

**Vertical (Mother-to-Child)
Transmission of HIV: Prevention,
Treatment, and Education
Literature Review**

Prepared by the Saskatchewan Prevention Institute

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Vertical (Mother-to-Child) Transmission of HIV: Prevention, Treatment, and Education

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Executive Summary

Saskatchewan continues to see high rates of new cases of human immunodeficiency virus (HIV) infection in comparison to the rest of Canada. A large number of these new cases are being identified in women of childbearing age, particularly those between the ages of 20 and 29 years. These are important facts to consider when thinking about the prevention of HIV transmission, particularly the prevention of vertical (mother-to-child) transmission of HIV. Both planned and unplanned pregnancies occur in women living with HIV, and HIV transmission to the baby can occur during pregnancy (in utero), around the time of delivery (intrapartum), or postnatally through breastfeeding. Women living with HIV have approximately a 25% chance of transmitting HIV to their newborn in the absence of preventative measures and HIV treatment. If the woman breastfeeds her baby, the risk of vertical transmission increases to an estimated 35%. Therefore, it is important that women living with HIV and their health care providers are knowledgeable about HIV in the context of pregnancy and ways to reduce the risk of transmission to the baby.

Due to increases in knowledge about vertical transmission, women receiving proper treatment and care have less than a 2% chance of having a baby infected with HIV. The introduction of universal HIV testing in the antepartum period, the use of combination antiretroviral treatment (cART), scheduled caesarean section when appropriate, and formula feeding have been found to produce transmission rates that are less than 1%. When vertical transmission does occur, it is mainly in women who are unaware of their HIV status at delivery. It is for this reason that the Saskatchewan HIV Testing Policy calls for confidential HIV testing to be included in the routine panel of prenatal screening for every pregnant woman. Testing allows those who test positive to access treatment and care early, while also providing education to those who test negative who may be at risk of infection during pregnancy.

Research has identified numerous factors that increase the risk of vertical transmission. Maternal factors related to vertical transmission include: advanced stage of disease; decreased CD4 cell count; high maternal viral load prior to birth; lack of cART during pregnancy; having a genital infection during pregnancy; and using alcohol, drugs, or cigarettes during pregnancy. The health of the fetus, which is related to maternal nutrition and prenatal care, has also been linked to in utero transmission. Overall, women who are less healthy are more likely to pass HIV to their babies. Intrapartum events associated with potential fetal exposure to maternal blood are also correlated with a higher incidence of vertical transmission of HIV. Such intrapartum events include placental abruption, use of fetal scalp electrodes, intrauterine catheters, episiotomy, and lacerations. Other obstetric factors associated with an increased risk of transmission include: longer duration between the rupture of membranes and delivery, presence of a bacterial infection in the membranes around the fetus and the amniotic fluid (chorioamnionitis), the use of forceps, and, in some circumstances, having a vaginal delivery.

In addition to identifying factors that increase the risk of transmission, research has identified numerous factors that significantly decrease the risk of vertical transmission of HIV. First, it is important for pregnant women to find a doctor whom they trust and see him or her regularly. Pregnancy and HIV require special medical care, so it is important for women to find a doctor who is knowledgeable about

HIV. Second, cART is vital for reducing the risk of vertical transmission in pregnant women living with HIV. The Canadian standard of treatment for pregnant women living with HIV includes antepartum cART, intrapartum zidovudine (AZT), and six weeks of postnatal oral AZT to the infant. In terms of antepartum cART, the most effective regimen that is safe in pregnancy should be selected as treatment. Treatment during pregnancy should focus not only on preventing vertical transmission, but also on ensuring optimal health for the mother. Finally, women with HIV should take special care to increase behaviours that support a healthy immune system, such as: getting enough sleep and rest, lowering their stress levels, ensuring they are getting proper nutrition, getting social support, maintaining contact with professionals, and decreasing substance use.

Researchers working in the areas of HIV prevention and prenatal care for pregnant women living with HIV have identified numerous barriers. Many of the barriers to HIV prevention and prenatal care include social determinants of health: lack of food, clothing, stable housing, adequate finances, and transportation. When pregnant women are unable to meet their most basic needs, it can be difficult for them to participate in prenatal treatment and care. Refusal to be tested and/or inability to obtain test results have been attributed in part to obstacles with transportation and having to return to health facilities. Other common reported barriers include: lack of childcare while attending doctor's appointments, mistrust of nurses and doctors, fear of health and social service organizations, fear of having the baby removed from their custody, and lack of access to appropriate substance use treatment programs. In order to receive appropriate treatment and counselling, women need to feel comfortable being honest with medical professionals about their lifestyle (e.g., treatment adherence, food intake, drug use).

Fear of potential judgements and discrimination by staff members, based on a pregnant woman's HIV status, can greatly decrease the likelihood that women will seek prenatal care. The stigma surrounding HIV can influence health and health seeking behaviours. For example, stigma from others can limit the services women receive, and internalized stigma can cause women to avoid seeking treatment and/or avoid disclosing their HIV status. Stigma against HIV is reported to be the main reason for women's reluctance to be tested, to disclose their HIV status, and to take cART. Stigma and discrimination are often based on fear and are often the result of a lack of information, or a wealth of misinformation, about HIV. Therefore, education about HIV and pregnancy is important for the general public, youth, vulnerable women, and health professionals. In addition to increasing knowledge, such education may reduce the stigma and discrimination faced by women with HIV. This, in turn, may increase women's willingness to seek appropriate care and treatment for their HIV in order to further reduce the risk of vertical transmission of HIV.

For more information, including a list of references, please refer to the complete report.

1. Introduction

Unlike other parts of Canada, Saskatchewan has seen a substantial increase in the number of new cases of human immunodeficiency virus (HIV) since 2003. In 2012, Saskatchewan had the highest rates of new cases of HIV in Canada at over 2.5 times the national average (16.1 vs 8.2/100,000) (Saskatchewan Ministry of Health, 2013). Of the 177 new cases of HIV reported in 2012 in Saskatchewan, 80% were in those aged 20 to 49 years. While 60% of the overall cases were identified in males, women of childbearing age (ages 15 to 39 years) are one of the groups with the largest increases in HIV infection rates. This is particularly true for the 20 to 29 age group, where female cases exceeded male cases in 2012 (Saskatchewan Ministry of Health, 2013). These are important facts to consider when thinking about the prevention of HIV transmission, particularly the prevention of vertical (mother-to-child) transmission of HIV. Without effective education, prevention, and treatment efforts, including those directed at women who are or may become pregnant, HIV infection rates will likely continue to rise in Saskatchewan.

Recognizing the importance of understanding HIV in the context of pregnancy, the Saskatchewan Prevention Institute conducted a review of the literature in this area.¹ The following literature review will focus on ways to ensure the best possible outcomes for pregnant women who live with HIV and for their newborns. The review includes findings and recommendations on vertical transmission, transmission prevention, barriers to prevention, and health promotion around these topics.

2. Introduction to HIV/AIDS

Before proceeding, it is important to first have a basic understanding of HIV/AIDS, including the meanings of acronyms used in this area. As indicated previously, HIV is the acronym for human immunodeficiency virus. This name highlights the fact that HIV can only be transmitted from one human to another human, and that it is a virus that causes a deficiency in the immune system (Positive Women's Network Society, 2001). More specifically, HIV infects the CD4 positive T cells, which are the key components of the human cellular immune system (Joint United Nations Programme on HIV/AIDS [UNAIDS], 2008). CD4 cells are a type of lymphocyte, or white blood cell, that are responsible for signalling other immune system cells to fight infections in the body (AIDS.org, 2009). When HIV enters these cells, it impairs or destroys them, resulting in a deterioration of the immune system. According to UNAIDS, the immune system is considered deficient when it is no longer able to fight off infections and diseases (i.e., when the number of CD4 cells is less than 200, meaning 200,000 cells per mL of blood).² HIV is a progressive disease that continually causes changes and damage to an individual's immune system.

¹ The current document is an update of a previously completed literature review conducted by the Saskatchewan Prevention Institute in 2010 (titled "Mother-to-Child Transmission of HIV: Prevention, Treatment, and Education").

² The lower limit of 'normal' is 500, meaning 500,000 CD4 cells per mL of blood.

When individuals' CD4 cells drop below 200 and they contract one or more opportunistic infections, they are said to have AIDS (acquired immunodeficiency syndrome). Opportunistic infections are those that individuals with HIV are particularly susceptible to because of the damage to their immune system. There are a wide range of opportunistic infections that include, but are not limited to, fungal infections, respiratory infections, and various forms of cancer. These infections are ones that are rare among people with a healthy immune system. In summary, AIDS is considered a syndrome or a group of signs, symptoms, illnesses, and infections that are related to the damage done to the immune system due to infection with HIV (UNAIDS, 2008).

Prior to the introduction of antiretroviral therapy (ART), particularly combination antiretroviral therapy (cART), the average life expectancy after HIV diagnosis was around 10.5 years (Harrison, Song, & Zhang, 2010). The use of ART or cART can slow down the progression of HIV by decreasing the individual's viral load or the amount of HIV virus in a person's blood. As a result, ART and cART can allow the immune system to strengthen itself. Since 1996, when the use of cART was expanded, the average life expectancy increased dramatically, approaching that of the general population (Gulick, 2010; Samji et al., 2013). Bhaskaran et al. (2008) found that by 2004-2006, deaths due to HIV/AIDS alone (excess mortality) was 94% lower than pre-1996 levels.

