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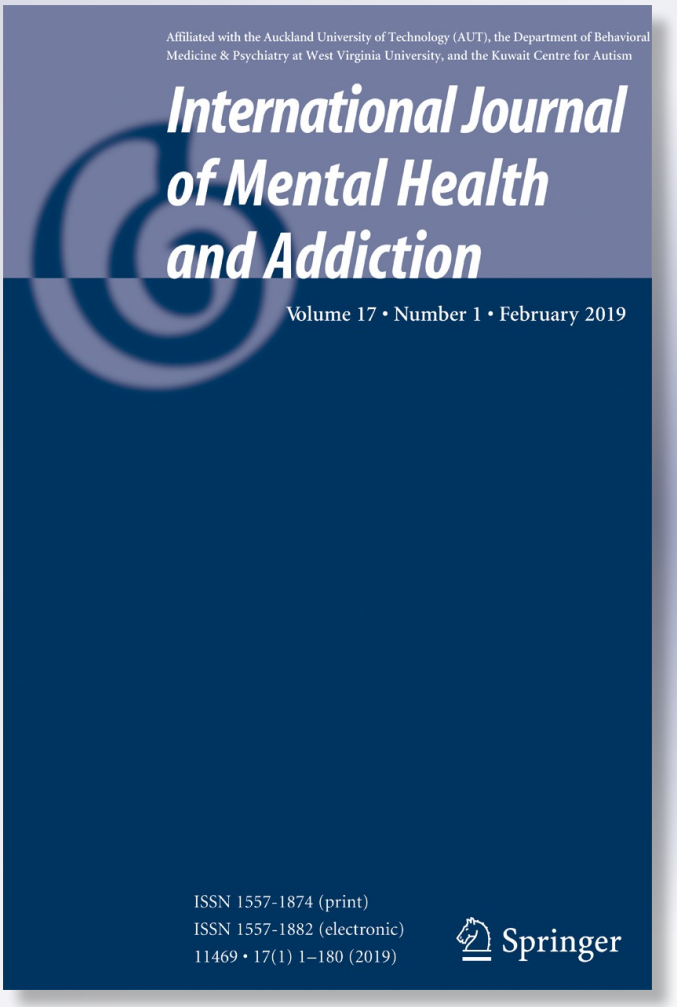

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ORIGINAL ARTICLE

Substance Use in Pregnancy Among Vulnerable Women Seeking Addiction and Parenting Support

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Abstract
Substance use during pregnancy is associated with obstetrical and fetal complications. Though use of some substances is discontinued during pregnancy, use of others persists. Our goal was to characterize substance-specific use and patterns of use throughout pregnancy among vulnerable women who attended an early intervention program for women with substance use issues. Through retrospective analyses of client records (1995–2016; $N = 470$), results indicated that the greatest number of women continued use of tobacco and cannabis for the duration of pregnancy ($n = 232$; 84.4% and $n = 102$; 60.0%, respectively), while the proportion of women continuing opioid use was relatively high ($n = 33$; 57.9%). Relapse rates were high for women who initially attempted to discontinue use of cocaine, crack cocaine, and heroin. Results can inform intervention and treatment by indicating which substances are more difficult to discontinue, as well as substances associated with high rates of relapse.

Keywords Pregnancy · Substance use · Polysubstance use · Prevalence · Women

Substance use during pregnancy, including legal (i.e., alcohol and tobacco) and illicit substances (e.g., cocaine, amphetamines), is associated with obstetrical and fetal complications

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(Aghamohammadi & Zafari, 2016; Bailey et al. 2012; Pinto et al., 2010). There are also long-term effects of substance use in pregnancy, including effects on the physical health and cognitive abilities of the child (Azuma & Chasnoff, 1993; Willford et al. 2006). Substance use during pregnancy has also been linked to increased rates of childhood behavioral problems, ADHD, and language delays (Wong et al. 2011).

Pregnant women's substance use is associated with a host of interconnected social, economic, and systemic factors. Pregnant women who use substances often have low socio-economic status, histories of trauma and abuse from caregivers/partners, concurrent and often untreated mental health issues, and poor relations with health and social systems (Bauer et al., 2002; Daley et al., 2000; Singer et al., 2012). Nonetheless, reduction or abstinence of substance use is ideal for healthy outcomes for both mothers and children. Women with substance use issues tend to discontinue *some* substances during pregnancy, but may persist in using other substances (Moore et al., 2010). As such, it is important to identify substance-specific use and patterns of use during pregnancy. Our aim was to identify and describe vulnerable pregnant women's substance persistence and discontinuation throughout pregnancy.

