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Substance use among pregnant women in the context of previous reproductive loss and desire for current pregnancy

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Objective. The primary objectives of this study were to explore maternal history of perinatal loss and pregnancy wantedness as correlates of substance use during pregnancy.

Method. The research design involved interviewing women who gave birth in Washington DC hospitals during 1992. Interview data included pregnancy history (prior births, induced abortions, miscarriages, and stillbirths), desire for the pregnancy (wanted, not wanted, mistimed), socio-demographic information, timing of onset of prenatal care, and substance use (cigarettes, alcohol, and drugs) during pregnancy.

Results. A history of induced abortion was associated with elevated risk for maternal substance use of various forms; whereas other forms of perinatal loss (miscarriage and stillbirth) were not related to substance use. Unwanted pregnancy was associated with cigarette smoking during pregnancy, but not with any other forms of substance use.

Conclusions. Reproductive history information may offer insight to professionals pertaining to the likelihood of women using substances in a later pregnancy.

Concern regarding potential detrimental effects of maternal substance use during pregnancy on the health and development of children has grown steadily over the last three decades (Ondersma, Simpson, Brestan, & Ward, 2000). The literature pertaining to the effects of both legal and illegal forms of substance use is extensive, with the most consistent findings related to the negative effects of alcohol exposure (Ondersma *et al.*, 2000). Well-documented evidence has demonstrated that high levels of alcohol ingestion during pregnancy are associated with irreversible cognitive impairments, neurological deficits, facial malformations, and retarded growth (Streissguth, 1997). Deficits in intelligence, attention, and learning have also been documented among the

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children of women who drank moderately during pregnancy (Streissguth, Barr, & Sampson, 1990; Streissguth, Barr, Sampson, & Bookstein, 1994). Because a safe level of drinking during pregnancy has not been established (Zuckerman & Brown, 1993), most women are typically advised to abstain completely. The effects of prenatal exposure to drugs apparently depend on the specific form of drug ingested by the mother. For example, cocaine exposure has been linked to genitourinary track malformations in the immediate; and deficits in self-regulation abilities, as well as decrements in IQ, and language abilities over time (Ondersma *et al.*, 2000). Exposure to marijuana has been consistently related to intrauterine growth retardation and attention difficulties later in childhood (Ondersma *et al.*). Finally, low birth weight is frequently reported in association with prenatal exposure to a variety of substances (Hutchings, 1993).

Most of the research to date pertaining to prenatal exposure to substances has focused on the effects and resulting behavioural challenges facing the developing child. Less attention has been directed toward understanding the demographic factors and socio-emotional processes likely to be associated with the use of substances during pregnancy. The frequency of substance use during pregnancy is fairly consistent across socio-economic groups; however women from higher socio-economic groups tend to favour alcohol and marijuana while women from lower socio-economic groups tend to prefer cocaine and other illicit drugs (Chasnoff, Landress, & Barrett, 1990; Hans, 1999). The primary objectives of this study were to explore maternal history of perinatal loss and desire to be pregnant as correlates of substance use during pregnancy. Literature related to these two objectives is reviewed below.

Perinatal loss and substance use

There is widespread recognition among healthcare providers as well as the general public that for many women perinatal loss is experienced as a personal tragedy with substantial grief reactions (Harmon, Plummer, & Frankel, 2000). Moreover, the available literature suggests that approximately 25% of women who experience a perinatal loss are likely to have persistent, severe negative psychological consequences (Harmon *et al.*, 2000). One of the early studies revealed similar grief responses among women who experienced miscarriages, stillbirths, and neonatal deaths (Peppers & Knapp, 1980).

Compared with other forms of perinatal loss, considerably less research has examined the potential for grief and feelings of loss associated with elective abortion. This oversight is seemingly due to the generally held belief that with induced abortion being optional, the experience is unlikely to cause distress (Harmon *et al.*, 2000). However, the choice to abort is often filled with conflicting emotions and external pressures, rendering the decision to abort difficult and at times inconsistent with the woman's true desire (Adler, 1975; Burke & Reardon, 2002; Coleman & Nelson, 1998; Conklin & O'Conner, 1995; Lemkau, 1988; Miller, Pasta, & Dean, 1998; Shusterman, 1979). Under such circumstances, women may experience the abortion as a loss involving grief and other unpleasant emotions.

