

Cannabis Use in the Childbearing Years

An Evidence Summary for Healthcare Providers

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Due to the legalization of cannabis in Canada, and for the health of children and families, there is a growing need to provide parents, prospective parents, healthcare professionals, and other service providers with evidence-based information about the potential risks of cannabis use. This information is particularly important for women of childbearing age, since children who are exposed to cannabis either in utero or during breastfeeding may experience negative life-long effects.

Currently, research findings on the effects of cannabis use during the childbearing years are mixed and more research is needed, both in quality and quantity. However, there is a concerning pattern of negative outcomes resulting from cannabis use on fertility, pregnancy, fetal development, and on the growing child/adolescent exposed in utero. There is also research to suggest that consumption of cannabis by women while breastfeeding may negatively impact their children's development. The current evidence summary provides some general information about cannabis and rates of cannabis use in Canada, as well as the potential risks of cannabis use before, during, and after pregnancy. This summary also offers several recommendations for public messaging based on the available research.

Key Points

- Until more is known about the short- and long-term effects of cannabis use during the childbearing years, it is safest to avoid cannabis use when planning a pregnancy, while pregnant, while breastfeeding, and around children. If a woman cannot abstain from cannabis, a harm-reduction message should be used (i.e., advise women to reduce their consumption) since research findings show that heavy/daily use of cannabis is most strongly associated with negative outcomes.
- Many women who use cannabis throughout pregnancy also use other substances, such as alcohol and tobacco. Polysubstance use increases the potential risks of harm and impacts on long-term health. It is important that healthcare providers inform women about the potential consequences of prenatal substance use broadly, whether it is exposure to cannabis, alcohol, tobacco, opioids, or illicit drugs.
- Education about the potential risks of cannabis use should begin in the preconception years. Rates of cannabis use are generally higher among young people. Further, rates of cannabis use have increased among women in recent years. Since almost half of pregnancies are unplanned, many children may accidentally be exposed to cannabis in utero. It is also important that men and women of childbearing age are aware that cannabis use increases the risk of sexually-risky behaviours, such as condomless sex, which could result in unplanned pregnancies or sexually transmitted infections.
- Pregnancy is a time when many women are motivated to make positive health behaviour changes. In order to encourage such changes, healthcare providers should be sufficiently informed and prepared to ask pregnant women about substance use (including cannabis use), to inform them about the potential risks, and to provide advice and support.

General Information about Cannabis

Cannabis (also known as weed, marijuana, hashish, hash, and pot) is produced from the *Cannabis sativa* plant and can be smoked, inhaled as a vapour, ingested in foods or drinks, and consumed through oil preparations. Cannabis contains hundreds of chemicals. The most researched of these is tetrahydrocannabinol (THC). Tetrahydrocannabinol (THC) is the compound in cannabis with psychoactive properties (i.e., the thing that makes people feel ‘high’). THC levels in cannabis products depend on several factors, including the part of the plant that is used and the process used to remove and manufacture the plant product. The highest THC levels are found in hash oil, followed by hashish (resin), and marijuana (dried leaves/flowers; Jacques et al., 2014). Cannabidiol (CBD) is another chemical in cannabis. Unlike THC, it does not make people feel “high”.

In general, using cannabis can cause feelings of euphoria (‘being high’), followed by relaxation, and an increase in appetite. Negative short-term effects of cannabis use may include a rapid, strong, or irregular heartbeat; anxiety; and sedation (Hill & Reed, 2013). Cannabis use also acutely affects one’s cognition, attention, memory, decision-making, and psychomotor functioning (Broyd, van Hell, Beale, Yucel, & Solowij, 2016). Long-term effects of frequent cannabis use may include problems with the immune system, lungs, and airways; as well as deficits in memory, attention, learning, and problem solving. Frequent cannabis use may also increase the risk of depression and anxiety (Government of Saskatchewan, 2018). Further, with cannabis use, one can become psychologically and physiologically dependent on the drug (Government of Saskatchewan, 2018).

For more general information about cannabis and its potential short- and long-term effects, refer to the Government of Saskatchewan’s fact sheet on cannabis:

<http://publications.gov.sk.ca/documents/13/99211-Cannabis%20-%202018.pdf>

Perceived Harm of Cannabis Use

Although cannabis use is associated with both short- and long-term harms, research suggests that the perceived risk of cannabis use has significantly decreased in recent years (Johnston et al., 2014, as cited in Warner, Roussos-Ross, & Behnke, 2014). According to one UK study, which examined adults’ assessments of the harms of illicit drug use, over half of the respondents indicated that cannabis was either ‘not very harmful’ or ‘not at all harmful’ (Pearson & Shiner, 2002). This was unlike other recreational drugs like heroin or cocaine, where the vast majority of respondents reported these substances as ‘very harmful’ (Pearson & Shiner, 2002). Related to this, research suggests that rates of cannabis use increase when the perceived harm of using cannabis decreases (Boak, Hamilton, Adlaf, & Mann, as cited in Grant & Bélanger, 2017; Pearson & Shiner, 2002).

