

Substance use among adolescent mothers: A review



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ABSTRACT

Maternal substance abuse is a critical problem, and adolescent mothers appear to be at high risk for such behaviors. We review studies on postpartum adolescent substance use to explore the extent of this problem and avenues for new research. Authors screened 1300 studies, identifying 12 articles on substance use among postpartum adolescent mothers for this review. Adolescent mothers reported greater substance use before pregnancy compared to other adolescent females. Although some adolescents continued substance use during pregnancy, most stopped using only to resume within six months after birth. Comparisons of use to national samples of nulliparous adolescent females showed a higher prevalence of substance use in this population. Substances used often varied by race/ethnicity, with white mothers more likely to smoke cigarettes and use marijuana, and Black mothers more likely than whites to drink and use drugs. Of all identified studies, only one focused on Hispanics. Beliefs about drug use grew less negative as girls transitioned from pregnancy to parenthood. As they transitioned to adulthood, substance use remained prevalent and stable. Psychological distress and low self-esteem appeared to influence continued use. Friends' cigarette smoking predicted early initiation of and persistent smoking, while increased education predicted quitting. Early initiation of substances often predicted problem behaviors. Adolescent mothers are a vulnerable population, implicating use of problem behavior theory or the self-medication hypothesis in future research. Multiple avenues for new studies are needed to help identify effective treatment and intervention for this understudied population.

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1. Introduction

Over the past 20 years, teenaged motherhood declined in the United States (US), decreasing from 59.9 live births per 1000 among girls aged 15–19 in 1990 to 34.3 live births per 1000 in 2010 (Hamilton, Martin, & Ventura, 2011). Although this population is smaller than it was, adolescent mothers remain a vulnerable group. Research shows a positive association between pregnancy before age 19 and problematic behaviors, such as substance abuse (Elster, Ketterlinus, & Lamb, 1990). In general, maternal substance abuse is a critical social and clinical problem (Pajulo et al., 2012). Population-based data suggest a reduced rate of substance use among women in pregnancy, but an elevated rate of use among women in the postpartum period (Substance Abuse and Mental Health Services Administration, 2007), implying a failed intervention opportunity. While substance use patterns differ between adolescent and adult women (De Genna, Cornelius, & Donovan, 2009), with use of most substances initiated before age 21 (e.g., marijuana) (Gfroerer & Epstein, 1999; Wu, Pilowsky, & Schlenger, 2005), differences in use patterns suggest adolescents may be at even greater risk than adult women for

substance use once their children are born. In addition, teenage mothers may be likely to engage in long-term substance use, as teens who initiate use of psychoactive substances (e.g., marijuana) are more likely to use substances as adults and require related treatment (Gfroerer & Epstein, 1999; Merline, O'Malley, Schulenberg, Bachman, & Johnston, 2004). Continuing substance use from adolescence increases the likelihood of use escalating to abuse or dependence, which negatively affects multiple domains of postpartum adolescent life (e.g., health, parenting, and educational attainment). Little is known about substance use among postpartum adolescents, yet these girls constitute a high-risk and vulnerable population. Here, we describe demographic characteristics of adolescent mothers and conduct a literature review on postpartum adolescent substance use to identify research gaps and facilitate future investigation.

1.1. Who are adolescent mothers?

Most adolescent mothers are white; however, birth rates are disproportionately high among Latinos, Blacks, and girls in Southern states (e.g., Mississippi) (Mathews, Sutton, Hamilton, & Ventura, 2010). Differences in birth rates relate to multiple factors, such as low income and low educational attainment (Mathews et al., 2010). However, the overall decline in births is primarily attributed to greater contraception use, with a smaller proportion attributed to decreased sexual activity (Santelli, Orr, Lindberg, & Diaz, 2009). In 2006, 68% of teen births occurred to girls aged 18–19, just 50% of whom had graduated high

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school; of all teen mothers, most were unmarried (84%) and received prenatal care within the first trimester (70%) (National Campaign to Prevent Teen and Unplanned Pregnancy, 2008).