This aim was addressed with a sample of highly vulnerable women enrolled at *Breaking the Cycle* (BTC), an early intervention program in Toronto, Canada, for pregnant or parenting women who have substance use problems, as well as their infants and young children (Motz et al. 2006). Women who attend BTC typically have a significant history of polysubstance use (usually since their teens), traumatic childhoods that involved abuse and parental substance abuse, transiency, child welfare involvement, concurrent mental health issues, domestic violence, unstable family lives and relationships, criminality, and high risk-taking behavior (Motz et al., 2006). The goal of BTC is to reduce the risk of substance use on child development by addressing maternal addictions and promoting a healthy mother-child relationship (Motz et al., 2011, Motz et al. 2006). Identifying substances that women are more or less likely to discontinue during pregnancy will highlight substances that require additional attention, addictions management, and treatment. As such, identification of sustained substance use patterns during pregnancy will have important implications for health care professionals and service providers who aim to engage vulnerable pregnant women in service and decrease substance use during pregnancy.

Despite the negative consequences associated with substance use during pregnancy (e.g., Pinto et al., 2010; Wong et al., 2011), it remains a widespread problem. Approximately, 50% of pregnancies are unplanned; women may be unaware of their pregnancy while using substances for several weeks (USA; Kost, 2015). Thus, even among recreational substance users, there is a risk of substance exposure during important early stages of fetal development. Women who use substances frequently or have substance use disorders are more likely than recreational users to continue use beyond discovery of their pregnancy (Harrison & Sidebottom, 2009). Canadian surveys indicated that during pregnancy, approximately 11% of women consumed alcohol, 10–13% smoked cigarettes, and 1–5% reported illicit substance use (Finnegan, 2013; Public Health Agency of Canada, 2009). These are likely underestimates due to the pattern of underreporting of substance use, particularly given the significant stigma accompanying this reporting (Ebrahim & Gfroerer, 2003). Further, many women who use substances during pregnancy are polysubstance users, particularly when alcohol and tobacco are included (Bauer et al., 2002).

Substance-specific use and patterns of substance use in pregnancy are understood only to a limited extent. Research suggests that women show a strong trend to cease or reduce use of

alcohol and *hard drugs* (i.e., methamphetamines, MDMA, cocaine) after discovering they are pregnant (Della Grotta et al., 2010; Harrison & Sidebottom, 2009; Havens et al. 2009). One study found that women who decreased their use of methamphetamines were more likely to continue using tobacco, alcohol, and marijuana, highlighting the difficulty in cessation of multiple substances concurrently (Della Grotta et al., 2010). A substantial proportion of women may continue to use tobacco and cannabis throughout pregnancy (Hayatbakhsh et al., 2011; Moore et al., 2010). Much of the prior research, however, has only focused on a limited number of substances (which is problematic given the prevalence of polysubstance users) or has only included women who self-identify as recreational users (who, as noted previously, may be less likely to continue use after discovering they are pregnant) (Harrison & Sidebottom, 2009). There is a paucity of research on substance use among high-risk pregnant women who not only use substances, but also have a range of interconnected interpersonal and systemic challenges.

The overarching goal of this study was to gain comprehensive insights into women's substance use during pregnancy. We used a retrospective chart review of over 20 years of BTC clients to determine substance-specific use and patterns of use throughout pregnancy. We expected that prevalence of substance use would be high in this vulnerable sample. In the overall sample, we expected a marked decrease in use across the trimesters of pregnancy, though we expected a relatively high proportion of women would continue tobacco and cannabis use throughout pregnancy. Finally, we explored intraindividual patterns of use *across* pregnancy. We expected to identify specific patterns of use and expected that patterns would differ across substances.

Method

Participants

Participants were women who had attended BTC, an early intervention program in Toronto, Canada, for pregnant women and mothers who have substance-use problems, and their children (Motz et al., 2006). We conducted a comprehensive chart review of all women who had been involved with BTC since its initiation in 1995 until 2016; 470 women had detailed information regarding prenatal substance use included in their chart, collected on at least one occasion.

