should not be used to adjust the *a priori* risk for Down’s syndrome.
- The presence of an increased nuchal fold (6 mm or above) or two or more soft markers on the routine anomaly scan should prompt the offer of a referral to a fetal medicine specialist or an appropriate health care professional with a special interest in fetal medicine.

Table 12 summarizes prenatal interventions where there is evidence of efficacy.

**Table 12: Prenatal Interventions with Evidence of Efficacy**

Intervention	Evidence	Reference
Energy and protein intake and fetal growth	<ul style="list-style-type: none"> <li>• Providing pregnant women with a balanced supplement of energy and protein (a supplementation in which protein provides no more than 25 per cent of the total energy content) modestly increases the growth of the fetus and improves fetal and neonatal survival.</li> <li>• Restriction of energy intake in pregnant women who are overweight or gain excessive weight does not help prevent preeclampsia and adversely affects fetal growth.</li> </ul>	Kramer & Kakuma, 2003 A



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Intervention	Evidence	Reference
Maternal diet and atopic disease in the child	<ul style="list-style-type: none"> <li>The combined data from the three available trials suggest a strong protective effect of maternal antigen avoidance on the incidence of atopic eczema during the child's first 12–18 months of life. Methodological shortcomings in all three trials, however, argue for caution in applying these encouraging results. In particular, the high incidence of atopic eczema in the control groups of all three trials might be explained by non-blinding or de-blinding of the examining physicians. Prescription of an antigen avoidance diet to a high-risk woman during lactation may substantially reduce the child's risk of developing atopic eczema, but better trials are needed.</li> </ul>	Kramer & Kakuma, 2006.
Multivitamin supplementation in preconception and during the first trimester, and birth defects	<ul style="list-style-type: none"> <li>Use of multivitamin supplements preconception and during the first trimester provide protection against:               <ul style="list-style-type: none"> <li>Neural tube defects (random effects OR 0.67, 95% CI 0.58–0.77 in case-control studies; OR 0.52, 95% CI 0.39–0.69 in cohort and randomized controlled studies).</li> <li>Cardiovascular defects (OR 0.78, 95% CI 0.67–0.92 in case-control studies; OR 0.61, 95% CI 0.40–0.92 in cohort and randomized controlled studies).</li> <li>Limb defects (OR 0.48, 95% CI 0.30–0.76 in case-control studies; OR 0.57, 95% CI 0.38–0.85 in cohort and randomized controlled studies).</li> <li>Cleft palate (OR 0.76, 95% CI 0.62–0.93 in case-control studies; OR 0.42, 95% CI 0.06–2.84 in cohort and randomized controlled studies); for oral cleft with or without cleft palate (OR 0.63, 95% CI 0.54–0.73 in case-control studies; OR 0.58, 95% CI 0.28–1.19 in cohort and randomized controlled studies).</li> <li>Urinary tract anomalies (OR 0.48, 95% CI 0.30–0.76 in case-control studies; OR 0.68, 95% CI 0.35–1.31 in cohort and randomized controlled studies).</li> <li>Congenital hydrocephalus (OR 0.37, 95% CI 0.24–0.56 in case-control studies; OR 1.54, 95% CI 0.53–4.50 in cohort and randomized controlled studies).</li> </ul> </li> </ul>	Goh, Bollano, Einarson, & Koren, 2006 A
Folic acid-supplement intake during pregnancy and oral clefts	<ul style="list-style-type: none"> <li>There is a protective effect of folic acid-containing supplement intake during pregnancy on the risk for oral clefts, although this conclusion is tempered by the potential for bias and uncontrolled confounding. Five prospective studies were analyzed, yielding combined relative risks of 0.51 (95% CI 0.32–0.95) for cleft lip/palate; 1.19 (95% CI 0.43, 3.28) for Cleft Palate, and 0.55 (95% CI 0.32,–0.95) for all clefts. Twelve case-control studies were assessed, which resulted in combined relative risks of 0.77 (95% CI 0.65, 0.90) for Cleft Lip/Palate, 0.80 (95% CI 0.69–0.93) for Cleft Palate, and 0.78 (95% CI 0.71–0.85) for all clefts.</li> </ul>	Badovinac, Werler, Williams, Kelsey, & Hayes, 2007 A
Multivitamin supplementation and pediatric cancers	<ul style="list-style-type: none"> <li>Rates of pediatric cancers among the children of women supplemented with multivitamins were compared with non-supplemented women using a random-effects model. There was an apparent protective effect for leukemia (OR 0.61, 95% CI 0.50–0.74), pediatric brain tumours (OR 0.73, 95% CI 0.60–0.88) and neuroblastoma (OR 0.53, 95% CI 0.42–0.68). In conclusion, maternal ingestion of prenatal multivitamins is associated with a decreased risk for pediatric brain tumours, neuroblastoma and leukemia. Presently, it is not known which constituent(s) among the multivitamins confer this protective effect.</li> </ul>	Goh, Bollano, Einarson, & Koren, 2007 A

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Intervention	Evidence	Reference
Multivitamin supplements	<ul style="list-style-type: none"> <li>Women taking vitamin supplements may be less likely to develop preeclampsia.</li> </ul>	Rumbold & Crowther, 2005
Vitamin D supplementation	<ul style="list-style-type: none"> <li>All women should be informed at the booking appointment about the importance for their own and their baby’s health of maintaining adequate vitamin D stores during pregnancy and whilst breastfeeding. In order to achieve this, women may choose to take 10 micrograms of vitamin D per day, as found in the Healthy Start multivitamin supplement. Particular care should be taken to enquire as to whether women at greatest risk are following advice to take this daily supplement. These include:               <ul style="list-style-type: none"> <li>Women of South Asian, African, Caribbean or Middle Eastern family origin.</li> <li>Women who have limited exposure to sunlight, such as women who are predominantly housebound, or usually remain covered when outdoors.</li> <li>Women who eat a diet particularly low in vitamin D, such as women who consume no oily fish, eggs, meat, vitamin D-fortified margarine or breakfast cereal.</li> <li>Women with a pre-pregnancy body mass index above 30 kg/m<sup>2</sup>.</li> </ul> </li> </ul>	NICE Guidelines, 2008

**8.10 Other Interventions not Proven to Improve Reproductive Health**

Table 13 summarizes interventions that are not proven to improve reproductive health.

**Table 13: Interventions not Proven to Improve Reproductive Health**

Intervention	Evidence	Reference
Repeated maternal weighing		NICE, 2003 <b>A</b>
Breast examination		NICE, 2003 <b>A</b>
Pelvic examination		NICE, 2003 <b>A</b>
Screening for postnatal depression using EPDS		NICE, 2003 <b>A</b>
Prenatal screening for the following		
<ul style="list-style-type: none"> <li><i>Chlamydia trachomatis</i>.</li> </ul>		Nelson, Saha, & Helfand, 2001
<ul style="list-style-type: none"> <li>Cytomegalovirus.</li> </ul>		NICE 2003 <b>A</b>
<ul style="list-style-type: none"> <li>Hepatitis C virus.</li> </ul>		NICE 2003 <b>A</b>
<ul style="list-style-type: none"> <li>Group B streptococcus.</li> </ul>		NICE 2003 <b>A</b>
<ul style="list-style-type: none"> <li>Toxoplasmosis.</li> </ul>		NICE 2003 <b>A</b>
<ul style="list-style-type: none"> <li>Bacterial vaginosis</li> </ul>		Guides, Mahon, Aicken, & Helfand, 2001
<ul style="list-style-type: none"> <li>Gestational diabetes mellitus (including dipstick testing for glycosuria)</li> </ul>		NICE 2003 <b>A</b>

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<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Iron supplements and any reproductive or newborn outcomes	<ul style="list-style-type: none"> <li>Women who receive daily prenatal iron supplementation are less likely to have iron deficiency and iron-deficiency anaemia at term as defined by current cut-off values. Further studies are needed to assess the effects of routine prenatal supplementation with iron or a combination of iron and folic acid on clinically important maternal and infant outcomes.</li> </ul>	Pena-Rosas & Viteri, 2006 A
Magnesium supplementation	<ul style="list-style-type: none"> <li>In the analysis of all trials, oral magnesium treatment from before the 25th week of gestation was associated with a lower frequency of preterm birth, a lower frequency of low birth weight and fewer small-for-gestational-age infants compared with placebo. In addition, magnesium-treated women had fewer hospitalizations during pregnancy and fewer cases of antepartum hemorrhage than placebo-treated women. In the analysis, excluding the cluster randomized trial, the effects of magnesium treatment on the frequencies of preterm birth, low birth weight and small for gestational age were not different from placebo. Of the seven trials included in the review, only one was judged to be of high quality. Poor quality trials are likely to have resulted in a bias favouring magnesium supplementation.</li> </ul>	Makrides & Crowther, 2001
Marine oil and other prostaglandin precursor	<ul style="list-style-type: none"> <li>There is not enough evidence to support the routine use of marine oil, or other prostaglandin precursor supplements, during pregnancy to reduce the risk of preterm birth, low birth weight or small-for-gestational age.</li> </ul>	Makrides et al., 2006
Antioxidants for the prevention of small for gestational age, preterm birth and low birth weight	<ul style="list-style-type: none"> <li>Women receiving antioxidants compared with control or placebo also had a reduced risk of having a small-for-gestational-age infant (RR 0.64, 95% CI 0.47–0.87, 3 trials, 634 women), their infants had a greater mean birth weight (weighted mean difference 91.83 g, 95% CI 11.55–172.11, 3 trials, 451 women), but they were more likely to give birth preterm (RR 1.38, 95% CI 1.04–1.82, 3 trials, 583 women). According to the authors, there were insufficient data to make recommendations for adoption of the intervention.</li> </ul>	Rumbold et al., 2005
Maternal nutrient supplementation	<ul style="list-style-type: none"> <li>There is not enough evidence to evaluate the use of supplemental carnitine, solcoseryl, glucose or galactose for suspected impaired fetal growth. The studies were too few to assess clinical outcomes adequately.</li> </ul>	Say, Gulmezoglu, & Hofmeyr, 2006
Multiple-micronutrient supplementation	<ul style="list-style-type: none"> <li>Analyses revealed no added benefit of multiple-micronutrient supplements compared with iron and folic acid supplementation for birth weight, maternal anemia, preterm birth, or perinatal mortality.</li> </ul>	Haider & Bhutta, 2006
Pyridoxine (vitamin B6) supplementation	<ul style="list-style-type: none"> <li>There is not enough evidence to detect clinical benefits of vitamin B6 supplementation in pregnancy and or labour, other than one trial suggesting protection against dental decay.</li> </ul>	Thaver, Saeed, & Bhutta, 2006