As a result of its legalization on October 17, 2018, some Canadians may believe that cannabis is safe to use, which could contribute to higher rates of usage. Yet, as noted previously, there is research to suggest that cannabis is not a harmless drug. It is important that all Canadians, including women in their childbearing years, have access to evidence-based information about the potential harms of cannabis use.

Rates of Cannabis Use

Cannabis is the most commonly used illicit drug in Canada (Canadian Tobacco, Alcohol, and Drugs Survey [CTADS], 2015). Rates of cannabis use are generally higher among young people. According to the CTADS 2015, cannabis use was more common among youth aged 15 to 19 (21% of those surveyed used cannabis) and young adults aged 20 to 24 (30% of those surveyed used cannabis), compared to adults aged 25 or older (10% of those surveyed used cannabis). Consistent with results reported in the CTADS 2013, among those surveyed in 2015, past-year cannabis use was more prevalent among males (15% of those surveyed) than females (10% of those surveyed). However, while the prevalence of cannabis use among males did not change between 2013 and 2015, it increased among females from 7% in 2013 to 10% in 2015. This implies not only that a number of women in Canada are using cannabis in their childbearing years, but also that this number may be increasing, pointing to the potential risk of children being prenatally exposed to cannabis.

Rates of Cannabis Use During Pregnancy

Consistent with findings in the general population, cannabis is the most frequently used illicit drug during pregnancy (American College of Obstetricians and Gynecologists, 2017; Porath, Kent, & Konefal, 2017). A study out of Alberta, Canada found that 2.3% of women who gave birth in 2006 admitted to using street drugs, with cannabis being the most commonly used substance (Reproductive Health Working Group, 2006). A similar number was found in Southwestern Ontario, Canada, where 2.2% of women at the London Health Science Centre who gave birth between February 2009 and February 2014 reported using cannabis during pregnancy (Campbell et al., 2018). There is research to suggest that cannabis use during pregnancy can be as high as 15 to 28% among women living in disadvantaged or urban, low-income environments (Beatty, Svikis, & Ondersma, 2012; Passey, Sanson-Fisher, D'Este, & Stirling, 2014; Schempf & Strobino, 2008). According to Conner and colleagues (2016), reported prevalence rates among pregnant women depend on a number of factors, including the population being considered, as well as how cannabis use is defined and detected. Furthermore, pregnant women may have systematically under-reported cannabis use in the past due to its illegal nature.

Similar to alcohol, research shows that cannabis use during pregnancy is highest in the first trimester and then declines in the second and third trimester (Fried, Watkinson, Grant, & Knights, 1980; Hill & Reed, 2013; Warner et al., 2014). In one study, 14% of women reported heavy use of cannabis (i.e., one or more joints per day) during the first trimester of pregnancy, compared to 5.3% and 5% during the second and third trimesters of pregnancy respectively (Goldschmidt, Richardson, Cornelius, & Day, 2004). Similar to alcohol, this pattern of decreased usage from the first to second and third trimester might be explained by women who decide to stop using cannabis once they learn that they are pregnant. Unfortunately, it takes several weeks to confirm a pregnancy. If a woman is using cannabis during this time, her fetus is at risk of the possible negative effects of cannabis.

Polysubstance Use

Although many women quit using cannabis upon finding out that they are pregnant, some women do continue to use throughout their pregnancy. For these women, prenatal cannabis use is frequently accompanied by other forms of substance use or abuse. Many women who use cannabis throughout

pregnancy continue to smoke tobacco and/or consume alcohol (Jacques et al., 2014). Burns, Mattick, and Cooke (2006) conducted a study examining obstetrical and perinatal outcomes for women with a drug-related hospital admission during pregnancy. In this study, they also examined the co-occurrence of drug-related diagnoses. Of those pregnant women with a cannabis use disorder, 12% reported an opioid disorder, 10% reported a stimulant use disorder, and 4% reported an alcohol use disorder. Almost one-half of these women also reported smoking more than 10 cigarettes per day (Burns et al., 2006). Similarly, in a study by Chabarria and colleagues (2016), they observed that nearly one-half (i.e., 45%) of pregnant women reporting cannabis use also reported using tobacco during pregnancy. Although the effects of drugs such as alcohol, cannabis, tobacco, cocaine, and opioids are frequently researched in isolation, they are rarely used alone and polysubstance use increases the potential risks of harm and impacts on long-term health (Harding & Poole, 2018).