Women were between 16 and 44 years old ($M = 29.42$ years, $SD = 6.29$). Women's involvement with BTC varied from 0 to 72 months ($M = 12.84$, $SD = 13.29$). Eighty percent of women reported previous access to some form of treatment (e.g., addiction, mental health). Twelve percent of women had less than a 9th grade education, 44% completed between grades 9 to 11, 19% completed high school, 11% completed some post-secondary, and 14% completed post-secondary. Women reported that substance use generally began in their adolescent or early adulthood years (age of initiation of use for tobacco $M = 13.66$ years, $SD = 4.04$; alcohol $M = 13.41$ years, $SD = 3.37$; cannabis $M = 14.33$ years, $SD = 2.87$; cocaine $M = 19.42$ years, $SD = 5.03$; crack cocaine $M = 21.93$ years, $SD = 6.23$; methamphetamine $M = 18.56$ years, $SD = 4.66$; heroin $M = 20.77$ years, $SD = 5.43$; other opioids $M = 23.25$ years, $SD = 6.56$; hallucinogens $M = 16.97$ years, $SD = 4.03$). Women were between 15 to 43 years old at the time of their child's birth (for women with more than one child enrolled in BTC, the first child to go through BTC's intake process is reported here; $M = 28.46$ years, $SD = 6.26$).

Women reported that their first prenatal doctor's visit occurred between 2 to 41 gestational weeks ($M = 16.53$ weeks, $SD = 9.13$), and birth weight ranged from 1.9 to 10.2 pounds ($M = 6.71$ pounds, $SD = 1.32$). Ninety-eight percent of women were involved with child protective services. See Motz et al., 2006 for a detailed description of women's histories of trauma, medical health, legal problems, housing status, etc.

Procedure

Data were collected from clients' charts using a structured extraction template. Women were asked by BTC clinical staff about their substance use on several occasions. Specifically, upon initial referral meetings, women were asked about their history of substance use and their child's prenatal substance exposure. During intake meetings, women were asked about their history of substance use, with clinical staff inquiring separately about each substance (tobacco, alcohol, cannabis, cocaine, crack cocaine, methamphetamines/amphetamines, heroin, other opioids, hallucinogens, and methadone/other opioid agonist therapies). Finally, women were asked about their use of substances during pregnancy, with staff separately asking about each month of pregnancy, to obtain a detailed understanding of the child's prenatal exposure. Thus, information on women's substance use during pregnancy could be found in a variety of locations within the client's chart. In addition, we reviewed the entire chart: referral forms, mother and child intake assessment forms, child developmental reports, medical notes, progress notes, and discharge forms, and gathered any additional information related to substance use during pregnancy. Ethics approval was obtained from the research ethics board at the Hospital for Sick Children, Toronto, Canada.

Measures

Data were collected subject to availability in the client's chart. Information on substance use during pregnancy was drawn from self-reported use, and verified in the multiple interviews in which women were asked to report on their substance use during pregnancy. Toxicological analyses were also taken into account, if available. Substance use information was collected separately for tobacco, alcohol, cannabis, cocaine, crack cocaine, methamphetamines/amphetamines, heroin, other opioids, hallucinogens, and methadone/other opioid agonist therapies (OAT). Crack cocaine was separated from cocaine; other opioids were separated from heroin, given that differential use of these substances varies across individuals (e.g., Moore et al., 2010). Information was collected regarding current use of substances and age of initiation, as well as information regarding use (yes/no), timing of use, and intensity of use across each trimester of pregnancy.

Results

Description of Substance Use

Polysubstance use during pregnancy was relatively common within this sample of women: 7% of women reported abstinence from substances during pregnancy, 27% reported using one substance during pregnancy, 24% reported using two substances, 20% reported using three substances, and 24% reporting using four or more substances.

Table 1 outlines the number of women using each substance by trimester. Overall, there was a downward trend for all substances over time, though this varied by substance. The number of women using methadone and other opioid agonist therapies (OAT) increased from the first to third trimester (78 to 92%). Women in this sample were using prescribed OAT, through medical maintenance treatment programs. Thus, we described OAT use across trimesters but did not include OAT in subsequent analyses, given that we did not expect OAT use to decrease during pregnancy. Tobacco was the most widely used substance across all trimesters and was less likely to be discontinued, with 84% of women continuing use into the third trimester.