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<b>Intervention</b>	<b>Evidence</b>	<b>Reference</b>
Nutritional advice	<ul style="list-style-type: none"> <li>Nutritional advice appears effective in increasing pregnant women's energy and protein intake, but the implications for fetal, infant or maternal health cannot be judged from the available trials.</li> </ul>	Kramer & Kakuma, 2006
Maternal diet and atopic disease in the child	<ul style="list-style-type: none"> <li>Maternal antigen-avoidance diet for high-risk women during pregnancy is unlikely to reduce the infant's risk of atopic diseases. An antigen-avoidance diet may adversely affect maternal and/or fetal nutrition. More studies are required to determine whether an antigen avoidance diet for high-risk women during lactation may reduce the child's risk of developing atopic eczema.</li> </ul>	Kramer & Kakuma, 2006
Treatments for iron-deficiency anaemia	<ul style="list-style-type: none"> <li>This review provides inconclusive evidence on the effects of treating iron-deficiency anaemia in pregnancy, due to the shortage of good-quality trials.</li> </ul>	Cuervo & Mahomed, 2006 <b>A</b>
Vitamin C supplementation	<ul style="list-style-type: none"> <li>Women supplemented with vitamin C compared with placebo were at increased risk of giving birth preterm (RR 1.38, 95% CI 1.04–1.82). Significant heterogeneity was found for neonatal death and preeclampsia. For preeclampsia, women supplemented with vitamin C were at decreased risk when using a fixed-effect model (RR 0.47, 95% CI 0.30–0.75); however, this difference could not be demonstrated when using a random-effects model (RR 0.52, 95% CI 0.23–1.20).</li> </ul>	Rumbold & Crowther, 2006
Vitamin E supplementation	<ul style="list-style-type: none"> <li>Women supplemented with vitamin E in combination with other supplements compared with placebo were at decreased risk of developing clinical preeclampsia (RR 0.44, 95% CI 0.27–0.71) using fixed-effect models; however, this difference could not be demonstrated when using random-effects models (RR 0.44, 95% CI 0.16–1.22). There were no differences between women supplemented with vitamin E compared with placebo for other outcomes.</li> </ul>	Rumbold, Middleton, & Crowther, 2006
Zinc supplementation	<ul style="list-style-type: none"> <li>Apart from possible reduction in induction of labour, caesarean section and preterm delivery in the supplemented group, no other differences were detected between groups of women who had zinc supplementation and those who did not.</li> </ul>	Mahomed, 2000
Multivitamin supplements and miscarriage	<ul style="list-style-type: none"> <li>Taking vitamin supplements, alone or in combination with other vitamins, prior to pregnancy or in early pregnancy, does not prevent women from experiencing miscarriage or stillbirth.</li> </ul>	Rumbold & Crowther, 2005
Physical activity	<ul style="list-style-type: none"> <li>Regular aerobic exercise during pregnancy appears to improve (or maintain) physical fitness. Available data are insufficient to infer important risks or benefits for the mother or infant.</li> </ul>	Kramer & McDonald, 2006 <b>A</b>
Miscarriage and bed rest	<ul style="list-style-type: none"> <li>There is insufficient evidence of high quality that supports a policy of bed rest in order to prevent miscarriage in women with confirmed fetal viability and vaginal bleeding in the first half of pregnancy.</li> </ul>	Aleman, Althabe, Belizan, & Bergel, 2005

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Intervention	Evidence	Reference
Early discharge	<ul style="list-style-type: none"> <li>No statistically significant differences in infant or maternal readmissions were found in six trials. Three trials had mixed results showing either no significant difference or results favouring early discharge for the outcome of maternal depression, although none of the trials used a well-validated, standardized instrument.</li> </ul>	Brown et al., 2006 A
Type of provider; number of visits	<ul style="list-style-type: none"> <li>A reduction in the number of prenatal visits was not associated with an increase in any of the negative maternal and perinatal outcomes reviewed.</li> </ul>	Villar et al., 2006 A
Preterm birth prevention educational programs	<ul style="list-style-type: none"> <li>No significant benefits were found for preterm birth education programs in preventing neonatal death (cumulative RR 1.00, 95% CI 0.99–1.01), low birth weight rates (RR 0.99, 95% CI 0.88–1.11), or preterm delivery rates (RR 1.08, 95% CI 0.92–1.27). The only statistically significant effect of preterm birth education programs appears to be an increase in the frequency at which preterm labour is diagnosed (RR 1.71, 95% CI 1.41–2.08).</li> </ul>	Hueston et al., 1995 A
Support/education/counselling for vaginal birth	<ul style="list-style-type: none"> <li>Two randomized controlled trials met the inclusion criteria. Both studies aimed to reduce caesarean births by encouraging women to attempt vaginal delivery. One used a program of prenatal education and support, and the other cognitive therapy to reduce fear. Neither intervention used in these trials made any difference to clinical outcomes.</li> </ul>	Horey, Weaver, & Russell, 2006 A

## 8.11 Summary

- Although prenatal education is a core public health program, the reviews of the evidence suggest that it improves outcomes for babies of adolescents and/or low-income women only.
- Achievement of weight gain during pregnancy within the Institute of Medicine guidelines can improve birth outcomes. There is emerging evidence that weight management can be safely accomplished during pregnancy for women of normal weight.
- Providing women with advice about healthy birth intervals should be part of routine prenatal care.
- Risk for preterm birth may be lowered by smoking cessation, screening, treatment of maternal infections and promotion of a healthy diet.
- A calorie and protein nutritional supplement may improve fetal growth and development.
- Multivitamin supplements during the preconception period and first trimester may reduce the risk of birth defects.
- Folic acid supplements during pregnancy may reduce the risk of cleft palate/lip.
- Multivitamin supplements during the prenatal period may reduce the risk of some childhood cancers.

- Universal prenatal education programs, moderate alcohol consumption, routine screening for some infections and single vitamin or mineral supplements other than folic acid or calcium have not been shown to affect reproductive health outcomes. While some controversy exists on improving intervention rates in labour, improved breastfeeding rates and reduced depression rates are noted with enhanced social and emotional support during pregnancy (Goldbort, 2002; Kennell, Klaus, McGrath, Robertson, & Hinkley, 1991; Scott, Klaus, & Klaus, 1999). These are important factors in women's and babies' long-term health.

## **9.0 SITUATIONS THAT INCREASE VULNERABILITY FOR ADVERSE OUTCOMES**

### **9.1 Occupational Risks and Interventions**

Occupational factors around reproductive health include exposure to harmful substances in the work environment, effect of work on the women and fetus, and the evaluation of lifestyle programs implemented in the workplace.

#### **9.1.1 Risk Factors**

In an in-depth review of occupational exposures and reproductive outcomes among women workers, there was some evidence found of spontaneous abortion as a presumed result of exposure from a variety of chemicals and minerals, pesticides, physical agents, ergonomic factors and stress. It appears that the evidence is sufficient to warrant the maximum protection of pregnant women to several well-documented occupational risk factors. These include anaesthetic gases, antineoplastic drugs, heavy metals and solvents; heavy physical work; and irregular work schedules. For other work risks, such as exposure to non-ionizing radiation and psychosocial work stress, the evidence is not conclusive (Figa-Talamanca, 2006). Another review focusing on occupational exposure and birth defects did not find a convincing link (Thulstrup & Bonde, 2006 **A**).

Preterm birth among working women may be related to hours worked per day or week and to adverse working conditions (Luke et al., 1995 **B**). A case-control study of 210 nurses whose infants were delivered prematurely (<37 weeks) (cases) and 1,260 nurses whose infants were delivered at term ( $\geq 37$  weeks) (controls) found factors significantly associated with preterm birth included hours worked per week ( $p < 0.002$ ), per shift ( $p < 0.001$ ) and while standing ( $p < 0.001$ ); noise ( $p = 0.005$ ); physical exertion ( $p = 0.01$ ); and occupational fatigue score ( $p < 0.002$ ). The adjusted odds ratios were 1.6 ( $p = 0.006$ ) for hours worked per week ( $\leq 36$  versus  $> 36$ ) and 1.4 ( $p = 0.02$ ) for fatigue score  $< 3$  versus  $\geq 3$ .

The risk of having a small-for-gestational-age infant increases with an irregular or shift-work schedule alone and with a cumulative index of the following occupational conditions: night hours, irregular or shift-work schedule, standing, lifting loads, noise, and high psychological demand combined with low social support. When the conditions were not eliminated, the risk increased with the number of conditions ( $P_{\text{trend}} = .004$ ; odds ratios = 1.00, 1.08, 1.28, 1.43, and 2.29 for 0, 1, 2, 3, and 4–6 conditions, respectively). Elimination of the conditions before 24 weeks of pregnancy brought the risks close to those of unexposed women (Croteau, Marcoux, & Brisson, 2006 **B**).

### **9.2 Women Experiencing Violence and Abuse**

#### **9.2.1 Prevalence and Outcomes**

Women in abusive or potentially abusive relationships report that their abuse began during pregnancy and continued afterward, or that it escalated during pregnancy (Hart & Jamieson, 2001). Coercion and control over the woman may include: ability to use or choose contraception,

and restrictions about abortion, pregnancy, access to health care or the use of medication to cope with labour and delivery (Hart & Jamieson, 2001). Increased rates of reproductive disorders and poor pregnancy and fetal outcomes are associated with intimate partner violence (IPV) (Plitcha, 2004). It is important to consider the influence of violence against a woman's reproductive health throughout her childbearing years.

Pregnancy is associated with both initiation and exacerbation of domestic violence. In Canada, the rate of spousal violence directed against women was reported as 8 per cent in 1999, a decline from the rate of 12 per cent reported in 1993. Two Canadian studies have estimated the prevalence of physical abuse during pregnancy to be between 5.7 per cent and 6.6 per cent (Stewart & Cecutti, 1993; Stewart, 1994). A study at an inner city family practice found 7.6 per cent of respondents reported physical or sexual abuse in 2006 (Ahmad, Hogg-Johnson, Stewart, & Levinson, 2007). In 1999, Aboriginal women reported a rate of spousal violence of 20 per cent (Mayer & Liebschutz, 1998; Muhajarine & D'Arcy, 1999; Statistics Canada, 2003b). Stewart and Cecutti's (1993) results showed that among those physically abused during pregnancy, the first episode of physical abuse occurred during the pregnancy in 14 per cent of cases, and 86 per cent reported previous abuse. In addition, 64 per cent of the abused women reported increased abuse during pregnancy. Of women who were abused during pregnancy, approximately 18 per cent reported that they had suffered a miscarriage or other internal injuries as a result of the abuse (Tan & Gregor, 2006).

### 9.2.2 Evidence About Interventions to Prevent Abuse Toward Women

The United States Preventive Services Task Force (USPSTF) found no direct evidence that screening for family and IPV leads to decreased disability or premature death. They found no existing studies that determine the accuracy of screening tools for identifying family and IPV. They found fair to good evidence that interventions reduce harm to children when child abuse or neglect has been assessed. They found limited evidence as to whether interventions reduce harm to women (USPSTF, 2004). The Society of Obstetricians and Gynaecologists of Canada drew similar conclusions (Cherniak et al., 2005). The American College of Obstetricians and Gynecologists (ACOG) (2008) and the Society of Obstetricians and Gynaecologists of Canada recommend screening for abuse in the perinatal period despite the lack of evidence of its value.

At least three systematic reviews of screening for IPV found insufficient evidence to recommend for or against routine screening. For pregnant women, clinical interventions that include counselling to increase safety behaviours have resulted in the adoption of these practices and a reduction in abusive incidents.

A systematic review identified 10 relevant studies designed to prevent or reduce spousal abuse toward women. The interventions included: individual counselling, professionally led support groups, screening and outreach through advocates or mentors. An analysis of the studies found a number of methodological weaknesses. Studies that implemented a screening protocol reported significantly improved identification of pregnant women who were abused. Although limited in their findings, all three interventions that used empowerment or advocacy frameworks reported positive significant outcomes for reducing abuse. All studies were conducted in urban settings with a primarily low-income cohort. The majority of participants (83 per cent) in these studies were pregnant (Public Health Research, Education & Development Program [PHRED], 2001).