One logical time for negative emotions associated with a difficult perinatal loss experience to manifest for the first time, or to re-emerge, is during a subsequent pregnancy, when the physical and psychological changes associated with a later pregnancy carry the potential to trigger affect-laden memories of the previous pregnancy (Burke & Reardon, 2002; Coleman, Reardon, Rue, & Cougle, 2002). There is research support for this hypothesis. For example, in a recent study of pregnant women

with a prior history of miscarriage, stillbirth, or induced abortion, 38% of women with a history of miscarriage, 37% of women with a history of induced abortion, and 100% of women with a history of stillbirth reported unresolved feelings related to their prior loss (Vila, 2002). In addition, Armstrong (2000) found that women with a history of a previous perinatal loss, compared with women without a history, reported higher levels of depressive symptoms and pregnancy-related anxiety as assessed during the second trimester of pregnancy. Research conducted by Bradley (1984) revealed that women who had had induced abortions, when compared with women without such a history, were more likely to suffer from anxiety during pregnancy and depression following childbirth. Finally, with a sample of women with no history of substance use prior to their first pregnancy, Reardon and Ney (2000) found that women whose pregnancies ended in induced abortion reported significantly more substance use than women who delivered. Differences between those who delivered and those with miscarriages or stillbirths were not significant.

Very little research has been designed to examine relationships between maternal history of perinatal loss and substance use during a subsequent pregnancy, with most of the available data pertaining to induced abortion. Studies comparing women with and without a history of induced abortion have focused on cigarette smoking and have revealed significant associations between a prior history of induced abortion and smoking during pregnancy (Harlap & Davies, 1975; Kullander & Kallen, 1971; Meirik & Nygren, 1984). A few studies have found significantly higher rates of alcohol consumption (Kuzma & Kissinger, 1981; Rue & Shutova, 2001) and use of illicit drugs such as cocaine, methamphetamines, and opiates (Frank *et al.*, 1988; Graham & Koren, 1991; Oro & Dixon, 1987) among pregnant women with a history of induced abortion compared with pregnant women with no known history of abortion. One recent study employing a nationally representative sample revealed that pregnant women with a prior history of induced abortion, compared with women with a prior history of live birth, were significantly more likely to use marijuana (odds ratio: 10.29), various illicit drugs (odds ratio: 5.60), and alcohol (odds ratio: 2.22; Coleman *et al.*, 2002). More data is clearly needed pertaining to the use of substances in later pregnancies based on a maternal history of miscarriage or stillbirth.

Unfortunately, very few available studies have explored pregnancy-related substance use effects based on the number of previous pregnancy losses of various forms. One study by Mendelson, Maden, and Daling (1992) did reveal that women with four or more induced abortions were more likely to smoke during pregnancy (41%) compared with women with one induced abortion (28.1%) and with no prior abortions (18.1%). The results of this study also revealed that women with multiple abortions were less likely to receive prenatal care than women with no history of induced abortion (73.4% vs. 80.1%). The design of the current study enabled the examination of differences in substance use during pregnancy based on the number of various types of pregnancy losses.

Desire to be pregnant and substance use during pregnancy

A second factor in addition to reproductive history that may be associated with an increased risk of substance use during pregnancy is whether or not the current pregnancy is desired or wanted by the mother. Unintended pregnancy has been shown to be associated with late prenatal care (Braveman, Marchi, Egerter, Pearl, & Neuhaus, 2000; Hulsey, 2001; Mayor, 1997; Pagnini & Reichman, 2000), substance use

(Altfed, Handler, Burton, & Berman, 1997; Hellerstedt *et al.*, 1998; Kost, Landrey, & Darroch, 1998), and maternal depression (Leathers & Kelley, 2000). However, Joyce *et al.* (2000) recently challenged the integrity of many of the studies used as the basis for the conclusion that unintendedness produces negative outcomes. In particular, they noted that the evidence for a causal model is weak as many of the previous studies neglected to control for potentially confounding socio-demographic, individual difference, and family factors.