The Potential Effects of Cannabis Use Before, During, and After Pregnancy

A Note on Research Designs

Available research assessing the impact of cannabis use on pregnancy, fetal development, birth outcomes, and longer-term effects on the growing child largely comes from preclinical¹, retrospective², and prospective longitudinal studies³. Evidence on the longer-term effects of cannabis use during pregnancy (i.e., child and adolescent development and behavioural outcomes) principally comes from three prospective longitudinal studies (Huiznk, 2014; Porath-Waller, 2015):

1. The Ottawa Prenatal Prospective Study (OPPS) was initiated in 1978 in Ottawa, Canada and consisted of a group of Caucasian, predominantly middle-class families.
2. The Maternal Health Practices and Child Development (MHPCD) study was initiated in 1982 in Pittsburgh, US and consisted of mainly African-American women from low socioeconomic backgrounds and their children.
3. The Generation R study was initiated in 2001 in the Netherlands and consisted of a multi-ethnic cohort of mothers and children with a predominantly higher socioeconomic status.

All three studies commenced when the women were pregnant and have followed their children into early childhood (Generation R study), adolescence (MHPCD study), and early adulthood (OPPS). Caution is advised when comparing results from the OPPS and MHPCD study to the Generation R study because THC levels have steadily increased in recent decades (Porath-Waller, 2015).

¹ Non-human studies often done with rodents. Preclinical research designs are important because they can control for confounding variables not possible in clinical studies. They can also offer a framework for developing hypotheses for later studies in human populations (Warner et al., 2014).

² Compare groups of individuals who differ on some developmental characteristic and draw assumptions based on an investigation of exposure to potential risk factors at some previous point in time (Porath-Waller, 2015).

³ Follow a group of similar individuals over time and who differ related to specific factors under study (Porath-Waller, 2015).

A Note on Methodological Shortcomings

Although there is evidence pointing to the potential risks of cannabis use in the childbearing years, the available research is somewhat mixed at present. Methodological shortcomings in research designs likely contribute to some of these mixed findings. For example, research on the effects of cannabis use during pregnancy has not always accounted for other (or confounding) variables that may influence outcomes, like poor nutrition, maternal stress, and polysubstance use. Many early studies also did not account for concurrent exposure to tobacco (Metz & Stickrath, 2015). It is particularly important to control for tobacco use, since tobacco exposure in pregnancy is linked to some of the same outcomes that are associated with cannabis exposure in pregnancy, such as preterm birth and low birth weight. Furthermore, studies often differ in terms of how they measure cannabis exposure. These methods can vary from a single self-report question at the beginning of a study about cannabis use to measurements of use over time and biological sampling (e.g., maternal urine sampling; Metz & Stickrath, 2015). It is also important to note that most research findings are related to cannabis that was administered by smoking; less is known about exposure through other methods of use (e.g., ingestion of edible cannabis).

Potential Outcomes of Cannabis Use in the Preconception Years

There is some research to suggest that cannabis use can impact fertility (i.e., the ability to become pregnant). For example, heavy cannabis use has been linked to disruptions in the normal ovulatory cycle for women (Brown & Dobs, 2002; Lee, Oh, & Chung, 2006; Mendelson, Mello, & Ellingboe, 1985), as well as a lower sperm count (Battista, Pasquariello, Di Tommaso, & Maccarrone, 2008), and poorer sperm quality in men (Fronczak, Kim, & Barqawi, 2012).

Cannabis use also increases the likelihood of engaging in risky sexual behaviours, which may result in adverse outcomes like sexually transmitted infections (STIs) or unplanned pregnancies. A recent meta-analysis determined that alcohol and cannabis use are each independently associated with risky sexual behaviours, including condomless sex and a higher number of sexual partners among adolescents (Bryan et al., 2018). Further, in the same study, an intervention that included alcohol- and cannabis-related content was more successful at decreasing the incidence of STIs, compared to an intervention that only included content about safer sex practices, such as the use of condoms (Bryan et al., 2018). Until more is known about the effects of cannabis use in the preconception years, it is safest for women who might become pregnant, including those who are planning a pregnancy, to avoid cannabis use.

Pregnancy, Fetal Development, and Birth Outcomes***Maternal Outcomes***

Currently, there is limited evidence of an association between prenatal cannabis use and pregnancy complications for the mother. Also, it is unknown whether there are possible benefits for the mother related to cannabis use during pregnancy. Some pregnant women report benefits from using cannabis to treat morning sickness; however, the effect of cannabis use on nausea and vomiting during pregnancy is unknown (Metz & Stickrath, 2015). Because of the potential risks of prenatal cannabis use for the fetus (detailed below), safer forms of treatment should be offered to pregnant women to treat morning sickness.

Fetal Outcomes

Although the evidence is somewhat mixed at present, there is research to suggest that prenatal cannabis use is associated with the following fetal outcomes: decreased fetal growth (Gunn et al., 2016; Hayatbakhsh et al., 2012); stillbirth (Varner et al., 2014); preterm birth (Hayatbakhsh et al., 2012); congenital anomalies/birth defects (Van Gelder et al., 2009); and NICU/ICU placement (Gunn et al., 2016; Hayatbakhsh et al., 2012). In addition, similar to tobacco, any form of smoking during pregnancy can interrupt the fetus' supply of oxygen and nutrients. This disturbance may impact fetal growth, which could result in outcomes like premature birth, miscarriage, and stillbirth (Harding & Poole, 2018). According to Moir et al. (2008), many of the toxins in tobacco smoke that cause respiratory disease are also found in cannabis smoke.