McNemar's test was used to determine whether there were significant differences in proportions of women using substances between each of the three trimesters. Results indicated that women's use of alcohol and crack cocaine decreased between each of the three trimesters. Use of hallucinogens decreased between the first and second trimester, and between first and third trimesters. In addition, women's use of cocaine, cannabis, heroin, and hallucinogens decreased from the first to third trimester. Women's use of tobacco, methamphetamines, and other opioids tended to decrease from the first to third trimester; however, these trends did not reach significance.

A two-proportion *z*-test was used to determine significant differences between continuation rates of substance use (Table 2 shows differences across substances between proportions of women using in third versus first trimester). Tobacco continuation rates were the highest of all substances; hallucinogen continuation rates were significantly lower than those of all other substances. Cannabis continuation rates were higher than those for alcohol, cocaine, crack cocaine, and heroin. The continuation rate for other opioids was significantly higher than for alcohol. Figure 1 depicts the comparisons, by substance, of the proportion of women who discontinued use completely versus those who reduced their use by 50% or more. As can be seen in this figure, across all substances, many women discontinued use completely and other women reduced their use even if they did not attain complete cessation. Tobacco users were as likely to reduce their use, as they were to discontinue completely, though overall reduction for tobacco was lower than that for other substances.

Patterns of Substance Use During Pregnancy

Based on the extensive chart review, the lead author created a coding scheme to categorize general patterns of use during pregnancy. For each substance used during pregnancy, each woman's pattern of use *across* pregnancy was coded as one of eight general patterns of use. To

Table 1 Substance use across trimesters

Substance	Use during pregnancy *n*	Use in 1st trimester *n* (%)	Use in 2nd trimester *n* (%)	Use in 3rd trimester *n* (%)
Tobacco	275	270 (98.2)	248 (90.2)	232 (84.4)
Alcohol	218	208 (95.4)[a]	129 (59.2)[ab]	87 (39.9)[ab]
Cannabis	170	154 (90.6)[b]	127 (74.7)	102 (60.0)[b]
Cocaine	71	61 (85.9)[b]	44 (61.97)	31 (43.7)[b]
Crack cocaine	178	164 (92.1)[ab]	119 (66.9)[bc]	85 (47.8)[ac]
Methamphetamine	18	17 (94.4)	10 (55.6)	7 (38.9)
Heroin	32	29 (90.6)[c]	17 (53.1)	13 (40.6)[c]
Other opioids	57	51 (89.5)	43 (75.4)	33 (57.9)
Hallucinogens	20	19 (95.0)[ac]	7 (35.0)[c]	2 (10.0)[a]
OAT	59	46 (78.0)	51 (86.4)	54 (91.5)

OAT, opioid agonist therapies. Within each row, shared superscripts indicated significant difference in proportion of use at [a] $p < .001$, [b] $p < .01$, and [c] $p < .05$

Table 2 Differences in proportions of women who continued use into the third trimester

	Tobacco	Alcohol	Cannabis	Cocaine	Crack cocaine	Methamphetamine	Heroin	Other opioids	Hallucinogens
Tobacco	–	.44 (10.97***)	.20 (4.55***)	.35 (5.15***)	.34 (7.71***)	.45 (3.66***)	.41 (4.30***)	.21 (3.09***)	.75 (10.20***)
Alcohol		–	−.24 (−4.72***)	−.09 (−1.31)	−.10 (−1.90)	.01 (.01)	−.03 (−.35)	−.23 (−3.07**)	.31 (3.94***)
Cannabis			–	.15 (1.98*)	.14 (2.62**)	.25 (1.95)	.21 (2.08*)	.02 (.00)	.56 (6.87***)
Cocaine				–	−.01 (−.05)	.10 (.71)	.06 (.53)	−.14 (−1.45)	.40 (4.23***)
Crack cocaine					–	.11 (.80)	.07 (.64)	−.13 (−1.69)	.41 (5.05***)
Methamphetamine						–	−.04 (−.24)	−.24 (−1.69)	.31 (2.21*)
Heroin							–	−.20 (−1.70)	.34 (2.95**)
Other opioids								–	.54 (5.56***)
Hallucinogens									–