Teenage mothers are a vulnerable population. Adolescent sexual behavior and resulting parenthood are associated with an increased prevalence of substance use, including alcohol (Krohn, Lizotte, & Perez, 1997), marijuana, cocaine (Lowry et al., 1994), and methamphetamines (Zapata, Hillis, Marchbanks, Curtis, & Lowry, 2008). In addition, adolescent substance use elevates the odds of having difficult transitions to adulthood that negatively affect their success at engaging in adult roles and increase the likelihood of later problematic substance use (Krohn et al., 1997).

1.2. Consequences of prenatal adolescent substance use

Although the focus is postpartum substance use, we include a brief description of the potential consequences of prenatal use to the fetus and of potential consequences of adolescent use to the mother as background. Some mothers continue substance use in pregnancy, and fetal effects could influence mother and infant life trajectories. Because girls who begin or resume substance use postpartum may not be able to quit in subsequent pregnancies, prenatal effects are also relevant to later children development (Jagodzinski & Fleming, 2007). Developmental changes made to maternal brain structure due to adolescent substance use could also negatively alter the maternal and infants life course.

Prenatal substance use confers multiple potentially lasting adverse effects on the neonate. Thompson, Levitt, and Stanwood (2009) reviewed animal and human studies that examined prenatal substance use effects on fetal brain development. These effects vary by substance and frequency of use. Alcohol exposure can have severe neuro-developmental consequences and result in fetal alcohol syndrome. Prenatal exposure to cigarettes is positively associated with attention deficit disorder, hyperactivity, antisocial behavior, and learning disabilities (Thompson et al., 2009). Children exposed to cocaine in utero may exhibit behaviors that mirror attention deficit hyperactivity disorder (ADHD). Children prenatally exposed to methamphetamines show decreased arousal, increased stress, lower scholastic achievement, decreased ability to sustain attention and less spatial and verbal memory than their non-exposed peers (Thompson et al., 2009). Children prenatally exposed to methamphetamines also may have increased anxiety, depression and ADHD related problems (LaGasse et al., 2012). Additional papers that address outcomes of prenatal substance exposure to offspring include, but are not limited to, Imer (2011), Sithisarn, Bada, Dai, Randall, and Legan (2011), and Cornelius and Day (2009).

Moreover, maternal substance use continues to have significant consequences after birth. For example, alcohol may pass through breast milk and complicate infant development (Little, Anderson, Ervin, Worthington-Roberts, & Clarren, 1989). Exposure to second hand smoke is positively associated with respiratory infections, ear infections, and asthma (Carlsen & Carlsen, 2008); and it has been suggested to be a primary risk for sudden infant death syndrome (SIDS) (Alvik, Haldorsen, & Lindemann, 2006; Carlsen & Carlsen, 2008). Mothers using substances may have difficulty reading infant cues and meeting the interactional needs of children (Pajulo, Savonlahti, Sourander, Ahlqvist Helenius, & Piha, 2001). Further, alcohol and drug use contribute to child neglect and abuse and, because child abuse can be a precursor to substance abuse, may create generational cycles of abuse (Dunn et al., 2002; Romero, Donohue, & Allen, 2010).

Adolescence is also a critical time for brain development, and repeated substance use by adolescent mothers can alter their brain structure. Associated changes may contribute to increased risk taking and explain partly why early substance use often leads to continued use and addiction in adulthood (Squeglia, Jacobus, & Tapert, 2009). Although changes vary by substance and frequency of use, adolescent substance use may result in deficits in executive functioning, abstract reasoning, problem solving (Squeglia et al., 2009), and later substance and other psychiatric

disorders (Brook, Richter, & Rubenstone, 2000; Gfroerer, Wu, & Penne, 2002; National Institute on Drug Abuse, 2007). Hence, adolescent mothers are uniquely vulnerable to current and future problematic substance use. They and their children face severe consequences from substance use, yet little research addresses postpartum use.