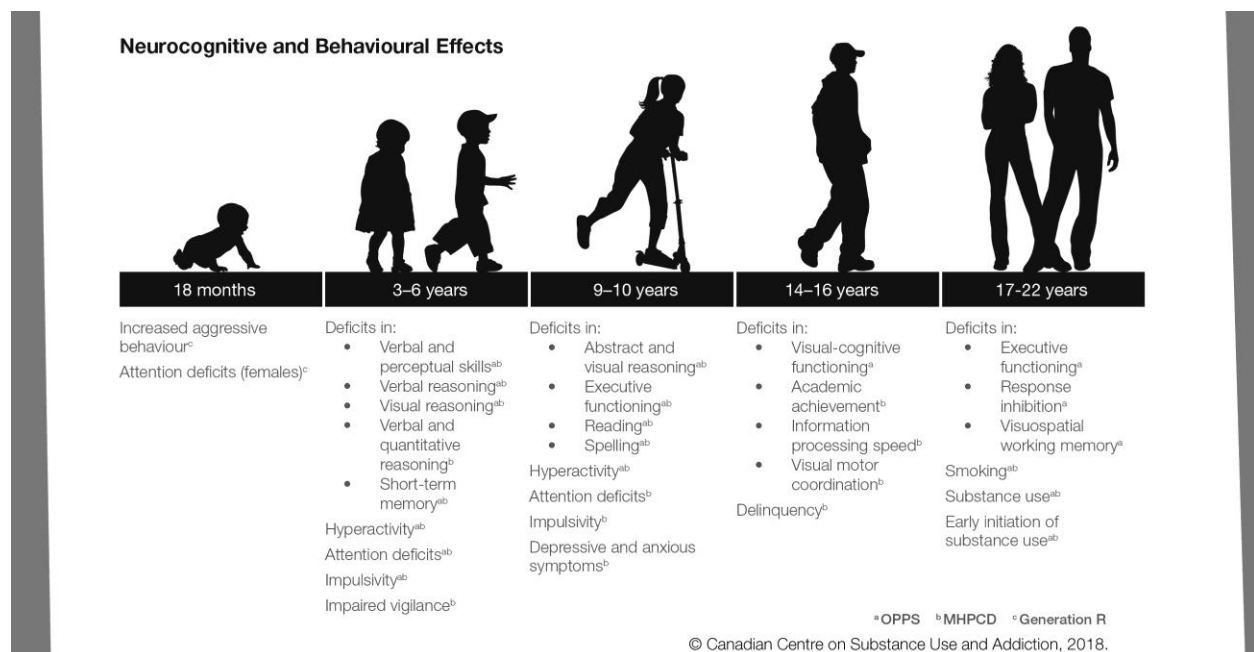
As noted previously, most research findings are related to cannabis that was administered by smoking; less is known about prenatal exposure through other methods of use, such as ingesting edible forms of cannabis. While more research is needed looking at the effects of cannabis use during pregnancy on fetal outcomes, based on the potential risks to the fetus, women should be advised to avoid cannabis use during pregnancy. Women who have difficulty quitting should be advised about the benefits of reducing their use and should be provided with further supports.

Longer-Term Outcomes for Children Exposed to Cannabis in Utero

As noted previously, evidence for the longer-term effects of prenatal cannabis use is principally drawn from three prospective longitudinal studies (i.e., OPPS, MHPCD study, Generation R study). More research is needed to establish a clear association between prenatal cannabis use and longer-term outcomes for children exposed in utero. However, there is a concerning pattern of altered brain development and behaviour associated with in utero cannabis exposure (Metz & Stickrath, 2015). It is important to note that these observed changes/deficits are primarily associated with heavy and prolonged maternal cannabis use during pregnancy. It is unclear to what degree children may be affected by smaller doses of cannabis in utero. Below are some summary points from the research on the longer-term outcomes for children exposed to cannabis in utero.

- There are no consistent findings early in infancy (i.e., the first weeks of life) with respect to the neurobehavioural effects of prenatal cannabis exposure (Warner et al., 2014). For example, in the OPPS, prenatal cannabis exposure was related to subtle changes in neonatal behaviour in the first week of life, such as an increase in startles and tremors and difficulties adjusting to light (Fried & Makin, 1987). The MHPCD study assessed neonates exposed to cannabis in utero on the second day postpartum using the same assessment tool as the OPPS. Unlike infants in the OPPS, however, no association was found between prenatal cannabis use and altered neonatal behaviour among infants in the MHPCD study (Richardson et al., 1989). Repeated measures of larger groups, with sufficient control for potentially confounding variables, are necessary to come to a definite conclusion (Huizink, 2014).