Despite such major reductions in excess mortality, a significantly increased risk of death remains among individuals of all ages with HIV (Bhaskaran et al., 2008; Samji et al., 2013). It has been suggested that even with current standards of HIV management, some long-term excess mortality remains because of problems of toxicity, resistance, and therapy adherence (Bhaskaran et al., 2008). In addition, many individuals living with HIV have demographic and behavioural characteristics associated with greater mortality than the general population. For example, people who are infected with HIV through injection drug use (IDU) have a higher excess risk of death overall (Bhaskaran et al., 2008; Samji et al., 2013), as do those with a co-infection with hepatitis C (Lohse et al., 2007). Factors that may contribute to the increased mortality rates of those exposed through IDU include the risks associated with substance abuse, the increased likelihood of having mental health issues, and a decreased likelihood of receiving HIV treatment.

2.1 HIV Transmission

HIV can only be transmitted when there is a direct exchange of specific bodily fluids between two humans. The five fluids capable of transmitting HIV are: 1) blood, 2) semen and pre-cum, 3) vaginal fluid, 4) anal fluid, and 5) breast milk (Positive Women's Network Society, 2001).

Common high risk activities include unprotected vaginal and anal sex, sharing needles and other substance use equipment, and tattooing with used needles. In Saskatchewan, IDU accounted for 67% of new cases of HIV in 2012 (Saskatchewan Ministry of Health, 2013), while the primary mode of transmission in other provinces was unprotected sex. In Canada, 50% of new cases of HIV infection were found in men who have sex with men, and 33% were reported in people engaged in heterosexual sex (Public Health Agency of Canada [PHAC], 2013).

Women living with HIV can also pass HIV to their babies through pregnancy, childbirth, and breastfeeding, although the occurrence is currently relatively rare in Saskatchewan, with nine cases of perinatal transmission being reported between 2002 and 2010 (Saskatchewan Ministry of Health, 2013). No babies were born infected with HIV in Saskatchewan in either 2011 or 2012. Another population gathering attention is immigrants from countries where HIV is considered very prevalent (endemic), or where the predominant means of HIV transmission is heterosexual contact. In Saskatchewan between 2003 and 2012, 1% of new HIV cases were identified in people who emigrated from countries where HIV is considered endemic (Saskatchewan Ministry of Health, 2013).

Everyday, casual contact is not a risk for transmitting HIV, unless people are participating in behaviours that could result in an exchange of bodily fluids. Simply put, HIV is spread when: 1) a body fluid with a high concentration of HIV (blood, semen, vaginal fluid, anal fluid, breast milk); 2) enters the body of someone else through an activity (e.g., intercourse; sharing needles; during labour, delivery, breastfeeding); 3) that provides direct access to the bloodstream (e.g., through breaks in the skin or by passing through a mucous membrane³) (Positive Women's Network Society, 2001; Sheth & Thorndycraft, 2009). In other words, HIV transmission requires a direct exchange of body fluids with high concentrations of HIV. Certain activities, like unprotected vaginal and anal sex, are considered higher risk activities because small abrasions can occur during sex resulting in direct routes for HIV transmission.

2.2 Symptoms of HIV

Most people living with HIV do not show symptoms for several years after infection. This means that they may not know that they have been infected. Some people develop acute retroviral syndrome at the time of seroconversion; the time at which the body develops antibodies to HIV. Seroconversion usually takes place between one and six weeks after HIV infection (UNAIDS, 2008). People experiencing acute retroviral syndrome typically have symptoms similar to glandular fever (e.g., fever, rash, joint pains, and enlarged lymph nodes). Even people with HIV who are not symptomatic are highly infectious, particularly at the time of seroconversion, and can transmit the virus to others.

AIDS is the most serious stage of HIV infection. People living with AIDS have severely weakened immune systems and, as such, may have developed an opportunistic infection (e.g., thrush, tuberculosis, recurrent pneumonia) or an AIDS-related cancer (e.g., lymphoma, Kaposi's Sarcoma) (AIDS.gov, 2014). Not everyone living with HIV will advance to AIDS. If a person is diagnosed with AIDS, however, they require medical treatment in order to prevent death. According to the Centers for Disease Control and Prevention (2014), life expectancy without treatment is about one year following a diagnosis with AIDS. With proper treatment, CD4 cell counts may increase and the person's health may begin to improve. Once a person receives a

³ Mucous membranes are tissues that line the surfaces of body cavities such as the nostrils, mouth, throat, vagina, urethra, and anus.

diagnosis of AIDS, however, the diagnosis is not removed regardless of subsequent changes in health status.

2.3 HIV Testing

Early detection of HIV infection is important for both treatment and for the prevention of HIV transmission (Spielberg et al., 2003). HIV diagnostic tests are used to detect whether HIV antibodies are present in a person's body. These antibodies are produced by the immune system in response to the HIV infection. This type of test is used because it is easier and cheaper to detect antibodies rather than the virus itself (UNAIDS, 2009a).⁴ As the test relies on the presence of antibodies, there is a window period between the occurrence of risky activities and when the results of an HIV test will be accurate. For most people, it takes three months for enough HIV antibodies to develop and result in a positive HIV test result.

Regular HIV testing is extremely important as it allows people who test positive to access treatment, care, and support services as early as possible. As someone can have HIV and not have any symptoms for five or more years, waiting until symptoms occur can be detrimental, as damage to the immune system is still occurring (Society of Obstetricians and Gynaecologists of Canada [SOGC], 2004). Receiving care before the immune system is severely impacted and/or opportunistic infections occur can help individuals keep their viral loads down, thereby prolonging the time before they are diagnosed with AIDS. Testing is also crucial because it allows people who test positive to take the necessary precautions to prevent the spread of HIV to others. Frequent testing is particularly important for people who are engaged in risky activities, as their HIV infection status may change rapidly. Also, as the HIV virus mutates quickly, a person living with HIV can be re-infected with a different strain of HIV by participating in risky behaviours (Canadian AIDS Treatment Information Exchange [CATIE], 2009).

For pregnant women, women contemplating pregnancy, or women having unprotected sex, knowing their HIV status can help them to prevent the spread of HIV to their children, in particular their fetus or newborn child (Lu et al., 2014). UNAIDS (2009a) views counselling and testing as both primary and secondary prevention strategies. Specifically, counselling can reduce the risk of HIV exposure in people who test negative by providing them with accurate information about HIV transmission (i.e., primary prevention). Counselling and testing can also reduce the risk of transmission of HIV to partners and unborn children in those testing positive for HIV through the provision of information and appropriate treatment and care. Testing of pregnant women can also serve as a secondary prevention activity, as knowledge of HIV status can increase the opportunities for interventions to slow the progression of HIV to AIDS.

⁴ The first test used is the enzyme-linked immunosorbent assay (ELISA). If the first test is positive for HIV antibodies, a repeat ELISA test will be done, and then a second test (called a Western blot) will be done to confirm the results.

2.3.1 Saskatchewan's HIV Testing Policy

Recognizing the importance of HIV testing for HIV care and transmission prevention, the Saskatchewan Provincial Leadership Team (SK HIV/PLT) developed a Saskatchewan-specific HIV testing policy in 2013.⁵ The policy recommends voluntary, confidential HIV testing and counselling for:

- all pregnant women
- all patients with tuberculosis and/or hepatitis C
- all clients assessed in a sexually transmitted infection (STI) clinic or seen in any health care setting for an STI
- all patients showing signs or symptoms that may be consistent with an HIV-related disease
- all clients who have requested an HIV test
- all patients aged 13 to 64 receiving primary or emergency health care who do not know their HIV status, or who are sexually active and have not had an HIV test in the last 12 months

During pregnancy, both the SK HIV/PLT and the SOGC (2006) indicate that HIV testing should be included in the routine panel of prenatal screening for all pregnant women. They also recommend that women who test negative for HIV and continue to engage in high risk behaviours should be retested in their third trimester. Finally, it is recommended that pregnant women with no prenatal care and an unknown HIV status should be offered HIV testing when they present to the hospital for labour and delivery. For more information about HIV testing in Saskatchewan, including the types of testing available and a list of testing sites, please refer to the Saskatchewan Ministry of Health website (<http://www.health.gov.sk.ca/hiv-testing>).

2.4 HIV Treatment

When the HIV/AIDS epidemic first began in the early 1980s, the virus was considered to be a death sentence, and individuals did not live long post-diagnosis. Currently, although there is still no cure for HIV, there are highly effective treatments that can help maintain the health of people living with HIV (Positive Women's Network Society, 2001). As previously discussed, cART can stop the virus from replicating in the body which, in turn, stops the virus from rapidly damaging the immune system (UNAIDS, 2009b). The medications allow CD4 cells to live longer and protect the body from infections. Because cART does not eliminate HIV from the body, people with HIV need to take these medications for the rest of their lives.

HIV is able to quickly adapt to medications, which makes the use of cART very important. For the same reason, treatment adherence is also important. Because HIV is characterized by high levels of virus production and mutation, the virus can become resistant to medication when treatment

⁵ For more information about the Saskatchewan HIV testing policy, please refer to [http://www.skshiv.ca/SK%20HIV%20Testing%20Policy%20Final%20Dec%202012%20\(2\).pdf](http://www.skshiv.ca/SK%20HIV%20Testing%20Policy%20Final%20Dec%202012%20(2).pdf)

regimens are not adhered to (Clavel & Hance, 2004; Deeks, 2006). When HIV becomes resistant to one drug, it may also become resistant to other drugs in the same class, even if the individual has never taken those drugs (CATIE, 2009; Clavel & Hance, 2004). As there are only a certain number of drug combinations available, acquiring resistance to a drug class can greatly reduce an individual's treatment options. Keeping the right levels of medications in the body at all times makes it more difficult for the virus to become resistant to the medication (UNAIDS, 2009b).