Proportions are third trimester *n*/1st trimester *n* (*n* can be found in Table 1). Difference in proportion calculated as substance in row minus substance in column. Value in parentheses is *z*-score test statistic. ***$p < .001$, **$p < .01$, and *$p < .05$

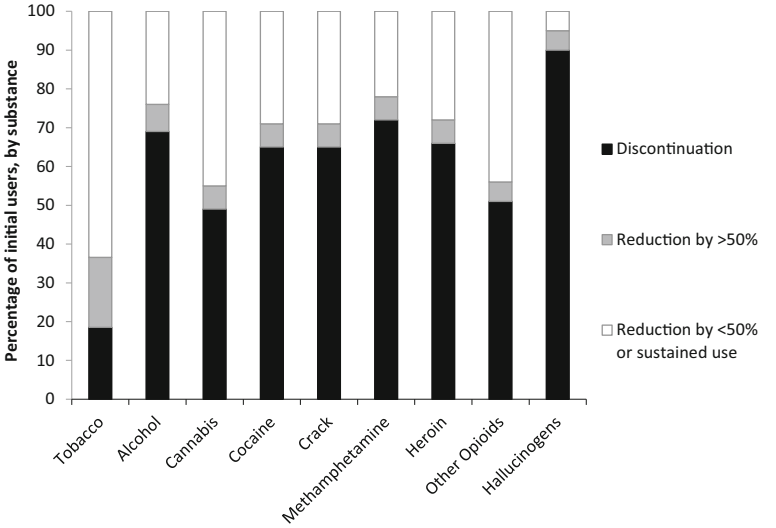

Fig. 1 Percentage of women who initially used the substance, separated into women who discontinued use completely (black), women who reduced their use by between 50 and 99% (gray), and women who sustained use or reduced their use by less than 50% (white)

ensure reliability of this coding scheme, 10% of the sample was double coded by a blinded team member (concordance rate = 86.5%; Cohen's kappa = .83, 95% CI = .77 to .89, $p < .001$). Established patterns of substance use are described below:

1. Sustained use throughout pregnancy;
2. Sustained use until the third trimester and then discontinuation;
3. Sustained use until the second trimester and then discontinuation;
4. Reduction of use, but reduced use sustained throughout the pregnancy;
5. Reduction of use and then discontinuation before the end of the pregnancy;
6. Discontinuation of use and then relapse(s) for a period shorter than 1 month;
7. Discontinuation of use upon discovery of pregnancy (assumed to be before the beginning of the second trimester);
8. Minimal use with no intensity (e.g., "a couple sips of wine throughout the entire pregnancy," "a few puffs of a joint throughout the entire pregnancy").

Table 3 shows the proportions of women with each pattern of use, separated by substance. The most common pattern of use for tobacco, crack cocaine, cannabis, and other opioids was sustained use throughout pregnancy (this was the second most common pattern for alcohol and methamphetamines). In contrast, a significant proportion of women using cocaine and heroin discontinued use and then relapsed. Across all substances (with the exception of tobacco), a large proportion of women discontinued use upon discovering they were pregnant.

Discussion

Vulnerable women with complicated histories of trauma face substantial interpersonal, psychosocial, and systemic barriers to decreasing and ceasing substance use during pregnancy

Table 3 Percentage of women who used each substance by use pattern

Substance (*n*)	Pattern 1 (%)	Pattern 2 (%)	Pattern 3 (%)	Pattern 4 (%)	Pattern 5 (%)	Pattern 6 (%)	Pattern 7 (%)	Pattern 8 (%)
Tobacco (275)	**61.82**	1.09	6.91	*19.64*	2.55	1.09	6.55	.36
Alcohol (218)	*17.89*	3.21	16.97	5.96	2.29	10.55	**34.86**	8.26
Cannabis (170)	**38.82**	7.06	*20.00*	7.06	2.35	5.88	17.06	1.76
Cocaine (71)	16.90	7.04	15.49	2.82	2.82	**28.17**	*26.76*	.00
Crack cocaine (178)	**27.53**	5.62	17.42	5.06	2.81	16.29	*25.28*	.00
Methamphetamines (18)	*16.67*	11.11	*16.67*	5.56	5.56	1.11	**33.33**	.00
Heroin (32)	12.50	3.13	12.50	3.13	6.25	*28.13*	**34.38**	.00
Other opioids (57)	**38.60**	3.51	14.04	3.51	.00	12.28	*24.56*	3.51
Hallucinogens (20)	5.00	.00	*20.00*	.00	.00	10.00	**65.00**	.00