Among studies designed to measure the strength of relations between pregnancy intention and maternal variables, with appropriate controls instituted, conflicting results have emerged. One study, using a sample of over 300 women from Chicago area hospitals, with adjustments for socio-demographic factors, revealed that women who desired to be pregnant were less likely to smoke cigarettes and drink during pregnancy than women who did not wish to be pregnant (Alfred *et al.*, 1997). However, no difference was detected relative to the timing of prenatal care. In contrast, using a sample of 1,223 low-income, high-risk pregnant women, with controls for maternal age, race, marital status, and parity, Poole, Klerman, Flowers, Goldenberg, and Cliver (1997) found that unintentional pregnancy was associated with later onset of prenatal care and alcohol use during only the first trimester. Smoking and the use of illegal drugs during pregnancy were not associated with intendedness status. In one of the largest, most well-controlled studies conducted, Kost *et al.* (1998) used data from the *National Survey of Family Growth*, a sample of over 18,000 women, to compare women with either unintended or unplanned (mistimed) pregnancies to women with intended pregnancies. Compared with the other groups, women with intended pregnancies were much more likely to seek early prenatal care (within 6 weeks), stop smoking, and take vitamins during pregnancy. Women with intended and unplanned pregnancies were slightly more inclined to reduce consumption or stop drinking alcohol during pregnancy when compared with women whose pregnancies were unintended. However, once prenatal care was initiated, all three groups were equally likely to make the recommended number of prenatal visits.

Based on the literature reviewed above, this study was designed to pursue the following two primary objectives:

(1) To examine possible differences in substance use during pregnancy based on maternal history of miscarriage, stillbirth, and induced abortion after controls are instituted for socio-demographic variables likely to be associated with the respective reproductive history variables.
(2) To examine the association between pregnancy wantedness and the use of substances during pregnancy after controls are instituted for various socio-demographic factors as well as women's reproductive histories.

Method

Participants

The participants in this study included 1,020 women who gave birth in Washington DC area hospitals during the calendar year of 1992. Of these women, 766 were District of Colombia residents and 254 were non-residents. Socio-demographic characteristics, data pertaining to the timing of onset of prenatal care, and the incidence of low birth weight and premature delivery for the full sample, and segments of the sample containing data pertaining to the three forms of pregnancy loss, are provided in Table 1. The number of

Table 1. Characteristics of the full sample and for segments with data pertaining to the various forms of pregnancy loss

Characteristic	Full sample ($N = 1020$) (%)	Miscarriage ($N = 404$) (%)	Induced abortion ($N = 426$) (%)	Stillbirth ($N = 401$) (%)
Married	32.1	28.5	27.7	28.2
Divorced/separated	3.8	4.5	4.7	4.5
Not married/living with a partner	10.8	10.9	11	11.5
Never married	53.7	55.9	55.9	55.6
Black	79.3	83.4	83.3	83.5
White	12.4	10.1	9.9	10.2
Other race	4	4.5	4.3	3.2
18 or under	9.3	4	4	4
19–25	37.4	38.6	39.4	38.9
26–34	40.3	41.6	41.5	41.4
35 or older	7.8	15.3	15.6	15.2
Fewer than 12 years of formal education	29.4	27.5	26.8	27.4
12 years of formal education	37.6	38.9	39.9	38.9
13–15 years of formal education	15.7	18.3	17.5	17.9
16 years of formal education	7.2	6.9	7.7	7
More than 16 years of formal education	10	8.4	8	8.7
Under $10,600 annual household income	34.9	33	33.6	32.4
$10,600 to $19,000	16.3	16.1	16.9	16.2
$19,100 to $30,000	12.2	10.8	10.8	11
$30,100 to $50,000	12.2	13.3	13.6	13.7
Over $50,000	14.3	12.9	12.2	13
Lives with 1 person	3.6	4.2	4.7	4.2
Lives with 2 people	27.6	30.4	30	29.7
Lives with 3 people	27.5	26	26.8	26.7
Lives with 4 people	18.3	18.6	17.6	18.7
Lives with 5 or more people	22.1	19.8	20	7.2
Prenatal care sought during 1st trimester	58.9	61.6	60.8	61.1
Prenatal care sought during 2nd trimester	24.4	22.3	22.5	22.4
Prenatal care sought during 3rd trimester	6.3	6.2	6.8	6.2
No care received	6.7	6.4	6.6	6.7
Pre-term birth (37 weeks or earlier)	35.1	39.1	39.2	39.9
Low birth weight (5 pounds or less)	21.3	21.6	21.2	22.7

cases with information on the various forms of loss were reduced due to missing data (12.7, 14.8, and 15.3% for induced abortion, miscarriage, and stillbirth, respectively) and to cases for which questions pertaining to the forms of loss represented 'legitimate skips' in that the women had not experienced any prior pregnancies.