A clinical trial to test a program of telephone interventions found significantly [ $F(2,146) = 5.11, p = .007$ ] more adopted safety behaviours reported by women in the intervention group than by women in the control group at both the three-month [ $F(91,74) = 19.70, p < .001$ ] and six-month [ $F(1,74) = 15.90, p < .001$ ] interviews. The effect size (ES) of the intervention was large at three months (ES = 1.5) and remained substantial at six months (ES = 0.56) (McFarlane et al., 2002 A).

A randomized, two-arm, clinical trial was completed in urban public primary care clinics with abused women who were assessed as positive for physical or sexual abuse within the preceding 12 months. Two interventions were tested: a wallet-sized referral card and a 20-minute nurse case management protocol. Two years following treatment, both treatment groups of women reported significantly ( $p < .001$ ) fewer threats of abuse, assaults, danger risks for homicide, and events of work harassment, and there were no significant differences between groups. Compared to baseline, both groups of women adopted significantly ( $p < .001$ ) more safety behaviours by 24 months; community resource use declined significantly ( $p < .001$ ) for both groups. There were no significant differences between groups (McFarlane, Groff, O'Brien, & Watson, 2006 A). All children improved significantly ( $p < .001$ ) on Child Behavior Checklist scores from intake to 24 months, regardless of which treatment protocol their mother received (McFarlane, Groff, O'Brien, & Watson, 2005 A).

Health care provides an opportunity to promote safety in women. Women have reported that they will disclose the abuse that is happening to them when:

- A trusting relationship exists with their care provider.
- Specific abuse questions were asked by the care provider.
- The women needed the help of the care provider (Lutz, 2005).

In BC, the evidence-based guideline for IPV during the perinatal period was published by the British Columbia Perinatal Health Program in 2003. The role of the health care provider, as well as best practices when providing perinatal health care for a women experiencing IPV, are outlined in the guideline.<sup>16</sup> This guideline focuses on improving the health services experienced by women and thereby, improving health outcomes.

The literature on the efficacy of assessing for IPV with respect to improving the safety of women is evolving. It is known that women are willing to be asked direct questions about violence, that they will use information provided to them, and that their ability to leave a violent relationship is related to their access to resources. A systematic review may note insufficient evidence to support screening and intervention as leading to improved outcomes for women identified as abused.

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<sup>16</sup> The guideline on *Intimate Partner Violence During the Perinatal Period* can be found at <http://www.rcp.gov.bc.ca/guidelines/IPV.July.2003.Final.pdf>.

9.2.3 Society of Obstetricians and Gynaecologists of Canada Guidelines on Women Experiencing Violence and Abuse

Cherniak et al., 2005

Since health care affords the opportunity to promote safety in woman, and increased rates of reproductive disorders and poor pregnancy and fetal outcomes are associated with IPV, both the American College of Obstetricians and Gynecologists (ACOG) (2008) and the Society of Obstetricians and Gynaecologists of Canada (SOGC) recommend screening for abuse in the perinatal period. The SOGC has published guidelines on managing women who are experiencing interpersonal violence.

**Asking about IPV (Intimate Partner Violence)**

- Training of health providers may reduce barriers to asking about violence.
- Most women do not disclose IPV spontaneously because of multiple perceived barriers; however, they often choose to disclose when asked.
- Several validated questionnaires exist for enquiring about IPV; however, the nature of the clinician–patient relationship and how questions are asked seem more important than the screening tool.

Recommendation

- Providers should include queries about violence in the behavioural health assessment of new patients, at annual preventive visits, as a part of prenatal care and in response to symptoms or conditions associated with abuse. **(B)**
- Women considered the provision of referrals to useful services (advocacy, job training and financial support) to be the most important role for health care professionals.

Recommendation

- Application of the Stages of Change Model to the counselling of women experiencing IPV requires further evaluation and research. **(A)**

**Professional Support and Coordination**

- A comprehensive strategy of service development and prevention of IPV requires the coordinated response of health and community workers.
- Administrative support and training sessions improve the ability of residents and professionals to identify and assist abused women.

Recommendations

- Professional organizations, accreditation bodies and institutions should set standards and support quality control measures for programs addressing IPV. **(B)**

- Providers need a supportive environment, ongoing training, appropriate human resources (i.e., multidisciplinary teams), strong links to the community and effective referral networks. **(B)**
- Institutions and clinicians' offices should have protocols for IPV, handouts for clients and up-to-date lists of community resources. **(B)**

### **Strategies for Supporting Women Experiencing IPV**

#### Recommendations

- Secure and confidential environments, well-trained staff, printed and visual patient resources, and provider tools such as checklists, documentation aids and facilitated referrals are necessary for the facilitation of IPV disclosure. **(B)**
- Providers should be caring, non-judgmental and respectful in their approach to asking about IPV. **(B)**
- Questions about IPV should be behaviour-specific. **(B)**
- Essential elements of health-sector response include documentation, risk assessment, addressing the safety of children present in the home, facilitation of a safety plan and effective referral and follow-up. **(B)**
- Providers should assess women who disclose violence for depression and suicide risk. **(B)**
- Women disclosing the presence of children at risk should be assisted by the reporting health professional in contacting their local child welfare agency. **(B)**

## **9.3 Women in Corrections**

Imprisoned women are more likely to deliver prematurely and have a low birth weight baby than population control women. However, when compared with a similarly disadvantaged group, imprisoned women are less likely to have a stillbirth or low birth weight baby, suggesting imprisonment may have a beneficial effect (Knight & Plugge, 2005 **A**). Other studies of incarcerated women show similar positive effects on pregnancy outcomes (Barkauskas, Low, & Pimlott, 2002; Bell et al., 2004a **B**; Bell et al., 2004b **B**).

## **9.4 Lesbians and Transgendered Individuals**

### 9.4.1 Lesbian Women

Lesbian women (and gay men) are represented in all racial, economic, geographic, religious, cultural and age groups as well as family and relationship structures (Bonvicini & Perlin, 2003). Gender, as a social determinant of health, influences the unique challenges related to promoting the reproductive health of lesbians and transgendered individuals. Challenges include:

- Accessing reproductive health screening/services.
- Use of alcohol, tobacco and other substances.

- Support for perinatal mental ill-health.
- Accessing a supportive perinatal health care provider.
- Accessing perinatal health care services that are attentive to the needs of same-sex co-parents.

Canadian lesbians use the health care system at approximately the same frequency as other women but more often than American lesbian women. Both American and Canadian lesbians are less likely to undergo screening tests, specifically Pap smears, mammograms and breast examinations. North American lesbian women use alcohol, smoke and use street drugs more often than women in general, a concern in relation to perinatal health (Davis, 2000; Moran, 1996).

Although lesbian and heterosexual mothers share many aspects of the transition to parenthood, lesbian mothers may differ on a number of variables that have been previously associated with perinatal mental health; for example, lesbian mothers may be more likely to lack social support, especially from their families of origin, and be exposed to additional stress due to discrimination. However, the likelihood that most lesbian pregnancies are planned, and that there is usually relatively equal division of childcare, may offer protection from perinatal depression (Ross, 2005).

Lesbian women considering parenting face unique challenges in finding a health care provider, exploring options for conception, securing legal implications of same-sex parenthood and involving their partner (McManus, Hunter, & Renn, 2006). Lesbian co-parents may experience misunderstanding, questions, or ignorance of their role by health care providers, friends and society. The non-childbearing partners may also face stressors such as invisibility and lack of support, particularly from their work and social communities.

Of particular interest to public health is the fact that although lesbian women initially expressed concerns with respect to “booking”, antenatal classes and postpartum care, a clear majority of respondents (35) felt the maternity care they received met their physical, emotional and social needs (Wilton & Kaufmann, 2000). In support of the benefits of breastfeeding, lesbian co-parents should be educated regarding the option of breastfeeding through induced lactation (Kenney & Tash, 1992).

#### 9.4.2 Transgendered Individuals

Transgender (or transsexual) refers to people who for various reasons identify with a gender identity that differs from their original physiological and psychological status (i.e., as male or female, man or woman). "Transitioning" to another gender may involve dressing and living as a different gender and adopting an identity associated with the opposite biological sex, without surgery. This includes transvestites and cross-dressers (who wear clothes conventionally associated with the opposite sex). Transgender also refers to those who are transitioning between two sexes by taking sex hormones or surgically removing or modifying genitals and reproductive organs. Reproductive health care from sensitive health care providers is important to males transitioning to females or females transitioning to males.

### 9.4.3 Public Health Implications

Public health and other care providers need to provide a message of acceptance and inclusion of lesbian women through the use of strategies to communicate a safe and welcoming environment, to elicit accurate sexual orientation and relationship status of patients, and to communicate consideration of partner and family relationships.

## **9.5 Summary**

- Limiting workplace physical and psychological demands and shift work for pregnant women may improve reproductive health outcomes.
- Evidence of interventions to prevent violence against women is lacking in terms of reproductive health outcomes. Nevertheless, guidelines have been developed to provide guidance to health care providers.
- Prenatal care for women in prisons can improve outcomes.

## **10.0 MALES AND HEALTH STATUS**

### **10.1 Promoting and Protecting Male Reproductive Health**

Promoting the reproductive health of men contributes to a healthy population. However, the available evidence is much less than that for women. Most evidence is derived from studies directed at infertility. Relevant parameters to consider, with respect to male infertility or subfertility, that may be influenced via pre-mordial and primary prevention activities include:

- Injury to reproductive organs.
- Screening and treatment for sexually transmitted infections (STIs).
- Smoking cessation.
- Alcohol use.
- Overweight and obesity.
- Paternal age.
- Exposure to environmental toxins.

Evidence was gathered to address the following outcomes that pertain to male reproductive function: quality and quantity of sperm and semen, structure and function of the testis and concentration of male reproductive hormones. Certain prophylactic measures can prevent future infertility, such as prompt correction of cryptorchidism, testicular torsion, genital infection, and adolescent varicocele, and proper precautions to limit occupational, medical and recreational gonadotoxins (Thompson, 1994).

Bacterial and viral infections of the genital tract may be important aetiological factors for male infertility. Infectious processes may lead to deterioration of spermatogenesis, impairment of sperm function and/or obstruction of the seminal tract. In several studies, the DNA of STI pathogens was detected in semen from a high percentage of asymptomatic male infertility patients, and was associated with poor semen quality. Efforts to diagnose and treat subclinical genital-tract infections should be intensified (Bezold et al., 2007). Most studies on STIs and sperm quality have been completed in Africa. However, the recommendations for investigating infertility include screening for STIs when completing a seminal analysis (Balen & Rutherford, 2007 A). Also, it is important to consider the effect of nonsymptomatic STIs, from a male host, on his partner's reproductive health.

Smoking is a powerful predictor of erectile dysfunction; cessation may restore normal function. Cigarette smoke also exerts adverse effects on sperm motility and count. Although there is no convincing evidence of reduced fertility in male smokers, it is advisable for men to quit smoking should they have marginal semen quality and wish to start a family. Smoking causes substantial urological pathology; these facts can be used to convince patients with urological problems to quit smoking (Mikhilidis, Ganotakis, Papdakis, & Jeremy, 1998).

In recent years, male infertility and subfertility has increased, which is attributed to many factors. Some studies have been directed at the factors influencing quality of semen and suggest combined tobacco and alcohol use have a detrimental effect on semen quality (Kalyani, Basavaraj, & Kumar, 2007). One study aimed to evaluate the effects of alcohol or cigarette consumption on seminal parameters in a large population of men attending an andrology laboratory. This study found that alcohol or cigarette consumption did not alter the seminal parameters. Nevertheless, when the patients with these two habits were compared to those without these habits, a significant reduction in seminal volume, sperm concentration, percentage of motile spermatozoa and a significant increase of the nonmotile viable gametes were detected (Martini et al., 2004).