Flanagan and Kokotailo (1999) reviewed prenatal substance use among adolescent mothers and found that adolescents at risk for pregnancy were also often at risk for substance use, likely related to common socioeconomic factors that increased vulnerability. However, reductions observed in prenatal and early postpartum use suggested that pregnancy might be protective, particularly in contexts where motherhood offered an alternative life course to girls affected by poverty, low education, and high rates of substance use. Flanagan and Kokotailo (1999) concluded that there was a need for research to determine if prenatal substance use declines held through the postpartum period and into the parenting years. To understand whether there is an increase in substance use after these young women give birth and facilitate future studies, we conducted a literature review and present identified gaps in adolescent postpartum substance use research.

2. Methods

We selected Google Scholar, PsychInfo, and PubMed to search for studies on postpartum adolescent substance use. PubMed focuses on the medical literature and was used to identify articles related to the postpartum period and to substance abuse treatment. PsychInfo focuses on psychology studies and was used to identify articles related to substance use, substance abuse, and substance abuse treatment. Google Scholar covers a wide range of topics and was used to find articles on topic but not included in the medical or psychological literature. Searches used keywords such as adolescent, postpartum, postnatal, substance use, substance abuse, alcohol, tobacco, cocaine, cannabis, marijuana, opioids, heroin, and methamphetamines which resulted in over 10,000 articles (Fig. 1). Most were found to be unrelated to the research topic. Several variations of search expressions were attempted, but most articles continued to relate to topics, such as substance use during the prenatal period or pregnancy as consequence of adolescent substance use. We also reviewed articles with related information for sources. Once an appropriate source was found, the cited by feature of Google Scholar then was used to identify additional articles. We found 12 articles on postpartum substance use among adolescent mothers dating from 1989 to 2010. We identified no studies published after 2010.

3. Results

Nearly all reported studies relied on moderately small samples ($N < 344$) (Table 1). Of the 12 identified studies, five were cross-sectional and seven used longitudinal designs. Longitudinal studies often followed samples from earlier cross-sectional studies. For comparative purposes, we present data reported by studies on pre-pregnancy and prenatal use first. Provided for comparison, Table 2 shows substance use prevalences for girls aged 12–17 in the US, as determined by the 2010 National Survey on Drug Use and Health (NSDUH) (SAMHSA, 2011). Marijuana and opioid pain relievers were the illicit drugs used most often by adolescents in 2010.

3.1. Cross-sectional studies

3.1.1. Pre-pregnancy use

Concerned that adolescent mothers who used substances and their children would have poor health outcomes and overall well-being, Amaro et al. (1989) examined substance use among 253 primarily poor adolescent mothers aged 13–19 years recruited from Boston, Massachusetts prenatal clinics (49% North American-born Black (specific

Database search and article review for postpartum use among adolescent mothers

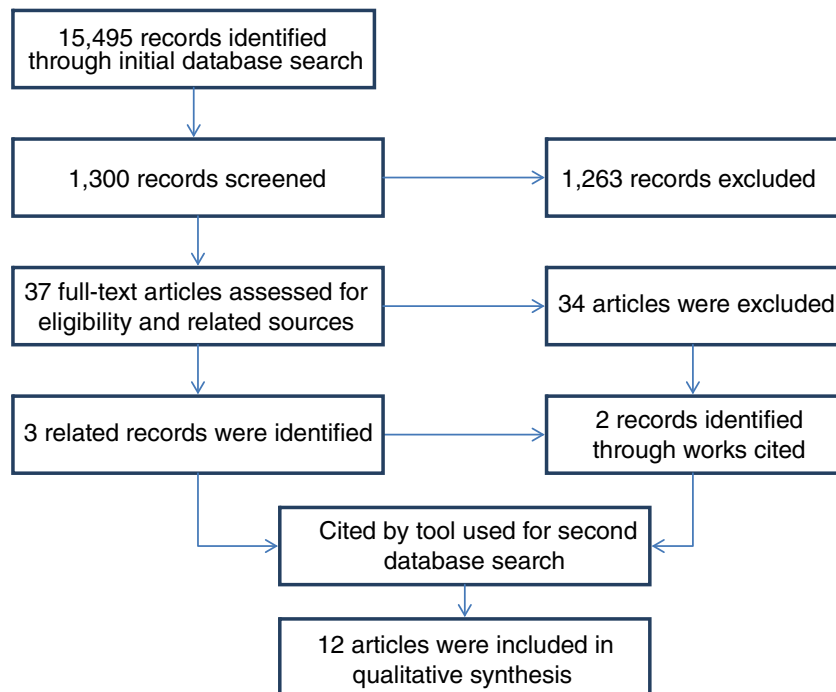


Fig. 1. Database search and article review for postpartum use among adolescent mothers.