Current recommendations from the World Health Organization (WHO, 2013) and the British Columbia Centre for Excellence in HIV/AIDS (2013) indicate that initial ART should consist of three medications (one non-nucleoside reverse-transcriptase inhibitors [NNRTI] plus two nucleoside reverse-transcriptase inhibitors [NRTIs]). With the availability of combination medications, this ART regimen can be as simple as a once-daily, single-pill treatment. Some ART medications can cause side effects like nausea, vomiting, headaches, and skin rashes. Most of these side effects improve over time or can be managed through a change in diet or the use of additional medications (CATIE, 2009). Although these side effects can usually be managed, they can sometimes cause low adherence to HIV treatment (Mehta, Moore, & Graham, 1997). This may be especially true in pregnant women who may already be experiencing some of these effects from pregnancy (e.g., nausea and vomiting).

3. HIV and Pregnancy

3.1 Modes of Maternal Transmission of HIV

As of 2002 it was estimated that 0.2% of pregnant women were living with HIV (SOGC, 2004), although this number is expected to be on the rise (Caprara, Shah, MacGillivray, Urquia, & Yudin, 2014; PHAC, 2010). When a woman living with HIV passes the virus to her fetus or baby, this is called vertical transmission⁶ (CATIE, 2009; Margolese, 2009; du Preez, du Plessis, & Pienaar, 2006). It is also sometimes called mother-to-child transmission, perinatal transmission, or maternal transmission. Transmission can occur during pregnancy (in utero), around the time of delivery (intrapartum), or postnatally through breastfeeding. The timing of transmission is difficult to determine for certain, and the risk factors for transmission vary between the in utero, intrapartum, and postnatal periods. Therefore, it is important for preventative interventions to address the major risk factors at the appropriate time (Jourdain et al., 2007; Magder, et al., 2005). Research suggests that among non-breastfeeding women, approximately one third of infections are acquired in utero and two thirds during delivery (Kourtis, Bulterys, Nesheim & Lee, 2001; Madger et al., 2005). Research also indicates that in utero transmissions occur primarily in the weeks or days prior to delivery (Thorne & Newell, 2003; Kourtis et al., 2001).

Women living with HIV have approximately a 25% chance of transmitting HIV to their newborn in the absence of preventative measures and HIV treatment (Boucher, 2001; Margolese, 2009;

⁶ When HIV is transmitted between sexual partners, it is known as horizontal transmission.

SOGC, 2004; Walmsley, 2003). If the woman breastfeeds her baby, the risk of vertical transmission increases to an estimated 35% (PHAC, 2010). Because of increases in knowledge about vertical transmission, women receiving proper treatment and care have less than a 2% chance of having a baby infected with HIV (Walmsley, 2003). The introduction of universal HIV testing in the antepartum period, the use of cART, scheduled caesarean section when appropriate, and formula feeding have been found to produce transmission rates that are less than 1% (Caprara et al., 2014; Coovadia, 2004; Loutfy et al., 2014; Money et al., 2013).

The potential for decreasing transmission rates is reflected in the Canadian and Saskatchewan data. Although the number of infants who are perinatally exposed to HIV has increased over time, the proportion of those confirmed to be infected with HIV has decreased (Forbes et al., 2012). Of the 225 Canadian infants who were prenatally exposed to HIV in 2012, there were no confirmed HIV transmissions (PHAC, 2013). In Saskatchewan, eight cases of vertical transmission were identified between 2002 and 2008. In all of these cases, the women did not receive HIV treatment during pregnancy or delivery (Saskatchewan Ministry of Health, 2009). One case of vertical transmission was identified in Saskatchewan in 2009 and another in 2010, but no cases of vertical transmission were identified in either 2011 or 2012 (Saskatchewan Ministry of Health, 2013).

Infants are classified as infected in utero if HIV cultures are positive within 48 hours of birth. They are classified as infected intrapartum (during birth) if cultures were negative at birth and then became positive within 90 days of life (Boyer et al., 1994; Bryson, Luzuriaga, Sullivan, & Wara, 1992; Magder et al., 2005). Infants born to women living with HIV may receive false-positive HIV test results if standard HIV tests are used. This is because all babies are born with their mothers' antibodies, and standard tests look for the presence of these antibodies. Therefore, tests that directly detect the presence of HIV are now being used for infants (WHO, 2010). Although these tests are very sensitive, they are less accurate in newborns under 28 days old (Krist & Crawford-Faucher, 2002). Consequently, it is currently recommended that infants be tested for HIV before 48 hours old, with the test being repeated at one to two months, and four to six months of age (Panel on Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission, 2014). HIV infection is definitively diagnosed when two HIV tests performed on separate blood samples are returned positive. Non-breastfed infants who receive two or more negative HIV tests, with one obtained around one month of age and one obtained at over four months of age, are deemed to be non-infected (WHO, 2010b).

3.2 Factors that Increase the Risk of Vertical Transmission of HIV

The Saskatchewan Ministry of Health (2013) points out that when vertical transmission does occur, it is mainly in women who are unaware of their HIV status at delivery. Lu et al. (2014) agree, suggesting that vertical transmission is most often due to the late HIV diagnosis of the mother (i.e., diagnosed at or after delivery). Knowledge about HIV status is important as research has identified a link between vertical transmission and maternal factors. These maternal factors include: advanced stage of disease; decreased CD4 cell count; high maternal

viral load prior to birth; lack of ART during pregnancy; having a genital infection during pregnancy; and using alcohol, drugs, or cigarettes during pregnancy (Canadian AIDS Society, 2004; Katz, 2003; Krist & Crawford-Faucher, 2002; Magder et al., 2005). The health of the fetus, which is related to maternal nutrition and prenatal care, has also been linked to in utero transmission (Vogler, 2006). Overall, women who are less healthy are more likely to pass HIV to their babies.

The use of alcohol and drugs can result in poorer maternal health. Specifically, alcohol and drug use can weaken the immune system, impact nutrition, and increase the risk of other pathogens. Therefore, women who are living with HIV and are using alcohol and drugs may be more likely to get infections or viruses. These women may also be less likely to adhere to their HIV treatment regimens (Mehta et al., 1997). To increase their health and the health of their babies, women should use alcohol and drugs less often, practice safer drug use, and stop using alcohol and drugs if possible (Positive Women's Network Society, 2001). Stopping alcohol and drugs should be done under the care of a medical professional, especially when pregnant.

In addition to these maternal factors, intrapartum events associated with potential fetal exposure to maternal blood are correlated with a higher incidence of vertical transmission of HIV. Such intrapartum events include placental abruption, use of fetal scalp electrodes, intrauterine catheters, episiotomy, and lacerations (Money et al., 2013; Thorne & Newell, 2003). Other obstetric factors associated with an increased risk of transmission include: longer duration between the rupture of membranes and delivery, presence of a bacterial infection in the membranes around the fetus and the amniotic fluid (chorioamnionitis), the use of forceps, and, in some circumstances, having a vaginal delivery⁷ (Burdge et al., 2003; Madger et al., 2005; Remez, 1997; Thorne & Newell, 2003). It is important to note that epidural anesthesia is not contraindicated (Money et al., 2013).

3.3 Factors that Reduce the Risk of Vertical Transmission

In addition to identifying factors that increase the risk of transmission, research has identified numerous factors that significantly decrease the risk of vertical transmission of HIV. First, it is important for pregnant women to find a doctor whom they trust and see him or her regularly. Pregnancy and HIV require special medical care, so it is important for women to find a doctor who is knowledgeable about HIV (Margolese, 2009). Second, women with HIV should take special care to increase behaviours that support a healthy immune system, such as: getting enough sleep and rest, lowering their stress levels, ensuring they are getting proper nutrition, getting social support, maintaining contact with health care professionals, and decreasing substance use (Positive Women's Network Society, 2001). Other important factors for reducing the risk of vertical transmission include HIV testing, receiving and maintaining adherence to cART, and possible caesarean section.

⁷ Mode of delivery is discussed further later in this review.

3.3.1 HIV Testing in Pregnancy

One of the most basic ways to reduce the risk of vertical transmission of HIV is to screen pregnant women as early in pregnancy as possible. The earlier in pregnancy the HIV testing takes place, the sooner arrangements can be made for treatment of both the mother and the fetus. As stated by Obermeyer and Osborn (2007), “testing for HIV is the gateway to treatment, care, and prevention” (p. 1). Burdge et al. (2003), on behalf of the Canadian HIV Trials Network Working Group on Vertical HIV Transmission, recommend that women who test negative early in pregnancy but who continue to engage in high risk behaviours should be offered repeat testing each trimester and at term. The SOGC (2006) states that it has yet to be determined whether repeat testing of all women would be cost-effective. As such, it is currently recommended that repeat testing be done only for women at continued risk for HIV infection (Bitnun et al., 2014; Saskatchewan Ministry of Health, 2013; SOGC, 2006). This includes women who engage in injection drug use, commercial sex work, and unprotected intercourse with multiple partners, and those in serodiscordant relationships (e.g., an HIV-negative woman in a relationship with an HIV-positive man; Bitnun et al., 2014).

Health Canada (2002) states that there are three main goals of HIV testing during pregnancy: 1) to identify women who are living with HIV so that they can receive optimal care, 2) to decrease the incidence of vertical transmission of HIV, and 3) to reduce the risk of transmission to sexual partners. These goals highlight the importance of offering HIV testing as a part of routine prenatal care and as a way of reducing vertical transmission of HIV. In recognition of the importance of prenatal HIV testing, it is now recommended that all pregnant women are offered prenatal screening for HIV, instead of just those who present as being high risk for HIV (Murray and Weir, 2005; Saskatchewan Ministry of Health, 2013; SOGC, 2006). Health Canada (2002) suggests that targeted testing of those considered to be high risk identifies only 8 to 58% of pregnant women who are HIV positive.