Overweight and obese men have been reported to have lower sperm counts and hormonal changes, but data are lacking regarding effects on couple fertility. Unfortunately, some findings have not been robust enough and require replication. As such, programs to prevent obesity may improve men's reproductive health. With respect to saving medical costs for infertility, programs directed to preventing obesity in males could be investigated (Sallmén, Sandler, Hoppin, Blair, & Baird, 2006).

In some studies, percentages of normal spermatozoa were reduced, although not significantly, among men with high or low body mass index (Jensen et al., 2004 **B**). Studies to evaluate whether overweight and obesity are related to changes in serum sex hormone concentrations and semen quality identified that overweight and obese men have a markedly changed sex hormone profile in serum, whereas reduction of semen quality, if any, was marginal (Aggerholm, Thulstrup, Toft, Ramlau-Hansen, & Bonde, 2008). When investigating the effect of male obesity on sperm parameters and erectile dysfunction, researchers found that male obesity is associated with increased incidence of low sperm concentration and low progressively motile sperm count (Hammoud et al., 2008).

Although the effect of maternal age on fertility is well known, it is unclear whether paternal age also affects fertility. In a convenience sample of healthy men from a non-clinical setting, semen volume and sperm motility decreased continuously between 22–80 years of age, with no evidence of a threshold (Eskenazi et al., 2003). When the male partner is >50 years of age, the incidence of subfertility and time to pregnancy seem to increase and the pregnancy rates in assisted reproductive technology seem to drop. Age-related changes are known to occur in the testis, including localized changes in spermatogenesis (ESHRE Capri Workshop Group, 2005).

Recent data showed that only a weak association exists between exposure to environmental contaminants and adverse effects on human fertility. However, it is postulated that evidence of chemical exposure and potential health consequences of these exposures highlight the need for further research in this area (Foster, Neal, Han, & Dominguez, 2008). Reproductive pathology in the male represents about 20 per cent of infertility cases. Male infertility may be attributed to a number of causes, including genetic and congenital abnormalities, infection, multisystemic diseases, varicocele, and others; however, a significant number of cases are idiopathic. Global declines in semen quality were suggested to be associated with enhanced exposure to environmental chemicals that act as endocrine disrupters, as a result of our increased use of pesticides, plastics and other anthropogenic materials. A significant body of toxicology data

based upon laboratory and wildlife animals studies suggests that exposure to certain endocrine disruptors is associated with reproductive toxicity. Further examination of the role in human fertility is required (Phillips & Tanphaichitr, 2008).

## **10.2 Men's Involvement in Reproductive Health and Family Planning.**

The shift in focus on men's reproductive health was influenced by the 1994 Cairo (ICPD) Action Plan to promote gender equality and equity, empower women and improve family health in society. Changing and improving the way in which men are involved in reproductive health can only have a positive impact on women's, men's and children's health. Educating and counselling men about contraceptive choices is essential if they are to be supportive of women's reproductive health. Research on new male contraceptive methods must continue if the bias of women shouldering the major responsibility for contraception is to be eliminated (Bustamante-Forest & Giarratano, 2004). However, the idea that men should play an active role in health promotion has not been without its critics, who have posed serious questions about the efficacy of involving men and the effects their involvement would have on women and children. The fact that few interventions have targeted heterosexual men and have been the subject of detailed evaluation suggests that there is a need for more interventions and better evaluations, which would examine not only the process of men's involvement, but also their impact on the lives of both the men themselves and their families (Sternberg & Hubley, 2004). Data from the 2002 National Survey of Family Growth were used to examine utilization of sexual and reproductive health services among 3,611 men aged 20–44 who had ever had sex with a woman. Only 48 per cent of men reported receiving sexual and reproductive health services in the past year. The testicular exam was the most commonly received service (35 per cent), but half of men who had had a testicular exam had received no other sexual and reproductive health services. Levels of unmet need for services among men engaging in sexual risk behaviours were substantial (32–63 per cent). Conclusions suggested that men who have sex with women are not receiving adequate levels of sexual and reproductive health care, and the care they receive is neither comprehensive nor integrated. Standards of clinical care need to be defined and communicated to men and providers (Kalmuss & Tatum, 2007).

## **10.3 The Influence of the Male Factor on Healthy Term Pregnancy**

Of the minimal evidence available, the research occurred within the context of IVF complications. Recent literature suggests that the male could contribute to recurrent pregnancy loss due to genetic factors, semen factors or due to other factors such as age (Puscheck & Jeyendran, 2007). Elevated sperm chromosome aneuploidy and apoptosis have been suggested in patients with unexplained recurrent pregnancy loss (Carrell et al., 2003). The best predictor of male subfertility is the hypo-osmotic swelling test when it is <50 per cent, which does not result in fertilization failure, but implantation failure. A high percentage of sperm coated by antisperm antibodies is very predictive of fertilization failure (Check, 2006).

As assisted human reproductive technology advances, further evidence should be expected to evolve and potential pre-mordial and primary prevention activities identified that would protect male reproductive health as a contributor to healthy, term pregnancy.



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The European Association of Urology published *Guidelines on Male Infertility* in 2007 (Dohle et al., 2007). These guidelines can be found at [http://www.uroweb.org/fileadmin/user\\_upload/Guidelines/13\\_Male\\_Infertility\\_2007.pdf](http://www.uroweb.org/fileadmin/user_upload/Guidelines/13_Male_Infertility_2007.pdf).

## **ABORIGINAL WOMEN**

Indigenous peoples and ethnic minorities are notoriously under-represented in randomized control trials. While Aboriginal people often note they've been "studied to death", there is not enough available research to conduct a systematic review in any particular health area.

Improvements in the health of First Nations people are seldom achieved from isolated activities, but instead are the result of longer term commitments to greater inclusiveness and to addressing the social determinants of health (Provincial Health Officer, 2007). Promoting the reproductive health of Aboriginal women is perhaps best approached from a holistic/qualitative perspective, as it is intimately tied to culture, land, identity, family and related social determinants.

Aboriginal women in British Columbia, especially those in small towns and in rural and remote areas, have asked to participate in a more positive birthing experience, so that they may receive the care and support required for healthy pregnancy and childbirth (*Transformative Change Accord: First Nations Health Plan*, 2006). Evidence links prenatal care to better birth outcomes. However, research that exists suggests that Aboriginal women do not attend regularly for prenatal care (Sokolowski, 1995). Canadian and American First Nations women report barriers to accessing care that also include: dislike of vaginal exams, lack of continuity, communication difficulties, transportation problems and prejudice on part of the provider (Sokolowski, 1995). Aboriginal beliefs and values should be considered when planning perinatal services for women in this population (BucharSKI, Brockman & Lambert, 1999).

### **10.4 Prevalence of Risk Factors**

This section captures some of the key issues around Aboriginal reproductive health. A few key risk factors and reproductive health outcomes are reported below (Health Canada, 2000).

Alcohol is a widely reported risk factor among Aboriginal women. A Quebec study found that compared with the general population, fewer Aboriginal women were drinking; however, those who drank consumed greater quantities per occasion, with two-thirds drinking five or more drinks on a day that they consumed alcohol (Lavallee & Bourgault, 2000). The Ontario First Nations Regional Health Survey indicated that significantly more Aboriginal females reported binge drinking than their counterparts in the general Canadian population (MacMillan et al., 2003). Drinking during pregnancy is considered a public health concern, and binge drinking is possibly the most important risk factor for fetal alcohol spectrum disorder (FASD) (Lavallee & Bourgault, 2000).

- Genital chlamydia among Aboriginal people was almost seven times higher than the national rate, while the rate for hepatitis C was one-third lower than the national rate.
- One-third of syphilis cases in BC women are Aboriginal women (BCCDC, 2005).
- The rate of smoking in the Aboriginal population is twice that of non-Aboriginal population, with 72 per cent of women aged 20–24 reported smoking (Smylie, 2000).
- Aboriginal women have 5.3 times more cases of diabetes than non-Aboriginal women (Smylie, 2000).

- Gestational diabetes rates vary but have been reported at between 8.4 per cent and 12.8 per cent in Aboriginal communities in Ontario and Quebec (Godwin, Muirhead, Huynh, Helt, & Grimmer, 1999; Harris, Caulfield, Sugamori, Whalen, & Henning, 1997; Rodriques, Robinson, & Gray-Donald, 1999).
- Thirty per cent of female diabetics participating in the First Nations and Inuit Regional Health Survey reported that their diabetes had been first diagnosed during pregnancy, leading to a recommendation for screening of all pregnant Aboriginal women with oral glucose testing (Smylie, 2000).

## **10.5 Outcomes**

Aboriginal teen pregnancy and Aboriginal infant mortality rates, especially for SIDS, have declined, as they have in the non-Aboriginal population (PHO, 2002). Aboriginal women were less likely to have babies of low birth weight or born prematurely and more likely to have babies with macrosomia. However these differences were statistically insignificant after adjustment for smoking, cervicovaginal infection and income (Wenman, Joffres, & Tataryn, 2004).

- One in five First Nations births (20 per cent) involved teenaged mothers, compared to 5.6 per cent in non-Aboriginal Canadian teenage mothers.
- In 2000, the infant mortality rate for First Nations was 6.4 deaths per 1,000 live births. This rate is 16 per cent higher than the Canadian rate of 5.5 per cent, but the elevated rate is primarily due to a higher post-neonatal death rate due to SIDS (Health Canada, 1997). The First Nations infant mortality rate has been falling steadily since 1979, when it was 27.6 deaths per 1,000 live births. The overall social and economic status of the Aboriginal population has been improving, which may account for the decline in their infant mortality.

## **10.6 Promising Interventions**

Little published evidence of interventions to improve reproductive health outcomes in Aboriginal population in Canada was found. The SOGC has published guidelines on care for Aboriginal women. The guidelines provide a useful orientation to approaching Aboriginal health issues for health professionals. See Section 10.3.1 for a list of the guidelines.

A Project called *Healthy Communities, Mothers and Children* is in progress in two urban and two rural Aboriginal communities in Ontario and BC. The project is funded by the Canadian Institutes of Health Research, and focuses on prevention of fetal alcohol spectrum disorder (FASD) by brief interventions, targeting second and subsequent pregnancies, as they were determined to be at greatest risk for excess alcohol consumption (Masotti et al., 2006). Considerable community input was sought in the project design. Brief interventions are one of the most successful interventions to reduce alcohol consumption (Chang et al., 2005 A; Poikolainen, 1999 A; Wilk, Jensen, & Havighurst, 1997 A). The project is co-developed with the University of British Columbia and McMaster University.

A prospective cohort intervention among Cree communities near James Bay used local radio broadcasts about healthy eating in pregnancy, pamphlets encouraging breastfeeding and healthy nutritional choices, supermarket tours and cooking demonstrations, exercise/walking groups and individual counselling. There was no difference between the control group and the intervention group, except a reduction in caffeine intake during pregnancy and an increase in folate intake postpartum (Gray-Donald et al., 2000).

#### 10.6.1 Society of Obstetricians and Gynaecologists of Canada Guidelines on Aboriginal Reproductive Health Care

Smylie, 2000

The recommendations of the SOGC are included in this review as they represent a consensus statement on an important aspect of reproductive health care in Canada. Since no evidence was found for interventions specific to First Nations reproductive health, these guidelines provide the next best resource for guidance for public health programs.