Design and procedures

The United States Department of Health and Human Services (DHHS) and the National Institute on Drug Abuse (NIDA) sponsored the drug use and pregnancy study as part of the Washington DC Metropolitan Area Drug Study (DC*MADS) in 1992 (United States Department of Health and Human Services, 1998). The data used in this report were

derived from the public release version of the drug use and pregnancy study data made available in 1998 by the Inter-University Consortium for Political and Social Research. The DC*MADS drug use and pregnancy study examined the extent of drug use during pregnancy and related infant and maternal outcomes among women delivering live births in Washington DC hospitals.

Eight out of nine Washington DC hospitals participated in the study. The research design involved interviewing women who gave birth to live infants in the hospitals during specified sampling periods from January through December 1992, with 86.7% of the individual women approached agreeing to participate. The resulting 1,020 women included in the study were identified using a sampling algorithm that over-sampled women giving birth to low birth weight or pre-term infants and who admitted to drug use, but the participants were otherwise representative of women giving birth in DC hospitals. This was done because one of the specific objectives of the data collection effort was to compare rates of drug use among women giving birth to normal, intermediate-low, and very low birth weight infants. Respondents were asked about their use of substances during pregnancy, perinatal care received, and pregnancy complications experienced. Information pertaining to pre-pregnancy, long-term substance use was not available in the data set. The women were also asked to give permission for their medical records and those of their newborn infants to be reviewed; 68% of the mothers in the sample ($N = 695$) granted permission. The women were given an overview of the purpose of the study prior to consenting to participate and they were all interviewed in their hospital rooms or another area of the hospital before discharge. To protect the anonymity of respondents, all variables with identifying information were encrypted, collapsed, or deleted.

Interview data abstracted for use in the current report included pregnancy history (number of prior births; induced abortions, less than 5% of which were sought for health reasons; miscarriages; and stillbirths), desire for current pregnancy (wanted, not wanted, wanted at an earlier or later date), socio-demographic information (age, marital status, race, education, household composition), trimester in which prenatal care was first sought, incidence of low birth weight and premature birth, and substance use at any point during pregnancy. Data pertaining to the following substance use categories were utilized: cigarettes, alcohol, marijuana, crack and other forms of cocaine, and use of any other illicit drugs. Frequencies for other classes of drugs such as stimulants and sedatives were too low for systematic analysis.

Results

Table 2 provides descriptive data pertaining to the percentages of women in the full sample who reported ever using the legal and illegal substances examined in the study. These frequencies are generally consistent with other self-report data (US General Accounting Office, 1990).

In order to examine possible differences in substance use of various forms during pregnancy based on maternal history of miscarriage, stillbirth, and induced abortion, a series of logistic regressions were conducted. In each analysis, controls were instituted for the number of prior births as well as the forms of pregnancy loss that were not the primary focus of any given analysis. In addition, socio-demographic variables that were significantly related to the specific forms of pregnancy loss were also controlled. Socio-demographic variables explored included age, race, marital status, income, years of formal education, and the number of people living with the respondent. The trimester

Table 2. Percentage of the full sample that used legal and illegal substances during pregnancy

Substance	Percentage
Marijuana	6.1
Cigarettes	27.4
Alcohol	26.1
Cocaine – any	11.9
Cocaine – other than crack	4.3
Cocaine – crack only	10.9
Any illicit drugs	14.6
Any illicit drugs except marijuana	12.4

during which the respondents first sought prenatal care was also explored as a possible covariate in each set of analyses.

Miscarriage data were available for 39.6% of the full sample. From among this group, 54.7% reported no miscarriages, 33.9% reported one miscarriage, and 11.4% reported two or more miscarriages. Socio-demographic variables found to be significantly related to miscarriage history included more advanced age, $r(402) = .16$, $p = .002$; being unmarried, $r(402) = -.14$, $p = .004$; and later onset of prenatal care, $r(402) = -.14$, $p = .004$. Although maternal history of one and two or more miscarriages tended to be associated with a greater likelihood of having reported substance use of various forms, none of the odds ratios comparing these two groups with women without a history of miscarriage were significant.