Saskatchewan currently uses an opt-out testing strategy, where all pregnant women are offered HIV testing as part of their routine prenatal screening tests (Saskatchewan Ministry of Health, 2013). As part of the opt-out testing strategy, the physician is required to inform the woman that HIV testing is part of routine screening, and that she has the option to decline the test (opt-out) if desired (Walmsley, 2003). Ideally, physicians should make sure that the purpose, risks, and benefits of the test are explained to the woman and that she understands her right to refusal. Research has shown that pre-test counselling of pregnant women leads to higher acceptance of testing, increased knowledge of HIV transmission, and increased use of condoms and contraceptives (Obermeyer & Osborn, 2007; Samson and King, 1998). It is important that the common principles of confidentiality and informed consent, conducted in a non-judgemental fashion, are applied to HIV testing in pregnancy (Health Canada, 2002; Saskatchewan Ministry of Health, 2013).

HIV testing usually consists of a blood test. First the enzyme-linked immunosorbent assay (ELISA) test is used to see whether the blood contains HIV antibodies (SOGC, 2004). HIV antibodies usually develop within six to eight weeks, but it can take up to three months for the body to develop enough antibodies to give an accurate result (Canadian AIDS Society, 2011). If the first test is reactive (positive), the ELISA test is repeated two more times. If at least two of the three ELISA tests are reactive, the test results are confirmed with a Western blot test (PHAC, 2012). The ELISA test is very sensitive but may still result in false positives. The Western blot test is a much more specific test used to confirm diagnoses (SOGC, 2004).

3.3.2 Anti-HIV Medications

Once women are aware of their HIV status, cART is one of the most important ways to reduce the risk of vertical transmission of HIV (Margolese, 2009). AVERT (2009) reports that a single dose of anti-HIV medication given to a mother and her baby can reduce the risk of vertical transmission by half. A Canadian review of vertical transmission between 1997 and 2010 found that the rate of transmission for mothers who received cART was 1% (Forbes et al., 2012). This rate was reduced to 0.4% if more than four weeks of cART was given before delivery. As previously mentioned, the chance of HIV transmission to the baby is approximately 25% when women do not receive any treatment. Therefore, the identification and appropriate treatment of HIV during pregnancy is very important (Health Canada, 2002).

The Canadian Paediatric and Perinatal AIDS Research Group and the Infectious Diseases Committee of the SOGC state that the standard of treatment for pregnant women living with HIV includes antepartum cART, intrapartum zidovudine (AZT), and six weeks of postnatal oral AZT to the infant (Bitnun et al., 2014). This group, as well as the SOGC, recommends intravenous AZT during labour and delivery for all women living with HIV, regardless of their antepartum ART regimen, mode of delivery, or viral load near delivery. The combination of medications taken during pregnancy depends on many factors, including the medications the woman has taken in the past. The SOGC (2012) states that treatment during pregnancy should focus not only on preventing vertical transmission, but also on ensuring optimal health for the mother. Therefore, the most effective regimen that is safe in pregnancy should be selected.

It is recognized that ART medications can have side effects for both the mother and her fetus. Some maternal side effects include high blood sugar, low red blood cell count (anemia), and stress on the kidneys and liver (Margolese, 2009). As these side effects can be worse during pregnancy, women should be monitored throughout pregnancy. Potential fetal side effects include prematurity, neural tube defects, low birth weight, pre-eclampsia, and gestational diabetes mellitus (Thorne & Newell, 2005; Thorne & Newell, 2007). However, much of the evidence for potential harm is from animal studies and

observational studies of varying strengths, and the benefits of these medications in reducing vertical transmission and delaying maternal HIV disease progression means that research is still needed to clarify the risks and benefits of these medications (Thorne & Newell, 2007). Physicians should be aware of the most recent evidence and assist a woman to balance the known risks and benefits. Updated information about the safety and toxicity of individual antiretroviral medications in pregnancy is available from the AIDSinfo website (see <http://aidsinfo.nih.gov/guidelines/html/3/perinatal-guidelines/190/appendix-b--supplement--safety-and-toxicity-of-individual-antiretroviral-agents-in-pregnancy>).

Currently, efavirenz (Sustiva/Atripla) is the most important ART medication contraindicated in pregnancy, particularly in the first trimester (WHO, 2009). Because of the potential for harm to the fetus, the Panel on Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission (2014) suggests that pregnancy should be avoided in women receiving efavirenz, and treatment with efavirenz should be avoided during the first eight weeks of pregnancy. Further, the Panel recommends that alternate cART regimens that do not include efavirenz should be strongly considered in women who are planning to become pregnant or are not using effective contraception, if such regimens will not compromise the woman's health.

Scientists do not yet know the long-term effects of many ART medications on babies, but they are currently considered to be safe. The Antiretroviral Pregnancy Registry is a program run by the United States health authorities. This registry has been monitoring children born to HIV positive mothers since 1994.⁸ The registry has found no evidence of long-term side effects in children of mothers who took ART during pregnancy (Margolese, 2009). This program has also found that the prevalence of birth defects in children born to women using ART is not different among trimesters of exposure (Volger, 2006). Importantly, it is known that these medications greatly reduce the risk of babies becoming infected with HIV (Thorne & Newell, 2007). Therefore, the Panel on the Treatment of HIV-Infected Pregnant Women suggests that "the potential risks of these drugs should be placed into perspective by reviewing the substantial benefits of ART medications for maternal health and in reducing the risk of transmission of HIV to infants" (p. C2).

If a woman is already on cART, doctors may decide to switch her medications in order to avoid those with possible harmful effects to the fetus. If women are planning on becoming pregnant, they should switch their medication as soon as possible. Women should not change or stop their medications without first consulting with their doctors. If a woman suddenly stops her medications, her viral load will likely increase, thereby increasing the risk of transmitting HIV to her baby (Margolese, 2009). As well, stopping medications can

⁸ For more information about this registry, see the AIDSinfo website: <http://aidsinfo.nih.gov/guidelines/html/3/perinatal-guidelines/222/antiretroviral-pregnancy-registry>.

increase the risk of the woman developing drug resistance, which, in turn, can limit her treatment options in the future. It is for these reasons that the importance of adherence to medications should be highlighted at each doctor's visit. This is especially critical in the third trimester, as virologic suppression should be achieved at this time (Money et al., 2013).

If a pregnant woman is not already on cART for her own health, she may delay starting treatment until after 12 to 14 weeks of pregnancy, unless there is a medical reason to start earlier (e.g., very high viral load; SOGC, 2012). The main reason for waiting is to avoid any potential negative effects of ART on the fetus during the early stages of development. Another reason to wait is to avoid taking pills during the first trimester, when women are most likely to experience morning sickness and may throw up their medications. If women are experiencing nausea and vomiting while on cART, Money et al. (2013) state that it should be managed aggressively, starting with a prescription for Diclectin (doxylamine-pyridoxine). Prevention of vomiting is important for managing the pregnant woman's viral load and reducing the risk of vertical transmission.

3.3.3 Mode of Delivery

In terms of delivery, in many cases a vaginal delivery is safe and preferable for a woman living with HIV. If the woman's viral load is less than 1,000 copies/mL (i.e., if there are less than 1,000 virus particles in a drop of blood), a caesarean section is not likely to further reduce the chances of vertical transmission. A review of vertical transmission in Canada between 1990 and 2010 found no difference in vertical transmission rates between those who delivered by caesarean section and those who delivered vaginally, when the women were treated with cART (Forbes et al., 2012). Therefore, Money et al. (2013) state that women on optimal cART with acceptable viral load suppression (<1,000 copies/mL) over the last four weeks prior to delivery are recommended to have a vaginal delivery in the absence of other obstetrical indications for a caesarean section (Money et al., 2013).

However, pre-labour elective caesarean section delivery (at around 38 to 39 weeks gestation) may reduce the risk of vertical transmission in some instances. The SOGC's Clinical Practice Guidelines (Boucher, 2001) suggest that elective caesarean sections should be offered to women living with HIV in the following specific situations: 1) women who have not received cART, 2) women receiving ART monotherapy, 3) women with a detectable viral load, 4) women in whom the viral load is unknown, and 5) women with unknown prenatal care. More recent recommendations also indicate that these are the situations in which planned caesarean sections should be considered (e.g., Bitnun et al., 2014; Money et al., 2013). It is currently unclear as to whether there is a benefit to caesarean section over a vaginal delivery if the woman is already in labour or has ruptured membranes. Therefore, the Panel on Treatment of HIV-Infected Women (2014) suggests that decisions about mode of delivery in these instances must be individualized, taking into account the duration of rupture/labour, HIV viral load, and current ART regimen.

It is important to note that caesarean section births present less risk of vertical transmission in women who have been circumcised, especially in cases of infibulations where all outer genitals have been removed (Margolese, 2009). For all women living with HIV, the chance of vertical transmission can be further reduced with the following precautions: 1) limiting the use of forceps and vacuum, 2) avoiding fetal scalp electrodes, 3) avoiding fetal scalp sampling, and 4) avoiding episiotomies (Money et al., 2013). The goal of these precautions is to limit fetal exposure to maternal blood.