- Most studies do not support measureable differences in neurodevelopmental outcomes among young children (i.e., before 3 years of age) who were prenatally exposed to cannabis (Jacques et al., 2014). For example, in the OPPS, global measures of functioning within particular domains (such as language development, memory, and components of reading) between the ages of 1 and 3 did not reveal an association with prenatal cannabis exposure (Fried, 1995). One exception to this is findings from the Generation R study. El Marroun and colleagues (2011) found prenatal exposure to cannabis was associated with an increased risk of aggressive behaviour and attention problems at 18 months of age in girls but not boys. It is important to recognize that the Generation R study is the most recent prospective longitudinal study available. Because THC levels have increased in recent years, El Marroun et al.’s significant findings may be a result of children in their study being exposed to higher levels of THC in utero than those in the OPPS and MHPCD study.
- There is slightly more evidence that cannabis exposure in utero is associated with adverse outcomes in later childhood (e.g., deficits in memory, verbal, and perceptual skills; attention deficits) and adolescence (e.g., impaired executive functioning, hyperactivity, impulsivity, early initiation of substance use). It is noteworthy that some effects tend to be more pronounced in specific age categories among children and adolescents. See Porath, Kent, and Konefal’s (2018) developmental infographic of the potential neurocognitive and behavioural effects of prenatal cannabis exposure according to age.



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Similar to fetal development and birth outcomes, longer-term outcomes need to be interpreted with caution. The association between cannabis exposure in utero and later life outcomes does not imply causality. Although the three longitudinal studies highlighted previously controlled for home environment, maternal socioeconomic status, prenatal exposure to tobacco and alcohol, and current maternal substance use, there may be additional variables that influenced the study outcomes (Harding & Poole, 2018; Metz & Stickrath, 2015). While more research is needed, women should be advised to avoid cannabis use during pregnancy because of the potential risks of prenatal cannabis use for the developing child/adolescent. For those women who cannot abstain from cannabis completely, a harm-reduction message should be used (i.e., advise women to reduce their consumption) since research findings show that heavy/daily use of cannabis is most strongly associated with negative outcomes.

Lactation and Breastfeeding

When a breastfeeding mother uses cannabis, the THC passes into the breast milk and is taken into a baby's fat cells and brain (Ordean, 2014). Currently, research examining cannabis use during breastfeeding is inadequate with one systematic review looking at the evidence. Of the four studies included in the review, one reported that a child's motor development is affected by age one if a mother used cannabis while breastfeeding. However, this finding was not repeated in the other three studies. The authors of this systematic review conclude that the risks associated with exposure to cannabis through breast milk remain uncertain at this point in time. It is worth noting that studies looking at cannabis use during breastfeeding are confounded by the fact that many of these women also used cannabis during pregnancy (Hill & Reed, 2013). While more research is needed about the effects of cannabis use during breastfeeding, based on the potential risks to the child, women should be advised to avoid cannabis use while breastfeeding.

The Potential Impacts of Cannabis Use on Parenting

There are other potential risks to children whose parents use cannabis. For example, parents who use cannabis should be informed about the safe storage of cannabis, the risks of driving while high, as well as the risks of their children being exposed to second-hand cannabis smoke.

It is important that parents with young children safely store all cannabis products. Food products that contain cannabis, such as gummy bears, brownies, and lollipops, may be attractive to young children. Children who accidentally ingest edible cannabis products may need medical treatment. Researchers in Colorado have discovered a number of unexpected negative consequences following the legalization of cannabis and the subsequent increase in its availability. These adverse consequences include pediatric overdoses and emergency visits for cannabis toxicity (Metz & Stickrath, 2015).

Parents can also put their children in danger if they are "high" while driving. Cannabis use acutely impairs processes necessary for driving, including cognition, attention, memory, decision-making, and psychomotor functioning. Some of these impairments have been found to persist after acute intoxication, particularly in chronic users (Broyd et al., 2016). A number of studies have found that acute cannabis impairment increases the risk of motor vehicle accidents (MVAs), including fatal collisions (Asbridge, Hayden, & Cartwright, 2012; Li et al., 2012; Rogeberg & Elvik, 2016). According to *Canada's Lower-Risk Cannabis Use Guidelines*, the strong evidence linking acute cannabis impairment to the risk

of MVAs warrants a definite recommendation that users do not drive for at least 6 hours after use (Fischer et al., 2017).

It is also important that parents do not smoke cannabis around their children, since second-hand cannabis smoke may cause some of the same health problems for children as second-hand tobacco smoke. As noted previously, many of the toxins in tobacco smoke that cause respiratory disease are also found in cannabis smoke (Moir et al., 2008). Based on the available evidence, parents who use cannabis should be informed about the safe storage of cannabis and the risks of driving while high, as well as the risks of their children being exposed to second-hand cannabis smoke.