country of origin not provided), 18% foreign-born Black, and 19% Hispanics, 8% white, 7% other races). The mean age of the sample was 17.7 years (± 1.33), with 18% of participants less than 16 years old. Using survey questions for tobacco, alcohol, and drug use, Amaro et al.

found that 84.2% reported any lifetime alcohol use, 62.1% reported marijuana use, 23.3% reported cocaine use, and 12.3% reported use of other drugs. These estimates indicate higher prevalences of alcohol and illicit drug use when compared with prevalences of any lifetime use of

Table 1
Cross-sectional studies of postpartum substance use among adolescents.

| Authors | Substances | N (age in year) | Time frame | Prevalence of use | Key findings |
|--|---|------------------|--|--|---|
| Amaro, Zuckerman, and Cabral (1989) | Alcohol, illicit drugs, tobacco, cocaine, marijuana | 253 (aged 13–19) | <i>Lifetime use</i> <i>Prenatal use</i> <i>12 months postpartum</i> | Alcohol – 84.2%, marijuana – 62.1%, cocaine – 23.3%, other drugs – 12.3% Alcohol – 52.2%, marijuana – 31.6%, cocaine – 13.8%, other drugs – 1.6% Alcohol – 65.2%, marijuana – 40.7%, cocaine – 17.4%, opiates – 0.8%, 4.3% – other drugs | Rates of prenatal substance use were high compared to the general population, decreased during pregnancy, and increased postpartum. |
| Gilchrist, Hussey, Gillmore, Lohr, and Morrison (1996) | Alcohol, cigarettes, cocaine, heroin, marijuana | 229 (aged < 18) | <i>Lifetime use</i> <i>Prenatal</i> <i>Postpartum</i> | Any drug – 62% Any drug – 16% Cigarettes – ~50%, alcohol – ~40%, marijuana – ~20% | Substance use significantly increased in 1 to 6 months postpartum. |
| Barnet, Duggan, Wilson, and Joffe (1995) | Alcohol, cigarettes | 105 (aged 12–18) | <i>Prenatal</i> <i>Postpartum</i> | Alcohol – 4%, cigarettes – 11% Alcohol – 31%, cigarettes – 27%, other drugs – 22% (marijuana – 17%, opiates – 7%, cocaine – 4%) | Substance use was higher postpartum & girls underreported their own use. |
| Spears, Stein, and Koniak-Griffin (2010) | Alcohol, cigarettes, marijuana | 305 (aged 13–18) | <i>Prenatal</i> <i>Postpartum</i> <i>3 months</i> <i>6 months</i> <i>12 months</i> | Alcohol – 2%, cigarettes – 4%, marijuana – 2.6% <i>Mean (standard deviation):</i> Cigarettes – 1.22 (0.91), Alcohol – 1.10 (0.42), marijuana – 1.08 (0.43) Cigarettes – 1.44 (1.26), alcohol – 1.35 (0.76), marijuana – 1.26 (0.81) Cigarettes – 1.52 (1.35), alcohol – 1.42 (0.78), marijuana – 1.28 (0.83) | Substance use increased postpartum, & resumption was predicted by variables that indicated a high level of vulnerability (e.g., history of abuse). |
| Morrison, Spencer, and Gillmore (1998) | Alcohol, cigarettes, marijuana | 241 (aged 12–17) | <i>Prenatal</i> <i>Postpartum</i> <i>6 months</i> <i>12 months</i> | <i>Mean (standard deviation):</i> Cigarettes – 1.59 (1.08), alcohol – 1.10 (0.41), marijuana – 1.10 (0.53) Cigarettes – 2.15 (1.50), alcohol – 1.58 (0.88), marijuana – 1.49 (1.05) Cigarettes – 2.34 (1.55), alcohol – 1.70 (0.94), marijuana – 1.56 (1.14) | Substance abuse increased postpartum & girl's attitudes & beliefs about substance abuse changed to become more positive towards substances along a similar pattern. |