The recommendations are based on expert opinion and a review of the literature. Published references were identified by a MEDLINE search of all review articles, randomized clinical control trials, meta-analyses, and practice guidelines from 1966 to February 1999, using the MeSH headings “Indians, North American or Eskimos” and “Health.” Subsequently published articles were brought to the attention of the authors in the process of writing and reviewing the document. Ancillary and unpublished references were recommended by members of the SOGC, Aboriginal Health Issues Committee and the panel of expert reviewers. Recommendations were reviewed and revised by the SOGC, Aboriginal Health Issues Committee, a panel of expert reviewers, and the SOGC Council. The guidelines were reviewed and supported by six key Aboriginal organizations and five health professional organizations.

#### ***Socio-cultural Context***

- Health professionals should have a basic understanding of the appropriate names with which to refer to the various groups of Aboriginal peoples in Canada.
- Health professionals should have a basic understanding of the demographics of Aboriginal peoples in Canada.
- Health professionals should familiarize themselves with the traditional geographic territories and language groups of Aboriginal peoples.
- Health professionals should have a basic understanding of the disruptive impact of colonization on the health and well-being of Aboriginal peoples.
- Health professionals should recognize that the current socio-demographic challenges facing many Aboriginal individuals and communities have a significant impact on health status.
- Health professionals should recognize the need to provide health services for Aboriginal peoples as close to home as possible.

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- Health professionals should have a basic understanding of governmental obligations and policies regarding the health of Aboriginal peoples in Canada.
- Health professionals should recognize the need to support Aboriginal individuals and communities in the process of self-determination.

#### ***Health Concerns***

- Health professionals should appreciate holistic definitions of health as defined by Aboriginal peoples.
- Health professionals should recognize that the degree of ill health in Aboriginal populations is unacceptable, and work with Aboriginal individuals and communities towards improved health outcomes.
- Health professionals should recognize and respond to key areas of morbidity and mortality without stereotyping.

#### ***Cross-cultural Understanding***

- Relationships between Aboriginal peoples and their health care providers should be based on a foundation of mutual respect.
- Health professionals should recognize that the current health care system presents many gaps and barriers for Aboriginal individuals and communities seeking health care.
- Health professionals should work proactively with Aboriginal individuals and communities to address these gaps and barriers.
- Health professionals should work with Aboriginal individuals and communities to provide culturally appropriate health care.
- Aboriginal peoples should receive treatment in their own languages, whenever possible.
- Health care programs and institutions providing service to significant numbers of Aboriginal peoples should have cultural interpreters and Aboriginal health advocates on staff.
- Aboriginal peoples should have access to informed consent regarding their medical treatments.
- Health services for Aboriginal peoples should recognize the importance of family and community roles and responsibilities when attempting to service Aboriginal individuals.
- Health professionals should respect traditional medicines and work with Aboriginal healers to seek ways to integrate traditional and western medicine.
- Health professionals should take advantage of workshops and other educational resources to become more sensitive to Aboriginal peoples.
- Health professionals should get to know Aboriginal communities and the people in them.

*Aboriginal Health Resources*

- Aboriginal communities and health professionals working with Aboriginal peoples should support the creation of community-directed health programs and services for Aboriginal peoples.
- Aboriginal communities and health professionals working with Aboriginal peoples should support the development of community-directed, participatory health research for Aboriginal peoples.
- Aboriginal communities and health professionals working with Aboriginal peoples should encourage the education of Aboriginal health professionals committed to future work in Aboriginal communities.
- Aboriginal communities and health professionals working with Aboriginal peoples should recognize the need for preventative health programming in Aboriginal communities.

## **11.0 NEWBORN AND POSTNATAL**

### **11.1 Newborn Screening**

#### **11.1.1 Hyperbilirubinemia**

In healthy, term infants, 50 per cent have visible jaundice (BCRCP, 2002). Early initiation and establishment of breastfeeding is the key preventative intervention, assisting infants to excrete bilirubin and thereby reducing the risk of hyperbilirubinemia.

Despite improvements in neonatal care, and the near non-existence of classic, jaundice neonatal encephalopathy, safe bilirubin levels have not been established with absolute certainty. The data from many studies have shown that the issues surrounding bilirubin toxicity are complex; therefore, a single course of management is not possible. One common principle is: if there is any evidence that the cause of the jaundice is not physiological, cause investigation must occur prior to treatment initiation. In BC, best practice for management of jaundice in the term newborn is outlined in the British Columbia Reproductive Care Program guidelines. At present, routine testing of bilirubin levels for healthy, term newborns is not indicated (BCRCP, 2002).

In June 2007, the Canadian Paediatric Society (CPS) released a position statement recommending increased vigilance in assessment of the risk factors associated with hyperbilirubinemia, including standard screens for total serum bilirubin and transcutaneous bilirubinometry for all infants within the first 72 hours of life. The CPS statement was developed to guide prevention of the chronic sequelae associated with hyperbilirubinemia's relatively remote risk of bilirubin encephalopathy/kernicterus in newborns.

At the time of this evidence review, the British Columbia Perinatal Health Program is reviewing the CPS recommendations through a working committee of provincial perinatal health practitioners. This committee will analyze current best practice and implications for BC, and will ultimately advise whether or not the CPS's position statement should change how newborn care is managed in BC.

### **11.2 Breastfeeding**

#### **11.2.1 Prevalence**

The rate of initiation of breastfeeding is high in BC, although duration falls off after four months (see Table 14).

**Table 14: Breastfeeding Practices, Women Aged 15 to 55 Who Had a Baby in the Previous 5 Years, BC**

Did not breastfeed	6.4 per cent
Initiated breastfeeding	93.3 per cent
Breastfed at least four months	63.8 per cent
Breastfed at least four months exclusively	50.7 per cent
Breastfed at least six months	55 per cent
Breastfed at least six months exclusively	28.8 per cent

**Source:** Statistics Canada, 2003a.

### 11.2.2 Benefits of Breastfeeding

Breastfeeding has been shown to have a positive effect in infant physical and cognitive development and to reduce infant mortality. Breastfeeding has been shown to result in superior gross motor development (Sacker, Quigley, & Kelly, 2006 **B**), enhanced performance on tests of cognitive development (Horwood & Fergusson, 1998 **B**), and lower rates of morbidity, especially from infectious disease and gastrointestinal infection (Kramer & Kakuma, 2004 **A**). Assuming causality, promoting breastfeeding has the potential to save or delay approximately 720 post-neonatal deaths in the United States each year (Chen & Rogan, 2004). A dose-dependent effect of breastfeeding duration on the prevalence of obesity was reported in four studies (Arenz, Ruckerl, Koletzko, & von Kries, 2004 **A**).

### 11.2.3 Evidence of Strategies to Increase Breastfeeding

This section presents the evidence of interventions to promote the initiation and/or duration of breastfeeding, as prepared for the National Institute for Health and Clinical Excellence in several systematic reviews (Dyson et al., 2006 **A**; Fairbank et al., 2000 **A**; Protheroe, Dyson, & Renfrew, 2003 **A**; Renfrew, Woolridge, & Ross McGill, 2000 **A**; Renfrew et al., 2005 **A**).

The evidence shown in Table 15 has been grouped by interventions that:

- Are effective in increasing breastfeeding rates and duration of breastfeeding.
- Are promising for increasing breastfeeding.
- May be harmful or ineffective at increased breastfeeding rates.

**Table 15: Evidence of Strategies to Increase Breastfeeding**

<b>Strong evidence that interventions are effective.</b>	
Bliss, 1997 <b>A</b> ; Dennis, Hodnett, Gallop, & Chalmers, 2002 <b>A</b> ; Duffy, Percival, & Kershaw, 1997; Guise et al., 2003 <b>A</b> ; Porteous, Kaufman, & Rush, 2000; Renfrew et al., 2000 <b>A</b> ; Schafer, Vogel, Viegas, & Hausafus, 1998.	
Prenatal	<ul style="list-style-type: none"> <li>• Prenatal group teaching session on postnatal nipple pain and trauma.</li> <li>• Peer support program in antenatal period.</li> </ul>
Postnatal hospital stay	<ul style="list-style-type: none"> <li>• Skilled breastfeeding support, peer or professional, proactively offered to women who want to breastfeed.</li> <li>• Breastfeeding counselling in primary care.</li> <li>• Preventing the provision of discharge packs containing formula-feeding information and samples.</li> <li>• Unrestricted feeding from birth onwards.</li> <li>• Unrestricted mother-baby contact from birth onwards.</li> <li>• Unrestricted kangaroo care/skin-to-skin care from birth onwards.</li> <li>• Avoiding supplementary fluids for babies unless medically indicated.</li> <li>• Regular breast drainage/continued breastfeeding for mastitis.</li> </ul>



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<p><b>Interventions where evidence is moderate regarding duration of breastfeeding.</b>            Brent, Redd, Dworetz, D’Amico, &amp; Greenberg, 1995 A; Broadfoot, Britten, Tappin, &amp; MacKenzie, 2005; Cattaneo &amp; Buzzetti, 2001 B; Duffy et al., 1997; Fredrickson, 2005; Giovannini et al., 2003 B; Henderson, Stamp, &amp; Pincombe, 2001 A; Pollard, 1998; Renfrew et al., 2000 A; Rossiter, 1994 A; Sciacca, Dube, Phipps, &amp; Ratliff, 1995 A.</p>	
In pregnancy	<ul style="list-style-type: none"> <li>• Group, interactive, culture-specific education sessions.</li> <li>• Group education sessions on positioning and attachment.</li> <li>• Prenatal education individually tailored to the needs of low-income women.</li> </ul>
Immediate postnatal care	<ul style="list-style-type: none"> <li>• Basing prevention and treatment of sore nipples on principles of positioning and attachment.</li> </ul>
Postnatal care in the community	<ul style="list-style-type: none"> <li>• Self-monitoring daily log for women from higher socio-economic groups.</li> <li>• Combination of supportive care, teaching breastfeeding technique, rest and reassurance for women with “insufficient milk.”</li> </ul>
Wider social/political issues	<ul style="list-style-type: none"> <li>• National policy of encouraging maternity units to adhere to the UNICEF Baby Friendly Initiative.</li> <li>• Regionally/nationally determined targets with supporting activities, and/or penalties and/or incentives.</li> <li>• Multifaceted interventions (across time periods and types of interventions).</li> <li>• Tailored prenatal education combined with proactive postnatal support in hospital and the community.</li> <li>• Combining prenatal education with partner support, postnatal support and incentives for women in low-income groups.</li> </ul>
<p><b>Strategies that lack evidence.</b>            Bliss, 1997 A; Chapman, Young, Ferris, &amp; Perez-Escamilla, 2001; Gagnon, Dougherty, Jimenez, &amp; Leduc, 2002 A; Gunn, Chondros, &amp; Young, 1998 A; Hauck &amp; Dimmock, 1994 A; Howard et al., 2000 A; Renfrew et al., 2000 A; Rojjanasrirat, 2000; Serwint et al., 1996 A.</p>	
In pregnancy	<ul style="list-style-type: none"> <li>• Prenatal education by a pediatrician (postpartum).</li> <li>• Providing materials produced by formula milk companies on infant feeding in early pregnancy.</li> </ul>
Postnatal care in the community	<ul style="list-style-type: none"> <li>• Written educational materials used alone.</li> <li>• General practitioner clinic visit at one-week postpartum.</li> <li>• Single home visit by community nurse following early discharge.</li> </ul>
In pregnancy	<ul style="list-style-type: none"> <li>• Conditioning nipples in pregnancy.</li> <li>• Hoffman’s exercises for inverted and non-protractile nipples in pregnancy.</li> <li>• Breast shells for inverted and non-protractile nipples in pregnancy.</li> </ul>
Immediate postnatal care	<ul style="list-style-type: none"> <li>• Restricting the timing and/or frequency of breastfeeds.</li> <li>• Restricting mother/baby contact from birth onwards.</li> <li>• Routine use of supplementary fluids.</li> <li>• Provision of discharge packs containing samples or information on formula feeding.</li> <li>• Topical agents for the prevention of nipple pain.</li> <li>• Breast pumping before the establishment of breastfeeding in women at risk of delayed lactation.</li> <li>• Separating mothers and babies for treatment of jaundice.</li> </ul>
Multifaceted interventions	<ul style="list-style-type: none"> <li>• Combined prenatal education and limited postnatal telephone support for high-income women and women who intend to breastfeed (existing high rates suggest resources are better spent elsewhere).</li> </ul>