Conclusion and Recommendations

With the legalization of cannabis in Canada, and for the health of children and families, it is important that parents, prospective parents, healthcare professionals, and other service providers have access to the most current evidence on the impacts of its use, including the potential risks of cannabis use during the childbearing years. Although more research is needed about the effects of cannabis use during the childbearing years, there is a concerning pattern of negative outcomes on fertility, pregnancy, fetal development, and on the growing child/adolescent exposed in utero. Having access to evidence-based information will allow women of childbearing age to make informed decisions for the health of both them and their babies before, during, and after pregnancy. Below are some important points of consideration based on the available research:

- Women should be provided with evidence-based information about the potential risks of cannabis use in the childbearing years. Until more is known about both the short- and long-term effects of cannabis use across the lifespan (e.g., effects on babies, children, adolescents, and adults), it is safest to avoid cannabis use when planning a pregnancy, while pregnant, while breastfeeding, and around children. If a woman cannot abstain from cannabis, a harm-reduction message should be used (i.e., advise women to reduce their consumption) since research findings show that heavy/daily use of cannabis is most strongly associated with negative outcomes.
- Healthcare providers should be informed that many women who use cannabis throughout pregnancy also use other substances, such as alcohol and tobacco. Although the effects of drugs such as alcohol, cannabis, tobacco, cocaine, and opioids are frequently considered in isolation, they are rarely used alone and polysubstance use increases the potential risks of harm and impacts on long-term health (Harding & Poole, 2018). Because of this, it is important that healthcare providers inform women about the potential consequences of prenatal substance use broadly, whether it is exposure to cannabis, alcohol, tobacco, opioids, or illicit drugs (Harding & Poole, 2018).
- Education about the potential risks of cannabis use should begin in the preconception years. Rates of cannabis use are generally higher among young people. Further, rates of cannabis use have increased among women in recent years. Since almost half of pregnancies are unplanned, many children may accidentally be exposed to cannabis in utero. It is important that men and women of childbearing age are aware that cannabis use increases the risk of sexually-risky behaviours, such as condomless sex, which could result in unplanned pregnancies or STIs.

- Pregnancy is a time when many women are motivated to make positive health behaviour changes. In order to encourage such changes, healthcare providers should be sufficiently informed and prepared to ask pregnant women about substance use (including cannabis use), to inform them about the potential risks, and to provide advice and support. Harding and Poole (2018) recommend the development of clinical guidelines for healthcare professionals to discuss the potential health outcomes of cannabis use for women, including pregnant women. Further, they assert that these conversations need to be linked to the effects of other substances, such as alcohol, tobacco, and opioids.

Additional Resources

- SOGC's statement on cannabis use in pregnancy and breastfeeding, April 2018 (https://sogc.org/files/Cannabis%20campaign_web.pdf)
- CanFASD Issue Paper: Cannabis Use During Pregnancy, March 2018 (<https://canfasd.ca/wp-content/uploads/sites/35/2018/03/CanFASD-Cannabis-Use-During-Pregnancy-Issue-Paper-Final-March-2018.pdf>)
- Clearing the Smoke on Cannabis: Maternal Cannabis Use during Pregnancy – An Update, 2018 (<http://www.ccsa.ca/Resource%20Library/CCSA-Cannabis-Maternal-Use-Pregnancy-Report-2018-en.pdf>)
- Risks of Cannabis on Fertility, Pregnancy, Breastfeeding and Parenting, Best Start, 2017 (https://www.beststart.org/resources/alc_reduction/RisksOfCannabis_A30-E.pdf)

References

- American College of Obstetricians and Gynecologists. (2017). Committee Opinion 722: Marijuana use during pregnancy and lactation. *Obstetrics & Gynecology*, *130*, e205-e209. doi: 10.1097/AOG.0000000000002354
- Asbridge, M., Hayden, J. A., & Cartwright, J. L. (2012). Acute cannabis consumption and motor vehicle collision risk: Systematic review of observational studies and meta-analysis. *British Medical Journal*, *344*, e536. doi:10.1136/bmj.e536
- Battista, N., Pasquariello, N., Di Tommaso, M., & Maccarrone, M. (2008). Interplay between endocannabinoids, steroids and cytokines in the control of human reproduction. *Journal of Neuroendocrinology*, *20*, 82-89. doi: 10.1111/j.1365-2826.2008.01684.x
- Beatty, J. R., Svikis, D. S., & Ondersma, S. J. (2012). Prevalence and perceived financial costs of marijuana versus tobacco use among urban low-income pregnant women. *Journal of Addiction and Research Therapy*, *3*, 1-12. doi: 10.4172/2155-6105.1000135
- Brown, T. T. & Dobs, A. S. (2002). Endocrine effects of marijuana. *Journal of Clinical Pharmacology*, *42*, 90S-96S. doi: 10.1177/0091270002238799
- Broyd, S. J., van Hell, H. H., Beale, C., Yucel, M., & Solowij, N. (2016). Acute and chronic effects of cannabinoids on human cognition – A systematic review. *Biological Psychiatry*, *79*, 557-567. <https://doi.org/10.1016/j.biopsych.2015.12.002>
- Bryan, A. D., Magnan, R. E., Gillman, A. S., Yeater, E. A., Feldstein Ewing, S. W., Kong, A. S., & Schmiege, S. J. (2018). *Journal of American Medical Association Pediatrics*, *172*, e175621-e175621. doi:10.1001/jamapediatrics.2017.5621
- Burns, L., Mattick, R. P., & Cooke, M. (2006). The use of record linkage to examine illicit drug use in pregnancy. *Addiction*, *101*, 873-882. doi:10.1111/j.1360-0443.2006.01444.x
- Campbell, E. E., Gilliland, J., Dworatzek, P. D. N., De Vrijer, B., Penava, D., & Seabrook, J. A. (2018). Socioeconomic status and adverse birth outcomes: A population-based Canadian sample. *Journal of Biosocial Science*, *50*, 102-113. doi:10.1017/S0021932017000062
- Chabarria, K. C., Racusin, D. A., Antony, K. M., Kahr, M., Suter, M. A., Mastrobattista, J. M., & Aagaard, K. M. (2016). Marijuana use and its effects in pregnancy. *American Journal of Obstetrics & Gynecology*, *506*, e1-e7. <http://dx.doi.org/10.1016/j.ajog.2016.05.044>
- El Marroun, H., Tiemeier, H., Jaddoe, V. W. V., Hofman, A., Verhulst, F. C., van den Brink, W., & Huizink, A. C. (2011). Agreement between maternal cannabis use during pregnancy according to self-report and urinalysis in a population-based cohort: The Generation R Study. *European Addiction Research*, *17*, 37-43. doi: 10.1159/000320550
- Fischer, B., Russell, C., Sabioni, P., van den Brink, W., Le Foll, B., Hall, W., ... Room, R. (2017). Lower-risk cannabis use guidelines: A comprehensive update of evidence and recommendations. *American Journal of Public Health*, *107*, e1-e12. doi:10.2105/AJPH.2017.303818