Table 2

Prevalences of substance use among female adolescents aged 12 to 17 years in the United States (N = 22,246).

| | Alcohol | Illicit drugs ^a | Cigarettes | Marijuana | Opioid pain relievers ^b | Inhalants | Hallucinogens | Cocaine |
|-------------------|---------|----------------------------|------------|-----------|------------------------------------|-----------|---------------|---------|
| <i>Lifetime</i> | 35.7% | 25.3% | 19.9% | 15.8% | 10.0% | 8.6% | 4.1% | 1.5% |
| <i>Past year</i> | 29.4% | 19.4% | 13.9% | 13.0% | 7.0% | 4.2% | 3.1% | 1.0% |
| <i>Past month</i> | 13.5% | 9.8% | 8.1% | 6.4% | 3.0% | 1.2% | 0.8% | 0.2% |

Source: The 2010 National Survey on Drug Use and Health (SAMHSA, 2011).

^a Use of any illicit drugs included marijuana/hashish, inhalants, cocaine (including crack), heroin, hallucinogens, or prescription-type psychotherapeutics (stimulants, sedatives, tranquilizers, opioid pain relievers) used nonmedically.^b Nonmedical use.

alcohol (35.5%), marijuana (15.8%), and cocaine (1.5%) among girls aged 12–17 in the general population (Table 2). It is important to note that adolescent mothers in this sample differed from the general population of adolescent girls in that they were predominantly poor and resided in urban areas, which, as a group, tend to differ from girls of the same ages in the general population (Mathews et al., 2010). Adolescent mothers' low socioeconomic status and prevalent rates of drug use highlight a need for research to inform intervention.

3.1.2. During pregnancy

While some girls continued to use substances during pregnancy, prevalences of use during the prenatal period showed a decline. Among the 253 mothers discussed above, 52.2% reported alcohol use at least once during the prenatal period, 31.6% reported marijuana use, 13.8% reported cocaine use, and 1.6% reported use of another drug (Amaro et al., 1989). Concerned that shared risk correlates (e.g., depression) of adolescent pregnancy and substance use would impair girl's ability to parent, Gilchrist et al. (1996) surveyed 229 predominantly poor (35% of the girl's parents received welfare), white (52%), or Black (32%) adolescents recruited in the urban Northwest to assess their substance use. Of the sample, 5% were first interviewed in their first trimester, 43% in their second, and 52% in their third. The majority of girls were aged 16 (31%) or 17 (44%); a smaller proportion were young girls aged 15 (18%) or younger than 15 (7%). In the sample, 16% of girls used at least one substance during pregnancy (cigarettes, alcohol, marijuana, cocaine, or heroin), a decrease from the 62% who used substances pre-pregnancy. Use was not reported by trimester.

Not all studies included pre-pregnancy substance use rates, but among those that did, rates decreased during pregnancy. Barnet et al. (1995) studied 105 predominantly Black (93%) mothers aged 12–18 years (mean age 16.3 ± 1.3 years) recruited from an adolescent pregnancy program at an inner-city teaching hospital; they found that only 4% of girls reported alcohol use while pregnant and 11% reported cigarette smoking. Finally, Spears et al. (2010) found that substance use among pregnant adolescents and young women decreased during pregnancy and increased postpartum. Spears et al. (2010) examined smoking, alcohol, and marijuana use among 305 Hispanic ($n = 168$) and Black ($n = 60$) girls aged 13–18 (mean age 16.51 ± 1.07 years) for 12 months postpartum, recruited from a Los Angeles HIV prevention program, and found that 4% of girls smoked cigarettes, 2% drank alcohol, and 2.6% used marijuana during pregnancy. It is worth noting that, although substance use declined in the prenatal period, a small percentage of girls continued to use substances, making substance use a risk to them and their fetuses.