3.3.4 Other Elements of Care

The current best practices to reduce the risk of vertical transmission include: 1) routine prenatal testing for all pregnant women; 2) cART for women testing positive during pregnancy, labour, and delivery; 3) delivery by caesarean section if indicated; 4) a short course of ART for the baby after birth; and 5) exclusive formula feeding for the infant (Bitnun et al., 2014; Margolese, 2009). According to Money et al. (2013), the risk of postnatal transmission of HIV through breastfeeding is approximately 9.3% above the risk through labour and delivery. Therefore, breastfeeding is contraindicated in Canada regardless of maternal HIV viral load and use of cART (Money et al., 2013). As mothers who are unable to breastfeed may experience engorgement, which can be painful, they should be provided with comfort measures (pain relievers, cold compresses). Common medications used for suppressing lactation (e.g., bromocriptine, cabergoline) can interact with ART medications and are contraindicated (Money et al., 2013).

Cultural and family pressure related to breastfeeding has been found to contribute to a mother's inability to abstain from breastfeeding, resulting in HIV transmission to the infant (Loutfy et al., 2012). In an Ontario study of vertical transmission between 1999 and 2008, 11 of the 35 confirmed infected infants (34%) had been breastfed (Lu et al., 2014). Risk of disclosure of their HIV status associated with not breastfeeding is a real challenge for some women (Bitnun et al., 2014). Not being able to breastfeed has also been found to impact a woman's sense of being a woman and a good mother (Greene et al., 2014). The women in Greene et al.'s study reported feelings of guilt, loss, and shame, as well as concerns about stigma and disclosure. Therefore, women need to be supported and provided with advice about how to explain their choice to bottle-feed without disclosing their HIV status. Ideally, health care providers should work with women to create a plan around what to say to family and friends (Money et al., 2013). According to the Canadian Paediatric and Perinatal AIDS Research Group, "counselling on this issue is essential and best initiated before delivery" (p. 77; Bitnun et al., 2014).

Risk of vertical transmission has been associated with other potentially modifiable factors, including cigarette smoking, substance use, genital tract infections, and unprotected sexual intercourse with multiple partners during pregnancy (Panel on the Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission, 2014). Along

with improving maternal health, decreasing or stopping smoking and substance use, treatment of genital tract infections, and use of condoms during sexual intercourse may reduce the risk of HIV transmission. Within a harm reduction model, women should be encouraged to stop smoking, drinking alcohol, and using recreational drugs and should be referred for counselling support and/or treatment as appropriate (Money et al., 2013).

Women should be counselled on all relevant aspects of ensuring a healthy pregnancy, such as good nutrition, safe water, basic hygiene, plenty of sleep, strong support networks, and limited stress. In addition to these elements of care, the Positive Women's Network Society (2001) lists numerous complementary and alternative medicines which can be used to improve maternal health during pregnancy, including, but not limited to: yoga, exercise, massage, reflexology, acupuncture, traditional Aboriginal healing practices (prayer, smudge ceremonies, sweat lodges, healing circles), journaling, visualising, and meditation.

Nutrition is especially important for pregnant women living with HIV (Positive Women's Network Society, 2001). HIV causes the body to burn more calories, so women with HIV need to eat more in order to maintain their weight. In order to avoid and better fight infections, women should eat a variety of nutritious foods and take multivitamins with folic acid. Women should take folic acid for at least the first three months of their pregnancy, ideally starting before they become pregnant (Money et al., 2013). Because HIV can make it difficult for the stomach to digest food, women should try to eat frequent, smaller portions. As malnutrition and micronutrient deficiencies have been linked to vertical transmission risk, it is important that women with food insecurity issues be linked to nutrition resources (Money et al., 2013). It is also important that HIV positive pregnant women get enough sleep, wash their hands regularly, and try to avoid stressful situations.

3.4 After-Care for Babies Exposed to HIV

Throughout pregnancy, a developing fetus has its own blood supply, meaning that it does not come into contact with its mother's blood. Fetuses do, however, receive nutrients and immune system antibodies from their mothers. This means that although all babies born to women living with HIV are born with HIV antibodies, not all babies are born with HIV (Positive Women's Network Society, 2001). As previously discussed, doctors must test the baby's blood several times before they know whether the baby has been infected. Babies will typically receive PCR (polymerase chain reaction) tests at birth, one to two months, and two to four months of life (Margolese, 2009). For children who received cART due to increased risk factors for vertical transmission, at least one of the PCR tests should be performed at or beyond four months of age (Bitnun et al., 2014). With the PCR test, it is possible to be fairly certain about a baby's HIV status by the age of two to four months of life (Margolese, 2009). However, the Canadian Paediatric and Perinatal AIDS Research Group recommends finalizing the HIV status of all exposed infants using a serological assay between 18 and 24 months of age (Bitnun et al., 2014).

Without proper medical treatment, including ART, many babies infected with HIV will die within the first three years of life (SOGC, 2004). Therefore, the Canadian Paediatric and Perinatal AIDS Research Group states that all infants born to mothers with HIV should receive ART as soon as possible after birth, preferably within six to 12 hours (Bitnun et al., 2014). They state that the efficacy of ART to prevent vertical transmission decreases with increasing time after birth and is almost completely lost when initiated after 72 hours of life. Newborns exposed to HIV should receive ART for six weeks to prevent vertical transmission of HIV, regardless of maternal ART, viral load, or mode of delivery (Money et al., 2013). The recommended regimen will depend on the level of risk of HIV transmission to the infant. Factors influencing decisions about the treatment regimen include the maternal ART, adherence to ART, and maternal viral load. Babies of women who did not receive medication, or whose mothers had a high viral load during delivery, may receive cART (Margolese, 2009).

According to Money et al. (2013), follow-up by health and allied health professionals is crucial for HIV-exposed, uninfected children. This is particularly true in families dealing with issues such as poverty, food insecurity, low literacy, and parental substance use; all of which can put children at higher risk of adverse outcomes (e.g., failure to thrive, developmental delay, and behavioural disorders). Women will also require support around infant feeding, as breastfeeding is contraindicated for women living with HIV. Although research has shown that the amount of HIV in breast milk can be reduced by heating it or by having the mother stay on ART for six months after birth, these methods do not eliminate HIV. Therefore, they are not deemed safe and are not recommended in Canada (Burdge et al., 2003; Canadian AIDS Society, 2004; CATIE, 2009). Saskatchewan infants born to women living with HIV are eligible for free formula for their first 12 months of life through the Saskatchewan Infant Formula Program (see [http://www.skshiv.ca/SK%20Infant%20Formula%20Program%20Policy%20April%202014,%202014%20\(final\).pdf](http://www.skshiv.ca/SK%20Infant%20Formula%20Program%20Policy%20April%202014,%202014%20(final).pdf) for more information).

Premastication of food (i.e., chewing food before feeding it to a child) is also a potential risk factor for HIV transmission. Transmission via this route is thought to require blood in the mouth of the caregiver, such as bleeding gums. The Centers for Disease Control and Prevention (2011) confirms that premastication was the likely cause of HIV transmission in several cases. Therefore, premastication of food by caregivers living with HIV is not recommended (Bitnun et al., 2014; Panel on the Treatment of HIV-Infected Pregnant Women and Prevention of Perinatal Transmission, 2014).

3.5 Pregnancy Planning and HIV

For women who do not wish to become pregnant, it is important for them to have information about and access to effective contraception (Vogler, 2006). Drug interactions between ART medications and oral contraceptives have been documented, so it is important to examine potential interactions when making decisions about oral contraceptives (Money et al., 2013). Information about specific interactions can be found in the National Institutes of Health *Perinatal HIV Guidelines* (see <http://aidsinfo.nih.gov/contentfiles/lvguidelines/PerinatalGL.pdf>).

The Saskatchewan Prevention Institute's contraceptives app (KIS-SK; see <http://www.skprevention.ca/keep-it-safe-saskatchewan/>) provides information about free contraceptives, as well as information about sexually transmitted infection testing sites throughout Saskatchewan. Many of the programs that offer contraceptives and/or testing also provide information about the prevention of sexually transmitted infections, including HIV, and the prevention of unplanned pregnancies.

For women who do wish to become pregnant, planning their pregnancies is an important step in preventing transmission of HIV to the baby. By planning for a pregnancy, women with HIV are better able to plan for the additional measures that need to be taken to ensure the best possible outcomes for their babies. According to Carter et al. (2013), it is critical to support women to safely achieve their reproductive goals through pre-conception, pregnancy, and postpartum services and support (including access to fertility services as required), as an increasing number of women living with HIV express the intention to have biological children. The following issues need to be considered with respect to pregnancy planning and counselling in women living with HIV: 1) preconception health including intake of folic acid, 2) transmission between partners during conception, and 3) ART and other drugs in pregnancy (Money et al., 2013). For example, women can discuss their ART medications with their doctors, as some medications are safer during pregnancy than others (Positive Women's Network Society, 2001).

According to Loutfy et al. (2013) for the SOGC's HIV Pregnancy Planning Guidelines, all people living with HIV who require ART for their own health should continue their current regimens throughout the preconception period. Women should not take any medications that are considered toxic or teratogenic in pregnancy, substituting other medications with a knowledgeable doctor's assistance. Women who are not on ART for their own health need to consider starting treatment before becoming pregnant or no later than at the end of the first trimester of pregnancy. In addition to cART, it is important to remember that most general recommendations for pregnancy planning also apply to people living with HIV. Loutfy et al. (2013) recommend PHAC's *The Sensible Guide to a Healthy Pregnancy*, which provides information about nutrition, folic acid, alcohol use, physical activity, smoking, and oral health (see <http://www.phac-aspc.gc.ca/hp-gs/guide/assets/pdf/hpguide-eng.pdf>).