- Fried, P. A. (1995). The Ottawa Prenatal Prospective Study (OPPS): Methodological issues and findings – It's easy to throw the baby out with the bath water. *Life Sciences*, *56*, 2159-2168.
- Fried, P. A. & Makin, J. E. (1987). Neonatal behavioural correlates of prenatal exposure to marijuana, cigarettes and alcohol in a low risk population. *Neurotoxicology and Teratology*, *9*, 1-7.
- Fried, P. A., Watkinson, B., Grant, A., & Knights, R. M. (1980). Changing patterns of soft drug use prior to and during pregnancy: A prospective study. *Drugs and Alcohol Dependence*, *6*, 323-343.
- Fronczak, C. M., Kim, E. D., & Barqawi, A. B. (2012). The insults of illicit drug use on male fertility. *Journal of Andrology*, *33*, 515-528. doi: 10.2164/jandrol.110.011874
- Goldschmidt, L., Richardson, G. A., Cornelius, M. D., & Day, N. L. (2004). Prenatal marijuana and alcohol exposure and academic achievement at age 10. *Neurotoxicology & Teratology*, *26*, 521-532. doi:10.1016/j.ntt.2004.04.003
- Government of Saskatchewan. (2018). *Cannabis*. Retrieved from <http://publications.gov.sk.ca/documents/13/99211-Cannabis%20-%202018.pdf>
- Grant, C. N. & Bélanger, R. E. (2017). Cannabis and Canada's children and youth. *Pediatrics & Child Health*, *22*, 98-102. <https://doi-org.cyber.usask.ca/10.1093/pch/pxx017>
- Gunn, J. K. L., Rosales, C. B., Center, K. E., Nunez, A., Gibson, S. J., Christ, C., & Ehiri, J. E. (2016). Prenatal exposure to cannabis and maternal and child health outcomes: A systematic review and meta-analysis. *BMJ Open*, *6*, e009986. doi:10.1136/bmjopen-2015-009986
- Harding, K. D. & Poole, N. (2018). CanFASD Issue Paper: Cannabis use during pregnancy. Retrieved from <https://canfasd.ca/wp-content/uploads/sites/35/2018/03/CanFASD-Cannabis-Use-During-Pregnancy-Issue-Paper-Final-March-2018.pdf>
- Hayatbakhsh, M. R., Flenady, V. J., Gibbons, K. S., Kingsbury, A. M., Hurrion, E., Mamun, A. A., & Najman, J. M. (2012). Birth outcomes associated with cannabis use before and during pregnancy. *Pediatric Research*, *71*, 215-219. doi:10.1038/pr.2011.25
- Health Canada. (n.d.). *Canadian Tobacco Alcohol and Drugs (CTADS): 2013 summary*. Retrieved from <https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2013-summary.html>
- Health Canada. (n.d.). *Canadian Tobacco Alcohol and Drugs (CTADS): 2015 summary*. Retrieved from <https://www.canada.ca/en/health-canada/services/canadian-tobacco-alcohol-drugs-survey/2015-summary.html>
- Hill, M. & Reed, K. (2013). Pregnancy, breast-feeding and marijuana: A review article. *Obstetrical and Gynecological Survey*, *68*, 710-718. doi: 10.1097/01.ogx.0000435371.51584.d1