#### 11.2.4 Breastfeeding for Women Who Use Illicit Drugs and/or Methadone

Jansson, Velez, & Harrow (2004) discussed the evidence of methadone transfer in breast milk and concluded the evidence regarding long-term impact on the infant is not conclusive. No clinical trials or systematic reviews have been done on lactation and illicit drug use. Jansson et al.'s opinion, based on the existing evidence, was that breastfeeding should be encouraged for women maintained on methadone. They suggested that women who are not in treatment for substance abuse or have inadequate prenatal care are not good candidates for breastfeeding. However the evidence is weak to either support or negate the policy of breastfeeding for women abusing illicit drugs.

#### 11.2.5 Breastfeeding and Vitamin D Supplementation

Health Canada recommends that all breastfed infants have a minimum intake of 400 IU of vitamin D per day, beginning the first month of life (Health Canada, 2004).

### **11.3 Postpartum Interventions Affecting Reproductive Health**

A review examined the evidence of postpartum support programs to improve maternal knowledge, attitudes and skills related to parenting, maternal mental health, maternal quality of life and maternal physical health. Universal postpartum support to women at low risk did not result in statistically significant improvements for any outcomes examined. However, evidence was found for the effect of interventions on low-income or high-risk populations. Educational programs reduced repeat unplanned pregnancies (12.0 per cent versus 28.3 per cent,  $p = 0.003$ ) and increased effective contraceptive use (RR 1.35, 95% CI 1.09–1.68,  $p = 0.007$ ). Maternal satisfaction was higher with home visitation programs (Shaw et al., 2006 A).

Project Viva examined the associations between postpartum television viewing, walking and trans fat intake with weight retention postpartum. Women who watched less than 2 hours of television, walked at least 30 minutes, and consumed trans fat below the median, had an odds ratio of 0.23 (95% CI 0.08–0.66) of retaining at least 5 kg. Postpartum television viewing, lack of exercise, and trans fat intake were associated with weight retention (Oken et al., 2007).

#### 11.3.1 Pregnancy Intervals

Spacing pregnancies at least 18 months apart has been shown to improve birth outcomes. Researchers in Colombia analyzed 67 studies that included more than 11 million births worldwide (Seppa, 2006). Findings include:

- Babies conceived 18 months to 5 years after a previous birth were healthier than those conceived at shorter or longer intervals.
- Compared with babies conceived 18 to 23 months after a sibling's birth, those conceived within 6 months were 40 per cent more likely to be born prematurely, 61 per cent more likely to be underweight (less than 2.5 kg), and 26 per cent more likely to be small for gestational age at birth.
- Babies conceived 5 years or more after a birth were 20, 29, and 43 per cent more likely to be premature, small for gestational age, or underweight, respectively, than were the

babies conceived after 18 to 23 months, though it is unclear why a long interval would impart such risks.

- A meta-analysis yielded an increased risk of preterm birth, low birth weight and small for gestational age when inter-pregnancy intervals were shorter than 6 months. The ideal spacing of pregnancies was found to be an interval between 18 and 59 months (Conde-Agudelo, Rosas-Bermudez, & Kafury-Goeta, 2007).
- Women whose subsequent inter-pregnancy interval was less than 6 months were more likely than other women to have had a first birth complicated by intrauterine growth restriction, extremely preterm birth, moderately preterm birth or perinatal death (Zhu & Le, 2003).

## **11.4 Summary**

- Many different educational programs and interventions regarding breastfeeding can increase breastfeeding initiation and duration, both during the prenatal period and during the hospital stay. Separation of mother and baby or imposing structure on breastfeeding frequency reduces the success of breastfeeding.
- Few postpartum interventions have a direct effect on reproductive health unless it is on a subsequent pregnancy.
- Advising women about ideal birth intervals should be standard practice for all health care providers.

## **12.0 USE OF THE INTERNET AND TECHNOLOGY**

This section reviews interventions that use technology to deliver information, support or counselling in a variety of health areas. A large number of these interventions can be considered technology-assisted self-help, while others incorporate some professional or lay person participation or leadership. Although few of the interventions are delivered to pregnant women, many of the strategies fit into the domain of preconceptual or primary prevention. Self-help has not traditionally been considered a public health strategy, but there is justification to consider it primary prevention.

By 2002, an estimated 40 per cent of the Canadian population obtained perinatal health information from online sources (PHRED, 2002 A). Health information seekers indicated that online health information improved the way they cared for themselves, including how they made decisions about how to treat an illness, whether to visit a physician, whether to ask new questions or get a second opinion (Fox & fallows, 2003)

### **12.1 Self-Help and Web-based Strategies**

New approaches to providing education, counselling and support on the Internet have been found to improve some aspects of mental health, and they could have potential applications for pregnant women and postpartum depression. A systematic review was done of computerized cognitive behaviour therapy (CCBT) for the treatment of anxiety, depression, phobias, panic and obsessive-compulsive behaviour. The analysis of these results showed some evidence that CCBT is as effective as therapist-led cognitive behaviour therapy (TCBT) for the treatment of depression/anxiety and phobia/panic and is more effective than treatment as usual (TAU) in the treatment of depression/anxiety. CCBT also appears to reduce therapist time compared with TCBT (Kaltenthaler et al., 2006 A).

A systematic review was done to identify the health and social benefits of peer-to-peer online self-help and support groups (Eysenbach, Powell, Englesakis, Rizo, & Stern, 2004 A). Of 38 studies reviewed, only 6 examined pure peer-to-peer interventions. Because of the complexity of the interventions evaluated, methodological problems and conflicting results among studies, the reviewers were not able to reach conclusions about the value of computer-based peer-to-peer communities and electronic support groups.

A systematic review of consumer use of Internet-based resources found positive outcomes for online smoking cessation programs and education programs that focused on eating habits, body image, physical activity and weight loss (PHRED, 2002 A).

A more recent review included smoking (6), depression (12), social support (12), health care use (7), eating disorders (17), weight loss (4), and diabetes (4). Most interventions showed an effect of the internet based program. In some studies, an association between greater use of peer-to-peer groups and better outcomes was observed, indicating a dose-response association. Whether increased use leads to better outcomes, or whether improvement is due to other factors is unclear. The lack of measurable evidence from controlled studies is in sharp contrast to the increasing body of anecdotal and descriptive information on the self-help processes in virtual communities.

If the volume of users is any measure of success, substantial benefits may yet to be found (Eysenbach et al., 2004 A).

A study of single mothers with young infants given access to a computer-mediated social support (CMSS) network concerned with parenting issues was conducted. The network operated 24 hours per day over a period of 6 months. It permitted public message exchanges, private email and text-based teleconferencing for as many as 8 participants at any one time. The majority of the supportive replies fell into the category of emotional support, followed in order by informational and tangible support. Both the self-report data following the intervention, and qualitative data extracted from online discussions indicated that close personal relationships and a sense of community developed in this novel social environment. An analysis of pre-test/post-test changes in the level of parenting stress revealed that mothers who participated regularly in this CMSS community were more likely to report a decrease in parenting stress following the intervention (Dunham et al., 1998).

## **12.2 Self-Help With Professional Support**

### **12.2.1 Weight Loss**

Three randomized controlled trials investigated the role of the Internet in weight-loss programs, and all found that the Internet support improved outcomes. In the first study, 192 overweight adults were randomized to one of three Internet treatment groups: No counselling, computer-automated feedback or human email counselling. All participants received one weight loss group session, coupons for meal replacements, and access to an interactive website. The human email counselling and computer-automated feedback groups also had access to an electronic diary and message board. The human email counselling group received weekly email feedback from a counsellor, and the computer-automated feedback group received automated, tailored messages. At 6 months, weight losses were significantly greater in the human email counselling group (-7.3 +/- 6.2 kg) than in the computer-automated feedback (-4.9 +/- 5.9 kg) or no counselling (-2.6 +/- 5.7 kg) groups. Further research is needed to improve the efficacy of automated computer-tailored feedback as a population-based weight-loss approach (Tate, Jackvony, & Wing, 2006).

In the second study, diabetic subjects were randomized to a basic Internet (n = 46) or to an Internet plus behavioural e-counselling program (n = 46). Both groups received one face-to-face counselling session and the same core Internet programs and were instructed to submit weekly weights. Participants in e-counselling submitted calorie and exercise information and received weekly email behavioural counselling and feedback from a counsellor. Intent-to-treat analyses showed the behavioural e-counselling group lost more mean (SD) weight at 12 months than the basic Internet group (-4.4 [6.2] versus -2.0 [5.7] kg; p = .04), and had greater decreases in percentage of initial body weight (4.8 per cent vs. 2.2 per cent; p = .03), body mass index (-1.6 [2.2] versus -0.8 [2.1]; p = .03), and waist circumference (-7.2 [7.5] versus -4.4 [5.7] cm; p = .05) (Tate, Jackvony, & Wing, 2003 A).

In another study, participants received cognitive behaviour therapy for weight loss with the following additions: 24-weekly email lessons on behavioural weight loss; weekly online submission of self-monitoring diaries; weekly personal feedback including recommendations and reinforcement via email; the opportunity for questions/comments to the therapist via email; and

access to an online bulletin board for social support among this group's participants. Participants in the behaviour therapy group lost significantly more weight than those in the education group during the first 3 months, and both groups maintained their weight loss in the next 3 months. Weight loss in the behaviour therapy group was 4.0 kg at 3 months and 4.1 kg at 6 months. Weight loss in the education group was 1.7 kg at 3 months and 1.6 kg at 6 months. As expected, participants in the behaviour therapy group logged on to the website more often than those in the education group, with an average of 19 versus 9 times during the first 3 months, and 7 versus 1 time during months 3–6. Internet programs may not be able to match the weight losses accomplished by face-to-face treatments, but they may provide a useful alternative to them. Further research may improve their effectiveness (Tate, Wing, & Winett, 2001 A).

## **12.3 Other Media and Technology-based Strategies**

### **12.3.1 Telephone**

In 2001, a review of studies to determine the effectiveness of the telephone as a public health nursing strategy was done. The studies included assessment, provision of information, support and counselling, with the intensity varying from one or two telephone calls to weekly calls, beginning during the prenatal period and continuing until twelve weeks postpartum. The varied goals of the interventions included improving pregnant women's health, utilization of screening programs for children, quitting smoking attempts and abstinence rates. Results suggested that telephone interventions can have a positive effect on physical health, psychosocial health, knowledge, health-related behaviours and use of health resources. The telephone interventions were usually used in combination with other interventions, such as home visiting, communication campaigns and mail packages; thus, determining the added benefit of telephone intervention to these combined situations was difficult. There was a differential impact across populations for some outcomes, possibly related to the nature and scope of the telephone interventions (Cava et al., 1999 A).