Pattern 1 is sustained use throughout pregnancy; pattern 2 is sustained use until third trimester and then discontinuation; pattern 3 is sustained use until second trimester and then discontinuation; pattern 4 is reduction of use, but reduced use is sustained throughout pregnancy; pattern 5 is reduction of use and then discontinuation before the end of pregnancy; pattern 6 is discontinuation of use and then relapse; pattern 7 is discontinuation of use upon discovery of pregnancy; and pattern 8 is minimal use throughout pregnancy. Bold indicates the most common pattern of use for each substance. Italics indicates the second most common pattern(s) of use for each substance

(Bauer et al., 2002; Motz et al., 2006; Singer et al., 2012). In light of these barriers, it is critical to support women's substance use cessation for their own and their unborn children's health. More research is needed to understand how and in what ways this high-risk group of women change substance use patterns during pregnancy and what treatment strategies are most effective in supporting them. This study comprising chart reviews enabled us to explore women's substance use and discontinuation throughout pregnancy. We found that, although use of substances decreased across trimesters, women continued to use substances at a concerning rate. The data on substance-specific use during pregnancy indicate that additional resources are needed to support women in their efforts to decrease use of certain substances (i.e., tobacco) and that early service engagement is essential (i.e., to decrease the risk of relapse later in pregnancy).

Rates of Substance Use During Pregnancy

Women's use of substances generally declined between the first and third trimester of pregnancy, which is consistent with past research (though much research has been conducted with samples described as recreational users, e.g., Harrison & Sidebottom, 2009; Havens et al., 2009). Thus, results support the idea that pregnancy is a *window of opportunity* for supporting women to make changes for the well-being of themselves and their children (Daley et al. 1998). Although women generally made attempts to reduce their substance use in the prenatal period, initial reports of polysubstance use were high. Given the challenges women experienced in discontinuing their use of multiple substances, it might be useful for service providers to adopt harm reduction approaches rather than abstinence approaches. In fact, integrated services that address many of the determinants of health, including addictions treatment, mental health, trauma, and parenting support are critical to support women in making changes in their substance use.

As expected, and similar to reports of recreational users (Moore et al., 2010), discontinuation rates differed by substance. For instance, tobacco was the most widely used substance

across all trimesters. In fact, reported rates of tobacco use are likely *underestimates*, because many women do not identify cigarettes as a problematic substance and therefore do not report its use (Castles et al. 1999). Tobacco discontinuation was also low. Tobacco cessation is generally a secondary concern for health care professionals, service providers, and the women themselves due to its legality and acceptability within society. However, Bailey et al. (2012) have suggested that it is important to address tobacco use during pregnancy, given the associated negative birth outcomes and the prevalence of tobacco use (see also Toro et al., 2008). Similarly, and consistent with other research, we found high rates of cannabis use (Hayatbakhsh et al., 2011) and *continued* cannabis use over the duration of pregnancy (Moore et al., 2010). This may be due to a lack of research and education about the risks associated with cannabis use during pregnancy and the related perceived low risk of cannabis (Ko et al. 2015; Latuskie et al., 2018; Moore et al., 2010). Given that substance use in this sample of vulnerable women is tied to substantial trauma histories and systemic barriers to accessing treatment, continued use of tobacco or cannabis may be seen as significantly less important than, for instance, cessation of crack cocaine, securing adequate housing, or managing stress without appropriate support. In fact, in focus groups conducted with a subset of our sample, one woman reported that she continued using cannabis because it was more financially sustainable than her prescribed medication (Latuskie et al., 2018). Nonetheless, supporting women to discontinue tobacco and cannabis use during pregnancy is critical (Bailey et al., 2012).