- Huizink, A. C. (2014). Prenatal cannabis exposure and infant outcomes: Overview of studies. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 52, 45-52.
<http://dx.doi.org/10.1016/j.pnpbp.2013.09.014>
- Jacques, S. C., Kingsbury, A., Henshcke, P., Chomchai, C., Clews, S., Falconer, J., ... Oei, J. L. (2014). Cannabis, the pregnant woman and her child: Weeding out the myths. *Journal of Perinatology*, 34, 417-424. doi:10.1038/jp.2013.180
- Lee, S. Y., Oh, S. M., & Chung, K. Y. (2006). Estrogenic effects of marijuana smoke condensate and cannabinoid compounds. *Toxicology and Applied Pharmacology*, 214, 270-278.
doi:10.1016/j.taap.2005.12.019
- Li, M. C., Brady, J. E., DiMaggio, C. J., Lusardi, A. R., Tzong, K. Y., & Li, G. Marijuana use and motor vehicle crashes. *Epidemiological Reviews*, 34, 65-72. doi: 10.1093/epirev/mxr017
- Mendelson, J. H., Mello, N. K., & Ellingboe, J. (1985). Acute effects of marijuana smoking on prolactin levels in human females. *The Journal of Pharmacology and Experimental Therapeutics*, 232, 220-222.
- Metz, T. D. & Stickrath, E. H. (2015). Marijuana use in pregnancy and lactation: A review of the evidence. *American Journal of Obstetrics & Gynecology*, 213, 761-778.
<http://dx.doi.org/10.1016/j.ajog.2015.05.025>
- Moir, D., Rickert, W. S., Levasseur, G., Larose, Y., Maertens, R., White, P., & Desjardins, S. (2008). A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions. *Chemical Research in Toxicology*, 21, 494-502.
- Ordean, A. (2014). Marijuana exposure during lactation: Is it safe? *Pediatrics Research International Journal*, 2014, 1-6. doi: 10.5171/2014. 369374
- Passey, M. E., Sanson-Fisher, R. W., D'Este, C. A., & Stirling, J. M. (2014). Tobacco, alcohol and cannabis use during pregnancy: Clustering of risks. *Drug and Alcohol Dependence*, 134, 44 -50.
<http://dx.doi.org/10.1016/j.drugalcdep.2013.09.008>
- Pearson, G. & Shiner, M. (2002). Rethinking the generation gap: Attitudes to illicit drugs among young people and adults. *Criminal Justice*, 2, 71-86. <https://doi-org.cyber.usask.ca/10.1177/17488958020020010401>
- Porath, A. J., Kent, P., & Konefal, S. (2018). *Clearing the smoke on cannabis: Maternal cannabis use during pregnancy – An update*. Canadian Centre on Substance Abuse – issuing body. Retrieved from <http://www.ccsa.ca/Resource%20Library/CCSA-Cannabis-Maternal-Use-Pregnancy-Report-2018-en.pdf>
- Porath-Waller, A. J. (2015). *Clearing the smoke on cannabis: Maternal cannabis use during pregnancy – An update*. Canadian Centre on Substance Abuse – issuing body. Retrieved from <http://www.deslibris.ca.cyber.usask.ca/ID/246577>

- Reproductive Health Working Group. (2006). *Alberta reproductive health: Pregnancies and births 2006*. Edmonton, AB: Alberta Health & Wellness.
- Richardson, G. A., Day, N. L., & Taylor, P. M. (1989). The effect of prenatal alcohol, marijuana, and tobacco exposure on neonatal behavior. *Infant Behavior and Development, 12*, 199-209.
- Rogeberg, O. & Elvik, R. (2016). The effects of cannabis intoxication on motor vehicle collision revisited and revised. *Addiction, 111*, 1348-1359. doi:10.1111/add.13347
- Schempf, A. H. & Strobino, D. M. (2008). Illicit drug use and adverse birth outcomes: Is it drugs or context? *Journal of Urban Health: Bulletin of the New York Academy of Medicine, 85*, 858-873. doi:10.1007/s11524-008-9315-6
- van Gelder, M. M. H. J., Reefhuis, J., Caton, A. R., Werler, M. M., Druschel, C. M., Roeleveld, N., & National Birth Defects Prevention Study. (2009). Maternal periconceptional illicit drug use and the risk of congenital malformations. *Epidemiology, 20*, 60-66. doi: 10.1097/EDE.ObO13e31818e5930
- Varner, M. W., Silver, R. M., Hogue, C. J. R., Willinger, M., Parker, C. B., ... Reddy, U. M. (2014). Association between stillbirth and illicit drug use and smoking during pregnancy. *Obstetrics & Gynecology, 123*, 113-125. doi: 10.1097/AOG.0000000000000052
- Warner, T. D., Roussos-Ross, D., & Behnke, M. (2014). It's not your mother's marijuana: Effects on maternal-fetal health and the developing child. *Clinical Perinatology, 41*, 877-894. <http://dx.doi.org/10.1016/j.clp.2014.08.009>