Women can also discuss the safest methods of becoming pregnant with their doctors. Because unprotected intercourse can result in the transmission of HIV to HIV negative male partner(s), this method of reproduction is not recommended (Margolese, 2009; Semprini, Vucetich, & Hollander, 2004; Vogler, 2006). To avoid HIV transmission while trying to become pregnant, some women use artificial insemination (either at home or with medical assistance). At home, sperm is placed into the vagina with a syringe or eye dropper. Medically assisted insemination places sperm directly into the uterus, known as intrauterine insemination. Chances of getting pregnant are usually increased with intrauterine insemination (Volger, 2006).

Unprotected sex can also result in re-infection, also known as superinfection, if both partners are living with HIV (Smith, Richman, & Little, 2005). Re-infection occurs when one infected partner passes the virus to an already infected partner. Infection with a new strain of HIV can cause more health problems or may result in the development of premature resistance to some ART medications (Canadian AIDS Society, 2004). When both partners are HIV positive, the doctor may recommend sperm washing. According to Semprini et al. (2004), sperm washing involves separating the sperm from the semen, the latter of which contains a higher concentration of HIV. After the sperm is tested for HIV, it is used to inseminate the woman. This method allows for conception without the risk of re-infection (Loutfy et al., 2012). Sperm washing is also an option for men living with HIV who have HIV negative female partners (AVERT, 2009; Margolese, 2009; Semprini et al., 2004). In these cases, sperm washing allows for conception without risking the infection of the woman. It is important to note that sperm washing, intrauterine insemination, and in vitro fertilization are not covered by most provincial medical services plans in Canada, so the costs of these procedures are charged to the patient (Loutfy et al., 2013).

3.5.1 HIV Transmission and Sexual Assault

Although planned pregnancies may be preferable in terms of preventing HIV transmission, they are not always possible. This is especially true in cases of sexual violence and sexual assault. Sexual assault can lead to HIV infection directly, particularly because violent sex can increase the risk of transmission (Andersson, Cockcroft, & Shea, 2008). Sexual assault has also been found to increase HIV risk indirectly, as women who have experienced sexual assault, violence, and abuse have been found to engage in more high risk behaviours (Andersson et al., 2008; Kalichman & Simbayi, 2004). Through participation in these high risk behaviours, including unsafe sex and sex with multiple partners, these women may also be at higher risk for unintended pregnancies. It is important for clinical and social service providers to be aware of and sensitive to the possibility and prevalence of sexual violence in the lives of women living with HIV (Kalichman & Simbayi, 2004; Zierler, Witbeck, & Mayer, 1996). The National Conference on Women and HIV/AIDS (2000) recommended that more resources need to be made available for women who have experienced sexual assault.

4. Barriers to HIV Transmission Prevention and Prenatal Care

4.1 Social Determinants of Health

Researchers working in the areas of HIV prevention and prenatal care for HIV positive pregnant women have identified numerous barriers. Many of the barriers to HIV prevention and prenatal care include social determinants of health: lack of food, clothing, stable housing, adequate finances, and transportation (Bunting & Seaton, 1999; Leenerts, 1998; Wood & Tobias, 2005). When pregnant women are unable to meet their most basic needs, it can be difficult for them to participate in prenatal treatments and care. Refusal to be tested and/or inability to obtain test results have been attributed in part to obstacles with transportation and having to return to

health facilities (Obermeyer & Osborn, 2007). Related to issues with transportation, the accessibility of HIV testing and treatment can serve as barriers to maternal HIV transmission prevention. With the introduction of rapid testing in Saskatchewan, which provides a negative or preliminary positive result in minutes, issues related to the inability and/or unwillingness to return for test results may become less problematic. Rapid testing allows for results while the individual remains at the testing facility, meaning that more people actually receive their results. This gives people who test positive the opportunity to make decisions about treatment and to take preventative steps to prevent the transmission of HIV to others.

Access to other HIV-related services (e.g., counselling, care and treatment services, infant-feeding guidance) is also influenced by the place in which women live and their access to transportation. Other common reported barriers include: lack of childcare while attending doctor's appointments, mistrust of nurses and doctors, fear of health and social service organizations, and fear of having the baby removed from their custody (Mill et al., 2007; Streetworks, 2009; Wood & Tobias, 2005). In order to receive appropriate treatment and counselling, women need to feel comfortable being honest with medical professionals about their lifestyle (e.g., treatment adherence, food intake, drug use).

Another identified barrier to reducing the risk of maternal HIV transmission is a lack of access to appropriate substance use treatment programs (Wood & Tobias, 2005). Medical substance use treatment programs are necessary, and sorely lacking, for pregnant women who are living with HIV and are using drugs and/or alcohol. For women who have other children to care for, attending treatment programs can be impossible if the programs do not allow the women to have their children with them. Lack of childcare while in treatment has been identified as a significant barrier to participating in drug and alcohol treatment programs (Wood & Tobias, 2005). Although drug and alcohol use increase the chance of vertical transmission, many substance use treatment programs are not designed to deal with the barriers faced by pregnant women with HIV.

Research has shown that women from marginalized communities are less likely to access antenatal care, increasing the risk of vertical transmission if these women are living with HIV (Forbes et al., 2012). Overall, numerous studies have found that women are diagnosed with HIV at more advanced disease states, have longer delays in initiating ART, and are more likely to be non-adherent (summarized in Carter et al., 2014). According to Carter et al. (2013), many of the barriers faced by women living with HIV are shaped by their gender (e.g., stigma and discrimination, violence, lack of financial resources, inflexibilities in clinic hours, balancing work, and childcare). Therefore, these authors highlight the importance of women-specific HIV/AIDS programs and services that are responsive to the unique issues and challenges faced by women living with HIV. Examples of women-specific HIV/AIDS programs and services in Canada include the Oak Tree Clinic, Positive Women's Network, the Maple Leaf Medical Clinic, Women's Health in Women's Hands Community Health Centre, and the Centre for AIDS Services of Montreal Women.

4.2 Stigma and Discrimination

Fear of potential judgements and discrimination by staff members, based on a pregnant woman's HIV status, can greatly decrease the likelihood that women will seek prenatal care (Spielberg et al., 2003; Streetworks, 2009). Mill et al. (2007), state that the stigma surrounding HIV can influence health and health seeking behaviours. For example, stigma from others can limit the services women receive, and internalized stigma can cause women to avoid seeking treatment and/or avoid disclosing their HIV status. Stigma against HIV is reported to be the main reason for reluctance to be tested, to disclose HIV status, and to take ART medications (Obermeyer & Osborn, 2007).

Fear of potential judgements and internalized stigma may be especially experienced by women who are using drugs and alcohol. Wood and Tobias (2005), state that women living with HIV may be "reluctant to access the health care system due to lack of trust, previous negative experiences, or fear of confidentiality violations" (p. 48). These fears are related to the potential stigma and discrimination surrounding HIV. These stigmas may be especially experienced by pregnant women about their choices for wanting to have children and/or their actions during their pregnancy (Bharat & Mahendra, 2007; Margolese, 2009). Moral judgements about women's lives and their choice to have children can also prevent women from having the opportunity to learn healthy baby and self-care skills (Margolese, 2009). Leenerts (1998) states that self-care is not an option in an environment of rejection.

Stigma and discrimination are often based on fear and are often the result of a lack of information, or a wealth of misinformation, about HIV. Health Canada (2002) states that because of the stigma and discrimination faced by persons living with HIV/AIDS, confidentiality in HIV testing is of the utmost importance. Mill et al. (2007) found that the fear of punitive or discriminatory actions based on HIV status may deter women from coming forward for HIV testing, treatment, and/or other prenatal services.

4.3 Barriers to HIV Testing and Treatment

Common barriers to HIV prevention and HIV treatment include not getting tested or not returning for test results. Spielberg et al. (2003) report that the main reason people provide for not being tested is that they do not believe they are at risk for HIV. Other reasons given for not being tested include not wanting to think about being tested and fear of getting test results. Of people who do get testing, Spielberg et al. summarize research showing that 25% to 35% of people do not return for their test results. These rates will likely be reduced with the increased use of rapid testing, which allows for an almost immediate response, thereby reducing the anxiety provoked by having to wait for results.

Even for women who do access medical services, there may be a number of reasons why they are unable to take their ART medications (Ammassari et al., 2002; Positive Women's Network Society, 2001). In their extensive literature review on ART adherence, Ammassari et al. found

that the following were consistently associated with non-adherence: symptoms and adverse drug effects, lack of social or family support, complexity of the medication schedule, low patient self-efficacy, and inconvenience of treatment. Other identified factors which can influence treatment adherence include access to ART medication, alcohol and substance use, and worry about HIV disclosure (Positive Women's Network Society, 2001). If women are unable to adhere to treatment, or if they choose not to take treatment, they should be encouraged to take care of themselves in different ways (including those mentioned previously).

5. Public Health Education about HIV and Pregnancy

5.1 Basic Education about HIV, AIDS, and Pregnancy

Primary prevention of HIV infection in women of childbearing age is the most effective way to prevent vertical transmission of HIV (Vogler, 2006). Nyblade (2006) states that there is a "growing recognition of the reduction of HIV stigma as central to effective programs across the HIV/AIDS prevention to care and treatment continuum" (p. 335). Mill et al. (2007) agree, stating that stigma and discrimination are two of the most significant barriers to HIV testing and accessing of treatment by people with HIV. As these barriers have serious consequences, it is important that public education focuses on reducing the stigma surrounding HIV. Providing the basic information and facts about HIV is likely a good starting point, as a lot of stigma is based on misinformation (Mill et al., 2007). As will be discussed further in the next section, health care professionals are likely the best source of education for all women, particularly those seeking prenatal care.