Exactly 39.3% of the sample had data pertaining to stillbirths. From among this group, 91.5% reported no stillbirths, 7.5% reported one stillbirth, and 1% reported two or more stillbirths. Because the number of respondents reporting multiple stillbirths was so small, analyses were restricted to comparisons between those with no stillbirth history and those with one or more stillbirths. The only socio-demographic variable found to be significantly associated with stillbirth history was lower income, $r(349) = -.11$, $p = .027$. Women with a history of stillbirth tended to be less likely to report substance use of various forms; however none of the odds ratios were statistically significant.

Table 3 provides the results of the logistic regressions involving induced abortions. Exactly 41.8% of the sample had data pertaining to abortions. From among this group, 33.8% reported no abortions, 40.8% reported one abortion, and 25.4% reported two or more abortions. Socio-demographic variables found to be significantly related to history of induced abortion included older age, $r(424) = -.13$, $p = .007$; more formal education, $r(402) = .10$, $p = .031$; and having fewer people living with the respondent, $r(402) = -.10$, $p = .043$. Finally, more delayed onset of prenatal care was significantly related to a history of induced abortion, $r(402) = .11$, $p = .025$. As indicated by the data in the table, history of one induced abortion compared with no history of abortion was associated with a significantly higher likelihood of using substances of all forms during pregnancy, with the exception of alcohol (approached significance). Although women with a history of multiple abortions tended to report substance use of the various forms at higher rates than women without a history of abortion, only one of the comparisons was significant, with the women with multiple abortions tending to more frequently report having used cigarettes. A number of comparisons approached significance

Table 3. Results of logistic regressions comparing use of various legal and illegal substances based on history of induced abortion

Substance	Comparison	ODDS ratio* (p value)	95% Confidence interval
Marijuana	1 abortion	3.01 (.025)	1.12–8.05
	2 or more abortions	1.68 (.356)	.55–5.11
Cigarettes	1 abortion	2.00 (.012)	1.17–3.41
	2 or more abortions	1.90 (.030)	1.05–3.40
Alcohol	1 abortion	1.62 (.080)	.95–2.76
	2 or more abortions	1.58 (.121)	.89–2.81
Cocaine–any	1 abortion	3.15 (.003)	1.48–6.69
	2 or more abortions	2.02 (.087)	.90–4.52
Cocaine–other than crack	1 abortion	5.06 (.013)	1.40–18.24
	2 or more abortions	3.15 (.095)	.82–12.10
Cocaine–crack only	1 abortion	2.98 (.006)	1.34–6.51
	2 or more abortions	1.72 (.217)	.73–4.06
Any illicit drugs	1 abortion	3.13 (.003)	1.40–5.59
	2 or more abortions	2.20 (.052)	.95–4.18
Any illicit drugs except marijuana	1 abortion	2.80 (.003)	1.48–6.61
	2 or more abortions	1.99 (.069)	.99–4.88

*Adjusted odds ratios with controls for the number of prior births, miscarriages, and stillbirths; age; education; number of people the respondent lives with; and first trimester sought prenatal care. No abortion group served as the reference group.

(any drug use, any drug use except marijuana, any form of cocaine use, and cocaine use other than crack); in each case a greater likelihood of reporting usage was associated with a history of multiple abortions.

In order to examine possible differences in substance use of various forms during pregnancy based on pregnancy wantedness, two sets of logistic regression were conducted. In each set of analyses, controls were instituted for the number of prior births as well as history of miscarriage, stillbirth, and induced abortion. In addition, socio-demographic variables that were significantly related to the wantedness variable were controlled; the trimester during which the respondents first sought prenatal care was also explored as a possible covariate. Pregnancy wantedness data were available for 96.6% of the sample. From among this group, 31.1% wanted the pregnancy, 34.9% reported not wanting the pregnancy, and 34% reported feeling the pregnancy was mistimed. Two sets of comparisons were conducted: (1) between those who wanted the pregnancy and those who did not want the pregnancy, and (2) between those who wanted the pregnancy and those who wanted to be pregnant at an earlier or later date (mistimed). Socio-demographic variables found to be significantly related to pregnancy wantedness included younger age, $r(671) = -.24$, $p < .001$; being unmarried, $r(671) = -.45$, $p < .001$; less formal education, $r(671) = -.28$, $p < .001$; and fewer people living with the respondent, $r(671) = -.20$, $p < .001$. Finally, later onset of prenatal care was significantly related to the wantedness variable, $r(671) = -.19$, $p < .001$. No significant differences were observed between the wanted and unwanted groups relative to the different forms of substance use, with the exception of cigarette usage (odds ratio: 1:90, $p = .003$, 95% confidence interval: 1.24–2.94). Women who reported unwanted pregnancies were significantly more likely to indicate having

smoked during pregnancy than women who wanted their pregnancies. No significant differences relative to substance use were detected between the wanted and the mistimed groups.