The proportion of women continuing the use of other opioids throughout pregnancy was relatively high, especially in comparison to women who reported using heroin (sustained rates of use throughout the pregnancy of 39% versus 13%, respectively). Women who reported discontinuing their use of other opioids typically did so either immediately after confirming the pregnancy or by the end of the second trimester; however, there may be cases where women may have managed heroin withdrawal by switching to other opioids as opposed to using OAT. Early identification and engagement of women who use other opioids may support them to seek OAT to mitigate the risk of opioid use earlier in the pregnancy. This may be particularly important given the recent increases in opioid use seen in North America (Lind et al., 2015) (note though that these data were collected from 1995 to 2016 in a city that has come to the "opioid crisis" later than other North American cities, and therefore may not reflect the current state of opioid misuse in Toronto). Indeed, literature suggests that the best option for pregnant women who use opioids is OAT (American College of Obstetricians and Gynecologists, 2016). Thus, supporting women to access medical care, as well as a myriad of other services that they need to keep themselves healthy and help them plan for their pregnancy is essential.

Although there was a downward trend in the number of women using each substance from the first to second trimester, the decrease was only statistically significant for alcohol and crack cocaine. From first to third trimester, the numbers of women using alcohol, cannabis, cocaine, crack cocaine, heroin, and hallucinogens all decreased significantly. The decrease for alcohol may be, in part, due to prominent public health campaigns and the widely publicized risk of fetal alcohol spectrum disorders (Carson, 2010; Eguiagaray et al. 2016). The decrease in crack cocaine may be associated with the now discredited *crack baby* phenomenon of the 1980s (Paone & Alperen, 1998). Although it is encouraging that there were decreases in the use of many substances across pregnancy, it should be noted that a large number of women in our sample continued to use substances throughout pregnancy. Thus, though pregnancy itself may be a motivator for women to make changes in their substance use (Racine et al., 2009), high-quality, long-term, and integrated services are needed to support further substance use

discontinuation among highly vulnerable women with substance use issues. Specifically, services are needed that support vulnerable women in accessing basic needs (e.g., housing, food security), medical needs (e.g., prenatal medical appointments), mental health needs, and addictions treatment and support. Given the stigmatization, blame, and judgment often associated with pregnant women's substance use, it is essential that service providers offering such support focus on building positive, non-judgmental relationships with women (Latuskie et al., 2018; Racine et al., 2009).

The ratio of women who completely discontinued use to those who partially reduced their use was comparable across substances. The use of all substances, except tobacco, was generally characterized by complete discontinuation rather than partial reduction of use. For tobacco, a relatively equal number of women discontinued and partially discontinued their use. The partial continuation of tobacco use may be a harm reduction strategy (see Wong et al., 2011). In addition, tobacco discontinuation may be particularly difficult. Smoking provides a relief from anxiety, that is often elevated during pregnancy. Due to the general social acceptance of smoking (outside of pregnancy), women may continue to interact with others who smoke, making it more difficult to discontinue use (Bottorff et al., 2005; Flemming et al., 2013).

Substance Use Patterns Across Pregnancy

There were different profiles of use across substances, with no uniform pattern for any substance, highlighting the complexity of substance use during pregnancy, particularly for polysubstance users. Some patterns, however, were more common than others for a given substance. For instance, over a third of the women who were using alcohol at the beginning of pregnancy discontinued its use upon discovery of pregnancy. In fact, the majority of women who used alcohol discontinued use at some point during their pregnancy, suggesting a recognition of the potential harm to their unborn child.

Discontinuing substance use upon discovery of pregnancy was quite common. Though this is encouraging, women in this sample may not have known they were pregnant until later than would be expected in a typical population (based on gestational weeks at first doctor's visit; $M = 16.53$ weeks, $SD = 9.13$). A delayed awareness of pregnancy is understandable given the vulnerable nature of women in this sample and the many barriers these women face in accessing services. Again, this highlights the importance of early engagement with these vulnerable women, in order to provide better support and access to a variety of services both for women who are not (yet) pregnant, and as early in pregnancy as possible (Andrews et al., 2018; Racine et al., 2009). Outreach programs for vulnerable and marginalized women can be helpful in supporting not only early use of service, but also long-term engagement in service.

Reduction in use was not a prevalent pattern across substances (with the exception of tobacco), which highlights the difficulty in reduction of substance use in this population of vulnerable women, and/or may indicate that these women attempt an *all-or-nothing* approach to the discontinuation of substances. Such an approach may be problematic, because women who abruptly stop using substances risk relapse. We found that many women using cocaine, crack cocaine, and heroin relapsed after a period of discontinuation. Research indicates that heroin and other opioids pose a high risk of relapse for women (Finnegan, 2013), which may relate to the increase in use of OAT (Brands et al., 2002; Edelin et al., 1988). Research, such as this study, that identifies substances that are prone to relapse can guide service providers in supporting vulnerable women to avoid relapses. For example, BTC and other comprehensive

programs offer relapse prevention groups in combination with individual counseling and relevant trauma-informed supports that can contribute to sustained recovery and sobriety (Espinet et al., 2016; Finnegan, 2013; Motz et al., 2006).