Aggleton, Jenkins, and Malcolm (2005) suggest that three factors are necessary for successful HIV prevention: 1) quality information and education, 2) appropriate health services, and 3) a supportive societal environment. These authors state that while interventions that reach the masses are rarely effective in directly affecting specific target populations, they can be effective in raising general awareness and changing knowledge. Therefore, the use of such methods may be beneficial for increasing HIV knowledge and decreasing stigma in the general public. In order to be effective with specific target groups, though, Aggleton et al. suggest that messages specific and relevant to those groups should be used.

When people decide to be tested for HIV, pre-test counselling has been found to be an effective way of increasing knowledge about HIV transmission as well as increasing the use of condoms and contraceptives (Samson & King, 1998; Wiktor et al., 2004). Health Canada (2002) suggests that this information can come from a variety of sources including: written materials, videotapes, referrals to hotlines and other agencies, and/or one-on-one conversations with health professionals. As with any form of education, "the information should be geared to the audience, taking into account such things as linguistic and cultural barriers, geographic isolation, lack of transportation and child care, and fear of punitive action" (p. 107; Health Canada, 2002). It is also important that education and prevention efforts remain cognizant about prevention fatigues, like condom fatigue (Canadian AIDS Society, 2004). Adherence to prevention efforts is

difficult to maintain over longer periods of time. The use of a variety of sources and methods, as suggested by Health Canada, may help reduce the occurrence of this fatigue.

5.2 HIV Education in Schools

Schenker (2001) states that “schools are key contributors to our ability to halt the spread of HIV infection” (p. 416). By their very nature, many schools already have the resources necessary for delivering effective education to youth. Specifically, schools reach most children between the ages of five to 18, have skilled teachers, include various learning opportunities over the long-term, and have the potential of good parental involvement (PHAC, 2013; Schenker, 2001). Several authors have suggested that HIV education may be most effective when carried out within a comprehensive school health education program (Kerr, Allensworth, & Gayle, 2009; CATIE, 2014; Kirby, 2002). In addition to providing information to help youth protect themselves from HIV and other sexually transmitted infections, this type of education helps to reduce stigma and discrimination by dispelling misinformation (AVERT, n.d.).

Research has identified the use of multiple media (e.g., stories, role-play, lectures, self-tests) as necessary for effective education on HIV (Health Canada, 2002; Ragon, Kittleson, & St. Pierre, 1995). The use of different methods of learning provides an opportunity for students to become actively engaged in learning. Interactive activities, like role playing and simulations, are designed to help youth personalize and retain the information (Kirby, Laris, & Rolleri, 2007). Effective repetition of HIV messaging requires clarity, consistency, accuracy, and sufficient variety in order to hold students’ interest over time (Kirby, 2002; Ragon et al., 1995). Schools also require access to the most current knowledge about HIV and AIDS, including information about how to avoid HIV infection and transmission (Schenker, 2001). Finally, Schenker suggests that teaching HIV prevention to male and female students together, instead of in separate sex education classes, may encourage them to talk about HIV and sexuality amongst themselves.

While some schools and parents are concerned that HIV education may serve to promote sexual intercourse, two large-scale literature reviews suggest that this is not the case (Kirby, 2002; Kirby et al., 2007). Instead, it appears that such education can actually serve to delay the onset of sex, reduce the frequency of sex, and increase condom and contraceptive use (CATIE, 2014). HIV education programs were found to be particularly effective at increasing condom use, over and above classes focused on sexual education alone (Kirby, 2007). In addition to the characteristics listed above, Kirby suggests other important considerations for youth education: inclusion of activities that address social pressures that influence high risk behaviour; provision of modelling and practice of communication, negotiation, and refusal skills; and provision of training to teachers and peers who can then provide the information to others. Two educational resources specific for use in Canadian schools have been created and are currently available online. Please refer to Appendix A for more information about these resources.

5.3 Education for Vulnerable Women

Particularly in Saskatchewan, women who use injection drugs are at a high risk for HIV infection. Aggleton et al. (2005) suggest that “the twin stigmas of drug dependence and injecting, often in association with sex work, can make female intravenous drugs users one of the hardest to reach populations” (p. 26). Successful interventions that have been used to reduce the risk of HIV in this population include needle exchange programs, various forms of outreach, voluntary counselling and testing, peer-led education, treatment programs, and methadone therapy. Aggleton et al. suggest that people who use injection drugs need information on how to prevent transmission of HIV, the means to prevent this transmission (e.g., sterile needles, condoms), a supportive peer environment, and access to health and social services.

Outreach programs can be especially effective at providing HIV prevention information and establishing links with the necessary services (e.g., drug treatment, HIV counselling and testing, medical care, social services) (Aggleton et al., 2005; Spielberg et al., 2003). Such programs also usually offer specific materials for reducing risk (e.g., new needles, condoms, dental dams). Outreach programs have been found to be particularly effective in reaching people who use injection drugs who have never been in contact with mainstream services and in reducing their HIV risk behaviours. Aggleton et al. (2005) suggest that peer-driven interventions can also be highly successful at sharing HIV-related information and reducing the risk of HIV transmission. Bunting and Seaton (1999) found that many pregnant women with HIV are intensely motivated by concerns about their present and future children’s welfare. These authors suggest that health care providers and educators should consider this factor when designing education and treatment programs.

Another particularly vulnerable population in Saskatchewan are Aboriginal women. Of the new cases of HIV in Saskatchewan in 2012, 82% of the women diagnosed were Aboriginal (Saskatchewan Ministry of Health, 2013). The Public Health Agency of Canada (2007) suggests that evidence-based, culturally specific responses to HIV education are needed. Such responses should be designed to address the realities that contribute to infection and poor health outcomes for Aboriginal women. In order to be successful, women at risk of infection and those living with HIV should be consulted in order to directly shape policies and programs that affect them. The National Conference on Women and HIV/AIDS (2000) recommended that vulnerable women should be included in the planning, implementation, and evaluation of prevention programs in order to give them a sense of ownership of the programs.

6. Education about HIV and Pregnancy for Health

Professionals

Similar to education for the general public, it is important for health professionals to receive and understand the information presented in this literature review (e.g., HIV transmission, transmission prevention, testing for HIV, and these topics in the context of pregnancy). Before more detailed

education can be effective, health professionals require the basic information. Next, it is crucial that health professionals understand their own importance in HIV transmission prevention. According to Renggli et al. (2008), “inadequate training of health professionals about HIV leads to compromised patient care and perpetuates the spread of myths and other erroneous information” (p. 341). The National Conference on Women and HIV/AIDS (2000) recommended that educational campaigns should be developed to sensitize social and medical workers to the realities of the lives of women living with HIV.

6.1 Reducing Stigma and Discrimination

Mill et al. (2007) summarize research identifying health practitioners as significant sources of stigma and discrimination for people living with HIV. Although stigma is a recognized barrier to effective education and treatment, very few studies have examined the impact of stigma reduction interventions (Mahajan et al., 2008). Instead, studies typically focus on people’s experiences with stigma. For example, many of the women living with HIV in Leenerts’ (1998) sample described their relationships with their health care professionals as unhelpful and even hostile. Such experiences can lead to women not seeking follow-up treatment and to avoiding HIV testing in the first place. Leenerts states that health professionals should have the knowledge and abilities to educate women and to refer them to additional resources when needed. This is especially important at the time of diagnosis as women who feel alienated by health professionals at this time are less likely to return for follow-up care. The women in Leenerts’ sample waited approximately two years after their diagnosis before seeking follow-up health care.

On the opposite end of the care spectrum, the behaviour of health care providers can serve to motivate women to practice good self-care and prenatal care. Bunting and Seaton (1999) found that when professionals exhibited caring behaviours, pregnant women with HIV felt more self-worth and hope. These feelings resulted in the women taking better care of themselves and following through on their providers’ health care recommendations. The women in this study felt that their health care providers had a personal as well as a professional investment in them and their health outcomes.

Makadon and Silin (1995) support the idea that primary care physicians need to realize their potential to influence the attitudes and behaviours of their patients. These authors believe that physicians’ HIV prevention opportunities are hindered in four ways: 1) by narrow conceptions of medical care and the role of the physician; 2) by physicians’ attitudes toward sexuality, drug use, and HIV; 3) by constraints on time and resources; and 4) by the ambiguity of HIV prevention messages. Reis et al. (2005) agree and suggest that increasing physicians’ knowledge of their own importance in HIV prevention may change how they view their role. Instead of expecting physicians to become knowledgeable about every aspect of HIV, Makadon and Silin suggest that they become part of the system’s approach. In this way, physicians’ roles could be limited to helping patients assess their own risk, referring patients for testing and counselling, reinforcing good prevention strategies, and offering referrals to patients who want more information.

Proper education in HIV prevention, care, and treatment has been found to positively shape the attitudes of health care professionals towards people living with HIV, reduce misconceptions, and increase access to care (Reis et al., 2005; Renggli et al., 2008; Uwakwe, 2000). In other words, education and training can reduce misinformation and discrimination towards persons with HIV, resulting in an increased quality of care.

6.2 Pre-Service, In-Service, and Train-the-Trainer Models

Renggli et al. (2008) highlight the importance of pre-service HIV education for health care professionals. They state that pre-service education is critical for an increase in HIV prevention, care, and treatment services as it boosts the numbers of HIV-trained health care professionals. By including HIV-specific information in training curricula, all new professionals can receive fundamental HIV knowledge before entering the workforce. For practicing health care professionals, Renggli et al. recommend in-service training, and particularly on-site training followed by regular support and clinical mentoring after training. Because this type of training is expensive, pre-service training is recommended as the way of the future.