Discussion

Concern over the possible maternal and child effects of legal and illegal substance use during pregnancy has grown in recent years as potential associated problems have been systematically explored in the literature. With awareness of the possible negative effects expanding, the need to identify maternal factors leading to enhanced risk of substance use has become more pressing. This study was designed in an effort to explore possible maternal variables likely to differentiate between women who use substances during pregnancy and those who refrain. More specifically, maternal history of prior reproductive loss (miscarriage, stillbirth, and induced abortion) and pregnancy wantedness (wanted, not wanted, mistimed) were examined.

With regard to prior reproductive loss, only a history of induced abortion was found to be associated with a significantly higher likelihood of using substances of various forms in a later pregnancy (after statistically controlling for prior births, other forms of loss, age, education, number of people in the home, and the timing of the initial prenatal visit). More specifically, a history of one prior abortion, when compared with no history, was associated with a considerably higher likelihood of using substances in 7 out of the 8 categories examined (odds ratios ranged from 2.0 to 5.06). Alcohol was the only form of substance use not found to be significantly associated with a greater chance of consumption by women with one previous abortion in comparison with women without a history.

Interestingly, comparisons between the one induced abortion and the no induced abortion groups were considerably stronger than the comparisons between the two or more and the no induced abortion groups. Although several of the comparisons between the latter two groups approached significance, only the comparison based on cigarette usage was found to be significant, with women with a history of two or more induced abortions found to be twice as likely to smoke during a later pregnancy when compared with those without a prior induced abortion. This finding is similar to the results of the study by Mendelson *et al.* (1992) described earlier. With so little prior research comparing women with one versus multiple prior induced abortions, interpreting the current findings suggesting a greater risk of substance use associated with a single induced abortion is difficult and more research is clearly indicated. One possible explanation, however, is that women who have more than one induced abortion are more comfortable with the choice to abort than those with only one prior induced abortion, and are therefore less likely to feel the need to use substances. This interpretation is consistent with studies indicating that women, who have more than one abortion, when compared with women who have experienced just one, tend to report less concern about moral or social issues (Bracken & Kasi, 1975), are less likely to report being religious (Leach, 1977), and are more prone to being emotionally detached (Fisher, 1986).

The obvious difference between induced abortion, which was found to be associated with enhanced risk for substance use, and miscarriage and stillbirth, which were not found to be associated with greater risk, is the voluntary nature of the loss. Perhaps women with an induced abortion felt more negative emotions due to feelings of guilt or

remorse associated with the prior loss and were more likely to use substances in an effort to mask such feelings. As noted earlier, there is evidence suggesting that women with a prior history of abortion are more inclined than those without a history to experience fears, anxiety, and depression in later pregnancies. Further, with the specific cause of a prior miscarriage or stillbirth likely unknown, these women, when compared with the women with a history of induced abortion, may have made a more concerted effort to reduce the chance of reoccurrence by taking better care of themselves during pregnancy, as reflected in lower rates of substance use.

An alternative interpretation to those described above is that women who use substances are more likely to decide to abort and to continue their usage into subsequent pregnancies. More specifically, women who use substances may be inclined to abort for fear that they have harmed the fetus prior to discovering the pregnancy. Further, there are data to suggest that women with a history of induced abortion, compared with women without a history, tend to describe themselves as independent and rebellious (Bradley, 1984). Dispositions such as these could lead to an increased likelihood of substance use in addition to being associated with the choice to abort. While these explanations may account for a portion of the observed effect, other studies with controls for prior use have revealed an association between induced abortion and substance use during pregnancy (Drower & Nash, 1978; Reardon & Ney, 2000).