### **12.3.2 Bibliotherapy and Reading Material for Mental Health**

In a meta-analysis of self-help (mainly bibliotherapy) on anxiety and depressive disorders, the mean effect size of self-help (mainly bibliotherapy) versus control conditions is 0.84, and 0.76 for follow-up; the effect sizes of self-help versus treatment are -0.03 and -0.07 respectively. A longer treatment period is more effective. Bibliotherapy for clinically significant emotional disorders is more effective than waiting list or no treatment conditions. The dearth of studies on self-help groups for emotional disorders does not permit an evidence-based conclusion concerning the effects of self-help groups. No difference was found between bibliotherapy and psychiatric treatment of relatively short duration (den Boer, Wiersma, & Van den Bosch, 2004 A).

A systematic review was done of randomized trials that evaluated self-help books for depression. There are a number of self-help books for the treatment of depression readily available. For the majority, there is little direct evidence of their effectiveness. There is weak evidence suggesting that bibliotherapy, based on a cognitive behavioural therapy approach, is useful for some people when they are given some additional guidance. More work is required in primary care to

investigate the cost-effectiveness of self-help and the most suitable format and presentation of materials (Anderson et al., 2005 A).

This report summarizes a meta-analytic review of 22 studies evaluating the effectiveness of such self-help materials. Modest support was found for the efficacy of self-help materials in decreasing at-risk and harmful drinking. The weighted mean pre/post-effect size for bibliotherapy was .80 with self-referred individuals seeking help for drinking problems, and .65 for individuals identified through health screening. Between-group comparisons of bibliotherapy with no-intervention controls appear to have a small to medium effect, with a weighted mean effect size of .31 with self-referred drinkers; effect size was more variable in opportunistic interventions based on health screening. These findings provide support for the cost-effective use of bibliotherapy with problem drinkers seeking such help to reduce their consumption, and to a lesser extent with drinkers who are identified as at-risk through screening (Apodaca & Miller, 2003 A).

Not all bibliotherapy has been shown to be effective. A randomized trial was conducted to test the clinical effectiveness of a guided self-help intervention for patients with anxiety and depression that were currently waiting for psychological therapy. Measures included self-reported adherence to the intervention, anxiety and depressive symptoms, social functioning and patient satisfaction. There were no statistically significant differences between groups in anxiety and depression symptoms at three months (Mead et al., 2005 A). A self-help book was compared to a waitlist control on several self-report measures. Bibliotherapy participants reported decreased participation in risky dating behaviours and improvement in sexual communication strategies across a variety of dating situations. However, the self-help book was no more effective than the waitlist control in reducing rates of sexual victimization (Yeater, Naugle, O'Donohue, & Bradley, 2004).

## **12.4 Summary**

There is a developing body of research on Internet-based information, self-help, education, peer support and counselling resources that have a beneficial effect on health behaviours and well-being. Some of these technologies could be adopted by the public health system and improve health behaviours, which in turn could improve reproductive health outcomes. Two promising areas are diabetic control e-counselling and smoking cessation quitlines.

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**Core Public Health Functions for BC: Evidence Review**  
**Reproductive Health**

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## GLOSSARY AND ABBREVIATIONS

### GLOSSARY<sup>17</sup>

**Case Reports:** A report based on a single patient or series of patients. This is an important method for identifying rare or new events.

**Case-control Studies:** “Cases” with the condition are matched with “controls” without the condition, and a retrospective analysis is used to look for differences between the two groups.

**Cohort Studies:** Groups of people are selected on the basis of a specific exposure and follow up is conducted to study specific outcomes.

**Confidence Interval (CI):** The 95 per cent confidence interval (or 95 per cent confidence limits) would include 95 per cent of results from studies of the same size and design in the same population. This is close but not identical to saying that the true size of the effect (never exactly known) has a 95 per cent chance of falling within the confidence interval. If the 95 per cent confidence interval for a relative risk (RR) or an odds ratio (OR) crosses 1, then this is taken as no evidence of an effect. The practical advantage of a confidence interval (rather than a P value) is that they present the range of likely effects.

**Cross-sectional Surveys:** These surveys randomly select from an identified population in a given time period. Good response rates are important to ensure results are accurate. Surveys are a major source of epidemiological data.

**Expert Opinion:** A consensus view provided by respected and experienced individuals.

#### **Meta-analysis:**

- Meta-analysis is a statistical technique for combining the findings from independent studies.
- Meta-analysis is most often used to assess the clinical effectiveness of health care interventions; it does this by combining data from two or more randomized controlled trials.
- Meta-analysis of trials provides a precise estimate of treatment effect, giving due weight to the size of the different studies included.
- The validity of the meta-analysis depends on the quality of the systematic review on which it is based.

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<sup>17</sup> Source: Bandolier <http://www.jr2.ox.ac.uk/bandolier/glossary.html>.



- Good meta-analyses aim for complete coverage of all relevant studies, look for the presence of heterogeneity, and explore the robustness of the main findings using sensitivity analysis.

**Odds Ratio (OR):** One measure of treatment effectiveness. It is the odds of an event happening in the experimental group expressed as a proportion of the odds of an event happening in the control group. The closer the OR is to one, the smaller the difference in effect between the experimental intervention and the control intervention. If the OR is greater (or less) than one, then the effects of the treatment are more (or less) than those of the control treatment. Note that the effects being measured may be adverse (e.g., death or disability) or desirable (e.g., survival). When events are rare the OR is analogous to the relative risk (RR), but as event rates increase the OR and RR diverge.

**Randomized Controlled Trial (RCT):** A trial in which participants are randomly assigned to two or more groups: at least one (the experimental group) receiving an intervention that is being tested and another (the comparison or control group) receiving an alternative treatment or placebo. This design allows assessment of the relative effects of interventions

**Relative Risk (RR):** The number of times more likely ( $RR > 1$ ) or less likely ( $RR < 1$ ) an event is to happen in one group compared with another. It is the ratio of the absolute risk (AR) for each group. It is analogous to the odds ratio (OR) when events are rare.

**Systematic Reviews:** Steps in conducting a systematic review

- Defining an appropriate therapeutic question.
- Searching the literature.
- Assessing the studies. Once all possible study reports have been identified, each study needs to be assessed for eligibility for inclusion, study quality and reported findings. Ideally, such assessment should involve two independent reviewers.
- Combining the results. The findings from the individual studies must then be aggregated to produce a bottom line on the clinical effectiveness of the intervention. Sometimes this aggregation is qualitative, but more usually it is a quantitative assessment using a technique known as meta-analysis
- Placing the findings in context. The findings from this aggregation of an unbiased selection of studies then need to be discussed to put them in context. This will address such issues as the quality and heterogeneity of the included studies, the likely impact of bias and chance and the applicability of the findings. Thus judgment and balance are not obviated by the rigor of systematic reviews, they are just reduced in impact and made more explicit.



## **ABBREVIATIONS**

AAP	American Academy of Pediatrics
ACOG	American College of Obstetricians and Gynecologists
BCRCP	BC Reproductive Care Program
CPG	Clinical Practice Guidelines
CPS	Canadian Paediatric Society
CTFPHC	Canadian Task Force on Preventive Health Care
aIOM	Institute of Medicine
NICE	National Institute for Health and Clinical Excellence
NTD	neural tube defects
RCOG	Royal College of Obstetricians and Gynaecologists
SOGC	Society of Obstetricians and Gynaecologists of Canada
USCDC	US Centers for Disease Control and Prevention
USDHHS	US Department of Health and Human Services
USPSTF	US Preventive Service Task Force

## **APPENDIX 1: FRAMEWORK FOR REVIEW OF CORE PUBLIC HEALTH PROGRAMS**

### **Criteria for Determining Core Programs**

- They include primary or early secondary prevention interventions.
- They either:
  - prevent diseases or conditions that are important contributors to the burden of disease; and/or
  - prevent diseases or conditions that are potentially important threats to health; and/or
  - Improve the overall health and resilience of the population, or some part of the population.
- There is reasonable evidence of their effectiveness in the scientific literature or in reviews of ‘best practices’.
- There is reasonable evidence of their cost-effectiveness.
- Indicators are available or can be developed that will measure their impact.
- They fall within the mandates of the health authorities and/or the Ministry of Health Services.

### **Core Programs**

- Each core program will have clear goals, measurable objectives, and an evidentiary base that shows it can improve people’s health and prevent disease, disability, and/or injury. Programs will be supported through the identification of best practices and national and international benchmarks.
- Core programs will target one of four broad categories. These are not mutually exclusive, and there will be overlap:
- Health Improvement Programs – intended to improve overall health and well-being, and prevent a wide range of acute and chronic disease and disability, as well as injuries.
- Disease, Injury and Disability Prevention Programs – intended to prevent specific health problems that make, or might make, a significant contribution to the burden of disease.
- Environmental Health Programs – intended to protect people from environmental hazards, whether caused by natural or human agency, in constructed and natural environments.
- Health Emergency Management Programs – intended to coordinate available resources to deal with emergencies effectively, thereby saving lives and avoiding injury or disease.

### **Public Health Strategies**

Core programs will be implemented using a variety of public health strategies, which are based upon the unique functions essential to public health. These strategies will include:

- health promotion – strategies that range from health advocacy for change in public policy or private sector practices, to partnership building and coalition development, to education that helps people develop personal skills for health;
- health protection – strategies that protect people through legislation, regulation, inspection and, if necessary, enforcement and prosecution;
- preventive interventions – strategies that include immunization, counselling, screening and early detection, and prophylactic or in some cases preventive treatments; and
- Health assessment and disease surveillance – strategies critical for monitoring population health status, detecting and responding to outbreaks of disease or other health-related issues, and assessing the effectiveness of public health programs and services.

### **Prevention**

“actions aimed at eradicating, eliminating, or minimizing the impact of disease and disability, or if none of these is feasible, retarding the progress of disease and disability.” There are five levels of prevention:

- **Primordial Prevention:** “actions and measures that inhibit the emergence and establishment of environmental, economic, social and behavioural conditions, cultural patterns of living, etc., known to increase the risk of disease” (e.g., improving housing availability, reducing child poverty). This is the task of public health policy and of health promotion.
- **Primary Prevention:** “protection of health by personal and communal efforts, such as enhancing nutritional status, immunizing against communicable diseases, and eliminating environmental risks, such as contaminated drinking water supplies.” This is the task of public health.
- **Secondary Prevention:** “a set of measures available to individuals and communities for the early detection and prompt intervention to control disease and minimize disability, e.g., by the use of screening programs.” This is the task of preventive medicine.
- **Tertiary Prevention:** “measures aimed at softening the impact of long-term disease and disability by eliminating or reducing impairment, disability, and handicap; minimizing suffering; and maximizing potential years of useful life.” This is the task of rehabilitation.

For the purposes of this report, the focus is almost entirely on primordial and primary prevention, although it could be argued that some forms of secondary and even tertiary prevention in one condition are primary prevention for another. For example, early detection and appropriate treatment of hypertension (high blood pressure) is an effective means of delaying or even preventing the onset of cardiovascular and renal disease and stroke, while effective rehabilitation

from stroke may reduce both the burden of the residual disability (and thus the burden of disease) and reduce the likelihood of resultant depression.