Pre-service and in-service training could be expanded to include a train-the-trainer model of HIV education, where medical professionals are provided with the training to train other medical professionals and perhaps the general community. The use of train-the-trainer workshops has been found to be an effective and inexpensive way to disseminate information about HIV/AIDS and to change attitudes and behaviours (Burr, Storm, & Gross, 2006; Hiner et al., 2009; Wu et al., 2002). Research suggests that in order for a train-the-trainer model to work, it must incorporate both a didactic and an interactive approach (Burr et al.; Rees, Sheard, & McPherson, 2004; Scott, 2003). The didactic approach (usually involving oral presentations/lectures) is recommended for the presentation of technical content and for sharing greater amounts of information in a shorter amount of time. The interactive approach (e.g., role play, case study discussions, learning games, standardized patients) allows participants to apply newly acquired knowledge and skills to mock clinical situations. Burr et al. have developed a train-the-trainer package that includes a PowerPoint presentation, extensive speaker notes, case studies, a patient education booklet, an HIV education monograph for health care providers, and a pocket guide to perinatal guidelines for working with women with HIV. Importantly, the curriculum closely follows national guidelines and is updated regularly to reflect changes in research and practice.

Wu et al. (2002) and Bradley-Springer et al. (Bradley-Springer, Everett, Rotach, & Vojir, 2006) found that train-the-trainer workshops resulted in better attitudes toward persons with HIV/AIDS and effective dissemination of training to other health personnel and the general public. Burr et al. (2006) also found an increase in positive care of women with and at risk of HIV following the train-the-trainer workshops. The participants in these workshops “agreed that they were more knowledgeable about HIV testing in pregnant women, more likely to discuss it with pregnant women, had a better understanding of guidelines, and were more familiar with

local resources for local HIV care” (p. 188). These authors state that successful implementation of these types of workshops “requires ongoing support of faculty trainers by AIDS educators, involvement of local HIV experts as trainers and resource persons, and the use of standardized curriculum based on national guidelines” (p. 183).

6.3 Designing Training Models

In addition to the acknowledged effectiveness of interactive teaching approaches, Bradley-Springer, Vojir, and Messeri (2003) suggest that training and education events must be targeted at an acknowledged need. Therefore, using needs assessments to design and focus educational programs can be very important. Performing a needs assessment allows you to know what information is known, and what information is most needed. Gallagher (1996) states that HIV education programs that “speak to real-life problems, offer clinical case discussions, and can be immediately applied in practice are most valuable” (p. 13). Because medical professionals have very busy schedules, Bradley-Singer et al. (2003) also suggest making the education sessions convenient and comfortable. If medical professionals feel as though they do not need information about HIV (e.g., they do not believe they see enough infected patients, they do not want to treat infected patients), it is possible to combine HIV programming with more highly desired topics (e.g., sexually transmitted infections, tuberculosis, etc.).

There are numerous sources of information focused on HIV in the context of pregnancy. For example, CATIE (the Canadian AIDS Treatment Information Exchange; www.CATIE.ca) provides up-to-date, unbiased information about HIV for people living with HIV, at-risk communities, community organizations, and health care providers. CATIE provides resources free of charge in a variety of formats, including online learning, educational workshops, and conferences. CATIE’s MaterniKit is a comprehensive guide that reviews and summarizes the important aspects of managing HIV and pregnancy, while also providing a list of resources and links for further information in this area (see <http://librarypdf.catie.ca/pdf/ATI-20000s/26452.pdf>). Another Canadian-specific source of information is the British Columbia Centre for Excellence in HIV/AIDS (<http://www.cfenet.ubc.ca/>). The Centre is committed to the development, ongoing monitoring, and dissemination of research and treatment programs for HIV and related diseases. Part of this work includes their “Research and Training Program” which is designed to improve HIV clinical care and treatment through personalized learning programs and online courses. This training includes academic courses at the undergraduate and graduate levels, online training, continuing education, preceptorship training, and ongoing educational events.

The research discussed has highlighted the importance of health care professionals having accurate knowledge about HIV in the context of pregnancy, particularly in terms of reducing the risk of vertical transmission. Health care providers need to be aware of, or at least have access to, up-to-date guidelines for the care of women living with HIV during pregnancy, labour, delivery; and guidelines for the post-partum care of babies. While this information is highlighted in earlier sections of this literature review, a list of important resources for health care professionals can also be found in Appendix B.

7. Conclusions

As there is yet no cure for HIV infection, prevention is currently the only way to stop the epidemic. Effective prevention of vertical transmission of HIV requires the following combination strategy: 1) preventing HIV infection among prospective parents; 2) avoiding unwanted pregnancies among women living with HIV; 3) preventing transmission of HIV from mother to infants during pregnancy, labour, delivery, and feeding; and 4) integration of care, treatment, and support for women living with HIV and their families (AVERT, 2009). Education about HIV and pregnancy is important for the general public, youth, vulnerable women, and health professionals. In addition to increasing knowledge, such education may reduce the stigma and discrimination faced by women with HIV. This, in turn, may increase women's willingness to seek appropriate care and treatment for their HIV in order to further reduce the risk of vertical transmission of HIV.

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Appendix A: School-Based Educational Resources

Canadian AIDS Society (2010) - *Knowledge is our best defence: An HIV/AIDS Education Resource for Canadian Schools Provincial Curricula Outlines*

Based on an analysis of the results of the Survey on HIV/AIDS Education in Canadian Schools (2008), topic areas were identified for each grade level (K-3, 4-5, 6-8, 9-12) where HIV/AIDS curriculum should be targeted. Resources were then identified to meet these needs and compiled into a resource manual, with short fact sheets to fill resource gaps.

This Kindergarten to Grade 12 HIV/AIDS curriculum resource manual will be of use to educators and parents, as well as students. It will give educators access to resources to aid them in the development of HIV/AIDS curriculum for use in their classrooms, or more broadly, in their educational jurisdiction. For parents, it will serve as a resource manual that may be used to lobby their school boards to get them to implement an HIV/AIDS curriculum in their child's school. Students may find some curriculum resources suitable for independent use, to supplement the education they are receiving from their educators and parents.

For more information or to download the curriculum and resources, go to

<http://www.cdnaids.ca/knowledge-is-our-best-defence>

Ophea (2011) – *HIV and AIDS Online School Support Kit*

The *HIV and AIDS Online School Support Kit* supports teachers and school administrators in the development of lessons and instructional strategies that will help students fulfill the expectations related to age-appropriate HIV education in the Ontario curriculum. The *HIV and AIDS Online School Support Kit* brings together evidence-based information, best practice strategies, and a myriad of existing free HIV-related resources and tools to help schools deliver age-appropriate HIV education and create supportive environments for students who are living with, affected by, and vulnerable to HIV and AIDS.

While the *HIV and AIDS Online School Support Kit* was developed with teachers and school administrators in mind, it is relevant to everyone who wants to learn about and better prepare children and youth to make healthy, responsible, and compassionate decisions in a world with HIV and AIDS.

For more information or to download the School Support Kit, go to <http://hae.ophea.net/>

Appendix B: List of Resources for Health Care Professionals

Guidelines for HIV screening:

SK HIV Provincial Leadership Team. (2013). *Saskatchewan HIV Testing Policy*. Available from [http://www.skshiv.ca/SK%20HIV%20Testing%20Policy%20Final%20Dec%202012%20\(2\).pdf](http://www.skshiv.ca/SK%20HIV%20Testing%20Policy%20Final%20Dec%202012%20(2).pdf)

Health Canada (2002). Guiding principles for Human Immunodeficiency virus (HIV) testing of women during pregnancy - 2002. *Canada Communicable Disease Report*, 28, 105-108. Available from <http://www.collectionscanada.gc.ca/webarchives/20071222101021/http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/dr2813ea.html>

Guidelines for the care of pregnant women living with HIV:

Boucher, M. (2001). SOGC clinical practice guidelines: Mode of delivery for pregnant women infected by the Human Immunodeficiency Virus. *Journal of the Society of Obstetricians and Gynaecologists of Canada*, 101, 1-3.

Burdge, D. R., Money, D., Forbes, J., Walmsley, S., Smaill, F., Boucher, M., et al. (2003). Canadian consensus guidelines for the care of HIV-positive pregnant women: Putting recommendations into practice. *Canadian Medical Association Journal*, 168, 1683-1688. Available from <http://www.cmaj.ca/content/168/13/1683.full.pdf+html>

Canadian AIDS Treatment Information Exchange. (CATIE, 2013). *MaterniKit*, (4th ed.). Author. Available from <http://www.catie.ca/en/resources/maternikit>

Money, T., Tulloch, K., Boucoiran, I., Alimenti, A., Sauve, L., Pick, N. et al. (2013). British Columbia Guidelines for the Care of HIV Positive Pregnant Women and Interventions to Reduce Perinatal Transmission. Available from http://www.cfenet.ubc.ca/sites/default/files/uploads/docs/guidelines/BC_HIV_in_pregnancy_guidelines.pdf

SOGC. (2012). Canadian HIV pregnancy planning guidelines. *Journal of the Society of Obstetricians and Gynaecologists of Canada*, 34, 575-590 Available from <http://sogc.org/wp-content/uploads/2012/09/gui278CPG1206E1.pdf>

The Canadian AIDS Treatment Information Exchange (CATIE): a source for the most up-to-date guidelines for the care of HIV positive women during pregnancy, all free of charge. General information about HIV and information specific to health care professionals can also be found on CATIE's website (<http://www.catie.ca>).

HIV/AIDS Epi Updates: can be accessed through the Public Health Agency of Canada at <http://www.phac-aspc.gc.ca/aids-sida/publication/index-eng.php#er>