All of the above interpretations are speculative at this point, and studies designed to probe women's emotional reactions to their prior losses, prior history of substance use, feelings regarding their subsequent pregnancies, and the reasons they use or abstain from substance use during pregnancy, are needed. Unfortunately, obtaining candid information regarding substance use during pregnancy may be considerably more difficult today than it was in 1992 due to a number of women having been charged with various crimes, including possession of a controlled substance, delivering drugs to a minor (through the umbilical cord), corruption of a minor, and child abuse and neglect for using drugs during pregnancy (Dailard & Nash, 2000). As this literature develops, a greater emphasis should be placed on theory development to provide a context for the logical interpretation of the available data in light of social and political pressures and to guide generalization of the findings.

After controlling for maternal age, education, marital status, number of people residing with the respondent, trimester in which prenatal care was sought, number of prior births, and all forms of reproductive loss, experiencing an unwanted pregnancy was only found to be related to an elevated likelihood of cigarette use. No differences in substance use were revealed between the wanted and the mistimed groups. The generally non-significant findings are consistent with the interpretation of the available literature by Joyce *et al.* (2000), suggesting that associations between pregnancy wantedness and negative maternal behaviours like substance use may be minimal after controlling for a comprehensive set of socio-demographic variables.

This study benefited from a very thorough sampling methodology and the use of data pertaining to various forms of loss in the context of one investigation. Moreover, with most of the previous research pertaining to pregnancy loss having been conducted with predominantly White, middle income samples, the current study provides an important contribution as analyses were conducted with a predominantly Black, lower income sample. However, the data were derived through the exclusive use of self-reported interview data and subsequent research should incorporate information derived from other sources of information, such as from significant individuals in women's lives, medical records, and/or toxicology reports. Because the methodology involved

a restriction to one geographical locale, as well as an over-sampling of women who delivered low birth weight and/or pre-term infants and women who admitted to drug use, the generalizability of the findings is necessarily limited.

Another limitation of this study, and most studies employing self-reports of the history of induced abortion, pertains to the fact that many women do not reveal prior abortion history. In the USA, the abortion concealment rate has been estimated to be approximately 60% (Jones & Forrest, 1992). Moreover, women who conceal their abortion experience, compared with those who do not, are more likely to suppress thoughts of the abortion, experience more intrusive abortion-related thoughts, and feel greater psychological distress (Major & Gramzow, 1999). Therefore, any negative mental health consequences, such as the use of substances, are likely to be less apparent among women who are open about their abortion(s). With accurate abortion histories, the percentages of women reporting substance use may have been higher.

Existing data suggest that women with socio-demographic characteristics similar to those in this study (Black, unmarried, and poor) compared with their White, Hispanic, married, and financially stable counterparts, are more inclined to have an induced abortion (Harlap, Shiono, & Ramcharan, 1979; Henshaw & Silverman, 1988; Zavodny, 2001); yet Black and unmarried women are also more likely than other groups to conceal an abortion experience (Jones & Forrest, 1992). Nevertheless, the percentage of women in the current sample who acknowledged a prior abortion was high based on prevalence data indicating that 21% of pregnancies in the USA end in abortion, with 50% of pregnancies in the District of Colombia terminated by induced abortion (Alan Guttmacher Institute, 2003). In the study year (1992), the incidence of abortion was considerably higher among women in the District of Colombia area (130 per 1,000 women aged 15–44 years) compared with the rest of the USA (25 per 1,000 women aged 15–44 years; Alan Guttmacher Institute, 2003).

Future investigative efforts should examine substance use prospectively across pregnancy since women who use substances are more likely to miscarry. With the inclusion of only retrospective data from women who successfully carried to term, the association between prior losses and substance use may have been significantly under-estimated.

In conclusion, the data from this report revealed that history of an induced abortion was associated with elevated risk for maternal substance use of various forms; whereas other forms of perinatal loss (miscarriage and stillbirth) were not systematically related to substance use. The limits of the design preclude causal assumptions, and increased risk among the women who experienced an abortion could of course be due to a third variable such as emotional instability, relationship difficulties, or personality variables including orientation to risk-taking or independence. The correlational evidence, however, will hopefully offer an incentive for more comprehensive studies, including a broader array of possible third variables, the effects of which could be statistically removed. The other key finding described herein was that unwanted pregnancy was not significantly associated with enhanced risk of substance use, with the exception of cigarette smoking. Viewed together, the primary results of this study should provide an impetus for researchers and professionals to re-examine the frequently held belief that abortion represents the most sensible solution to unwanted pregnancies. Moreover, reproductive history information in particular may provide valuable insight to professionals pertaining to the identification of women who are likely to be at risk of substance use.

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