Limitations and Future Directions

We recognize the uniqueness of the sample in this study, which limits the generalizability of the findings to the general population of pregnant women. BTC offers support to women who are pregnant or parenting and are seeking support. These women are characterized by a pattern of polysubstance use, histories of intergeneration trauma, and mental health difficulties (Motz et al., 2006). Women in this sample *had* begun to access treatment, although some may have not been ready to engage in service. Thus, the sample is representative of vulnerable, substance using pregnant women: women who are trying to make changes in their substance use, but face many challenges, including lack of effective support for their addictions, mental health problems, trauma, or other systemic barriers (Bauer et al., 2002; Motz et al., 2006; Singer et al., 2012). This sample differs substantially from samples comprising recreational substance users, who report negligible use of illicit substances other than cannabis and *party drugs*, such as ecstasy (e.g., De Santis et al., 2011; Havens et al., 2009; Hayatbakhsh et al., 2011). A strength of this study is that these high-risk, vulnerable women are not often included in research. This study lays the groundwork for additional research to understand substance use prevalence and patterns of use and discontinuation during pregnancy among vulnerable women. For instance, pregnant women who use substances often have complicated life situations, including concurrent mental health difficulties, poverty and homelessness, and past or current interpersonal violence and trauma (Bauer et al., 2002; Daley et al., 2000; Singer et al., 2012). Researchers could consider future empirical work to assess these complex, interconnected factors, to better understand how these social, economic, and systemic factors impact and are impacted by substance use continuation and discontinuation during pregnancy. This research is essential to inform practice, programming, and policy.

Given the nature of the retrospective chart data, any ambiguous, illegible, or missing data could not be clarified. In addition, self-report data may not accurately reflect true experiences. That is, though women were asked to identify their substance use separately by each substance and for each trimester of pregnancy, a chart indicating that a particular substance was not used during a particular trimester may not be accurate. There may be lapses in women's memories, especially given the use of psychoactive substances and history of traumatic experiences, in addition to the typical underreporting in this population. However, previous research findings indicate that women's report of substance use at BTC were consistent with toxicology reports (Avner & Koren, 2004). We gathered substance use information from multiple places in women's clinical charts and toxicological analyses were included, if available; therefore, the data were cross-checked and verified to the best of our ability. The multiple sources of information increased the credibility of the data.

The patterns, availability, and purity of streets drugs are highly dynamic and change over time. Nevertheless, to maximize sample size, we decided to treat the results from the chart review as unified, regardless of when the data were collected (i.e., 1995 vs. 2005 vs. 2015). Future research could be done to separate substance use patterns into decades or 5-year samples, to explore changing patterns of use over time. This would help illuminate the changing nature of societal substance use over time, such as the recent "opioid crisis" (American College of Obstetricians and Gynecologists, 2016).

Conclusions

This study focused on exploring substance use and patterns of use in a sample of women with complex histories of trauma. Data indicated that a significant proportion of pregnant women with substance use issues continue to use all substances at some level, with the exception of hallucinogens. This finding is concerning given the risks of pregnancy complications and negative neonatal and long-term outcomes associated with substance use in pregnancy (Azuma & Chasnoff, 1993; Willford et al., 2006; Wong et al., 2011). We found relatively high rates of relapse for women who initially attempted to discontinue use of cocaine, crack cocaine, and heroin. This finding highlights the need to connect with pregnant women with substance use issues as early as possible, with effective approaches to apply harm reduction in a supportive environment. Women from this sample consistently identified high-quality relationships with service providers and health care professionals as the reason for accessing treatment, maintaining treatment and aftercare, and maintaining prenatal care (Latuskie et al., 2018). Therefore, there is a need for effective practices, programming, and policies to improve services for this disadvantaged population to further decrease substance use during pregnancy.

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Conflicts of Interest The authors declare that they have no potential conflicts of interest.

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