**Primary Care**

This is health care provided at the first point of contact. It is considered to be the first-contact assessment of provision of continuing medical care through a broad scope of health services including diagnostics, treatment and management of health problems, promotion and prevention activities and ongoing support from professionals, family and community.

**APPENDIX 2: SELECTED METHODS OF CONTRACEPTION**

Sources: Black et al., 2004; Fisher & Black, 2007; Hatcher et al., 2004.

Method	Characteristics	Effectiveness	Advantage	Side Effects and Risks
<b>Combined Estrogen-Progestin Contraception</b>				
Oral contraceptive Pill	<p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>inhibition of ovulation; endometrial effects; cervical mucus effects; tubal peristalsis</li> <li>1 pill daily; cyclically or continuously</li> </ul> <p><u>Initiation:</u></p> <ul style="list-style-type: none"> <li>first-day start (on first day of menses), Sunday start or “quick start” (at doctor’s office)</li> </ul>	Perfect use: 99.7% Typical use: 92%	<ul style="list-style-type: none"> <li>effective and reversible</li> <li>non-contraceptive benefits:               <ul style="list-style-type: none"> <li>cycle regulation; decreased menstrual flow; decreased dysmenorrhea</li> <li>increased bone density</li> <li>fewer perimenopausal symptoms</li> <li>less acne and hirsutism</li> <li>decreased risk of ovarian, endometrial and possibly colorectal cancer</li> <li>fewer ovarian cysts</li> <li>decreased incidence or severity of premenstrual symptoms</li> </ul> </li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>irregular bleeding or spotting; breast tenderness; nausea; headache (Rosenberg, Meyers, &amp; Roy, 1999)</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>risk of venous thromboembolism: increased 3- to 4-fold; absolute risk is 1 to 1.5 events per 10,000 users per year of use; risk highest in first year of use (Lidegaard, Edstrom, &amp; Kreiner, 2002 B; Vandembroucke et al., 2001)</li> <li>no increased risk of myocardial infarction, cerebrovascular accident or gallbladder disease in healthy women</li> <li>risk of breast cancer is increased only slightly if at all (CDC and National Institute of Child Health and Human Development, 1986 B; Collaborative Group on Hormonal Factors in Breast Cancer, 1996; Marchbanks et al., 2002 B)</li> </ul>
Transdermal contraceptive patch	<p>Contains ethinyl estradiol and norelgestromin</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>same as that of oral contraceptive</li> <li>1 patch weekly: cyclically (1 patch weekly for 3 weeks, then 1 patch-free week) or continuously</li> </ul>	Perfect use: 99.7% Typical use: 92%	<ul style="list-style-type: none"> <li>effective and reversible</li> <li>once-a-week dosing schedule</li> <li>48-hour window of forgiveness"</li> <li>non-contraceptive benefits similar to those of oral contraceptive</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>similar to those of oral contraceptives; local skin irritation in 20% (Sibai et al, 2002)</li> <li>patch detachment (uncommon)</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>similar to those of oral contraceptive; possibly increased risk of venous thromboembolism</li> </ul>

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Method	Characteristics	Effectiveness	Advantage	Side Effects and Risks
Vaginal contraceptive ring	<p>Contains ethinyl estradiol and etonorgestrel</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>• same as that of oral contraceptive</li> <li>• 1 ring monthly: cyclically (1 ring for 21 days, then 7-day ring-free interval) or continuously</li> </ul>	<p>Perfect use: 99.7%</p> <p>Typical use: 92%</p>	<ul style="list-style-type: none"> <li>• effective and reversible</li> <li>• once-a-month dosing schedule</li> <li>• 1-week window of forgiveness"</li> <li>• non-contraceptive benefits similar to those of oral contraceptive</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>• similar to those of oral contraceptive</li> <li>• ring-specific side effects: (Roumen, Apter, Mulders, &amp; Dieben, 2001) vaginitis (5.%),' leukorrhea (4.6%), vaginal discomfort (2.4%)</li> <li>• expulsion (uncommon)</li> <li>• uterovaginal prolapse or vaginal stenosis are relative contraindications</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>• similar to that of oral contraceptive</li> </ul>
<b>Progestin-only Contraception</b>				
Progestin-only pill	<p>Contains norethindrone</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>• cervical mucus changes; impaired sperm motility; possible inhibition of ovulation</li> <li>• 1 pill daily: no pill-free interval; must be taken at same time every day (back-up method of contraception required if &gt;27 hours between pills)</li> </ul>	<p>Perfect use: 99.7%</p> <p>Typical use: 92%</p>	<ul style="list-style-type: none"> <li>• effective and reversible</li> <li>• can be taken by women with contraindications to estrogen</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>• irregular bleeding; headache; bloating; acne; breast tenderness</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>• no apparent increased risk of venous thromboembolism or cerebrovascular accident</li> </ul>
Depot medroxy-progesterone acetate (DMPA)	<p>Contains medroxyprogesterone acetate</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>• suppresses ovulation; cervical mucus changes; endometrial effects</li> <li>• 1 injection (150 mg) intramuscularly every 12–13 weeks</li> </ul>	<p>Perfect use: 99.7%</p> <p>Typical use: 97%</p>	<ul style="list-style-type: none"> <li>• effective and reversible</li> <li>• infrequent dosing (only 4 times per year)</li> <li>• can be used by women with contraindications to estrogen</li> <li>• Amenorrhea occurs in 55–60% of users at 12 months</li> <li>• Non-contraceptive benefits: <ul style="list-style-type: none"> <li>- amenorrhea, and thus less dysmenorrhea and anemia;</li> <li>decreased risk of endometrial cancer;</li> <li>fewer symptoms from endometriosis, premenstrual syndrome and chronic pelvic pain; fewer seizures; possible decreased risk of pelvic inflammatory disease; possible decreased risk of sickle-cell crises</li> </ul> </li> <li>• only 2 known drug interactions: aminoglutethimide and nevirapine</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>• menstrual irregularities; hormonal side effects: headache, decreased libido, nausea, breast tenderness; weight gain (mean 2.5 kg in first year); mood effects (not proven in prospective studies)</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>• delayed return of fertility; no increased risk of venous thromboembolism or cerebrovascular accident; decreased bone mineral density (Black, 2006; Clark, Sowers, Nichols, &amp; Levy, 2004 B; Cromer et al., 2004 B; Health Canada, 2005; Scholes et al., 2002 B; Scholes et al., 2005; World Health Organization, 2005)</li> </ul>

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Method	Characteristics	Effectiveness	Advantage	Side Effects and Risks
<b>Intrauterine Device/System</b>				
Copper intrauterine device (IUD)	<p>Contains copper wire on a vertical stem</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>Multiple mechanisms of action; primary mechanism is prevention of fertilization (Videla-Rivero, Etchepareborda, &amp; Kessler, 1987)</li> </ul> <p>Duration of effectiveness in years</p>	<p>Perfect use: 99.2%</p> <p>Typical use: 99.4%</p>	<ul style="list-style-type: none"> <li>effective and reversible</li> <li>can be used by women with contraindications to estrogen</li> <li>may decrease risk of endometrial cancer (Benshushan, Paltiel, Rojansky, Brzezinski, &amp; Laufer, 2002 B)</li> <li>can be used for emergency contraception up to 7 days after unprotected intercourse</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>bleeding irregularities or changes; increased menstrual flow; pain or dysmenorrhea</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>perforation at time of insertion (rare);</li> <li>increased risk of infection in first 20 days after insertion; (Farley, Rosenberg, Rowe, Chen, &amp; Meirik, 1992)</li> <li>expulsion (up to 5% of cases);</li> <li>does not increase risk of ectopic pregnancy overall, but if pregnancy occurs with IUD in situ, ectopic pregnancy must be ruled out (Andersson, Odland, &amp; Rybo, 1994)</li> </ul>
Hormonal intrauterine system	<p>Contains levonorgestrel on a vertical stem released in continuous fashion</p> <p><u>Mechanism of Action:</u></p> <ul style="list-style-type: none"> <li>same as for copper IUD; changes in cervical mucus</li> </ul> <p>Duration of effectiveness is 5 years</p>	<p>Perfect use: 99.9%</p> <p>Typical use: 99.9%</p>	<ul style="list-style-type: none"> <li>effective and reversible</li> <li>can be used by women with contraindications to estrogen</li> <li>decreased menorrhagia; some users experience amenorrhea</li> <li>decreased dysmenorrhea</li> <li>may protect against endometrial hyperplasia (Lethaby, Cooke, &amp; Rees, 2005)</li> </ul>	<p><u>Side Effects:</u></p> <ul style="list-style-type: none"> <li>bleeding irregularities; hormonal side effects despite low levels of systemic hormones; functional cysts</li> </ul> <p><u>Risks:</u></p> <ul style="list-style-type: none"> <li>same as for copper IUD</li> </ul>
Male condom	<p>Latex or non-latex sheath used over the penis during intercourse</p>	<p>Perfect use: 98%</p> <p>Typical use: 85%</p>	<ul style="list-style-type: none"> <li>effective if used consistently and correctly</li> <li>no prescription required</li> <li>protects against many sexually transmitted infections</li> <li>may reduce premature ejaculation</li> </ul>	
Female condom	<p>Polyurethane sheath inserted into the vagina before intercourse; can be placed up to 8 hours before intercourse</p>	<p>Perfect use: 95%</p> <p>Typical use: 79%</p>	<ul style="list-style-type: none"> <li>effective if used consistently and correctly</li> <li>no prescription required</li> <li>protects against many sexually transmitted infections</li> <li>female-controlled</li> </ul>	<ul style="list-style-type: none"> <li>can be noisy during intercourse</li> <li>some users find it difficult to insert</li> <li>the inner ring may cause discomfort during intercourse</li> </ul>

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Method	Characteristics	Effectiveness	Advantage	Side Effects and Risks
Diaphragm	<ul style="list-style-type: none"> <li>dome-shaped latex cup (silicone diaphragms also available) that covers the cervix; inserted into the vagina up to 6 hours before intercourse</li> <li>must be left in the vagina for at least 6 hours, but no more than 24 hours, after intercourse</li> <li>used with a spermicide</li> <li>must be fitted by a health care provider</li> </ul>	Perfect use: 94% Typical use: 84%	<ul style="list-style-type: none"> <li>non-hormonal</li> <li>some protection against sexually transmitted infections</li> <li>can be used during menses</li> </ul>	<ul style="list-style-type: none"> <li>some women find correct insertion difficult</li> <li>possible sensitivity to latex or spermicide</li> <li>may increase risk of persistent urinary tract</li> <li>does not protect against HIV infection</li> <li>wearing diaphragm &gt;25 hours may increase risk of toxic shock syndrome</li> </ul>
Sponge	<ul style="list-style-type: none"> <li>Soft, disposable foam device that is impregnated with spermicide and inserted into the vagina before intercourse</li> <li>Must be left in vagina for at least 6 hours, but no more than 24 hours, after intercourse</li> </ul>	<u>Nulliparous</u> Perfect use: 91% Typical use: 84% <u>Parous</u> Perfect use: 80% Typical use: 68%	<ul style="list-style-type: none"> <li>non-hormonal</li> <li>one-size-fits-all</li> <li>no prescription required</li> </ul>	<ul style="list-style-type: none"> <li>some women find correct insertion and removal difficult</li> <li>possible sensitivity to spermicide</li> <li>may be less effective in multiparous women</li> <li>should not be used during menstruation</li> </ul>