3.1.3. Birth to 18 months

Although substance use declined during pregnancy, significant increases in use occurred within the first 18 months postpartum in all of the studies reviewed here. The following section reports on postpartum use for studies discussed so far. Adolescent mothers in the study by Amaro et al. (1989) showed prevalent rates of substance use within 12 months of birth: alcohol use, 65.2%; marijuana use, 40.7%; cocaine

use, 17.4%; opiate use, 0.8%; and other drug use, 4.3%. In the subsample of alcohol users, 15% drank ≥ 3 drinks a week; 40.2% of marijuana users smoked ≥ 3 joints per week; and 16.7% of cocaine users used 1–6 times per month, indicating a cause of concern. Past-year substance users were more likely to be Black than white or Hispanic, aged 16 or older (relative to younger adolescents), or married (relative to non-married).

Gilchrist et al. (1996) surveyed the 229 girls in their sample at 1, 6, and 18 months postpartum. Use of cigarettes, alcohol, marijuana, and illicit drugs significantly increased at 1 and 6 months postpartum. Although exact prevalences were not provided, article figures indicate that cigarettes (~50%) were the substance used most often followed by alcohol (~40%) and marijuana (~20%). Poly-drug use also increased after birth. Overall, the greatest increase in use for alcohol, cigarettes, and illicit substances occurred in the first 6 months postpartum.

Of the 105 girls studied by Barnet et al. (1995), 31% used alcohol after birth (4% prenatally), and 24% of alcohol users reported weekly alcohol use. Cigarette smoking also increased postpartum (27% vs. 11%). In addition, 22% of adolescent mothers' urine samples were positive for one of eight drug classes (amphetamines, barbiturates, benzodiazepines, cocaine, cannabinoids, methadone, opiates, and phencyclidine) at two or four months postpartum. The most common drugs detected were marijuana (17%), opiates (7%), and cocaine (4%). Only 58% of those who screened positive also self-reported use, indicating under-reporting. Any postpartum substance use (i.e., alcohol, cigarettes, and illicit drugs) positively associated with age, with any substance users on average 7.2 months older than non-users. At four months postpartum, alcohol use was positively associated with depression (46% of alcohol users vs. 24% of nonusers scored as depressed, $p = 0.02$), alcohol and illicit drug use was positively associated with stress (62% of alcohol or illicit drug users vs. 43% nonusers, $p = 0.04$), and any substance use was marginally positively associated with a need for social support (62% of any substance users vs. 44% of nonusers, $p = 0.07$). Because high stress and a need for social support was positively associated with depression, logistic regression was used to examine the influence of depression on substance use, and it was found that the odds of any substance use at four months postpartum were 3.3 times higher for those who were depressed compared with the non-depressed group ($p = 0.02$). This increased to 6.7 times greater among girls who also smoked cigarettes ($p < 0.001$).

Among the 305 girls studied by Spears et al. (2010), preliminary analyses showed the same patterns as earlier research with the use of cigarettes, alcohol, and marijuana increasing overtime at 3, 6, and 12 months postpartum. Latent growth analyses showed that resumption of cigarette smoking postpartum was predicted by previous smoking, less religiosity, and amount of time since childbirth. Variables predicting alcohol resumption were: prior alcohol use, a history of physical or sexual abuse, having a drug-using boyfriend, a high level of acculturation, less religiosity, and lower self-worth. Predictors of marijuana resumption included: physical or sexual abuse history, having a substance using boyfriend, prior marijuana use, and being Black.

Further, Morrison et al. (1998) surveyed 241 white (52%) and Black (29%) adolescents (aged 12–17 years, mean age 16 years) during pregnancy and at 6 and 12 months postpartum to replicate results by Gilchrist et al. (1996). In addition to finding the same trends, girls'

beliefs about the potential outcomes of their drug use varied based on whether they were pregnant or postpartum, as did their readiness to change as assessed using the theory of reasoned action. As time progressed from delivery, girls reported greater intention to use substances and a belief that referent adults (e.g., parents and physicians) were less opposed to their substance use. Girls in the sample also were asked about the likelihood of various standardized positive and negative outcomes occurring for different types of substance use (e.g., smoking resulting in relaxing and reducing stress or resulting in making their baby sick). In the postpartum period, girls reported (perceived) potential outcomes of substance use as less negative and positive outcomes as more likely to occur compared to negative ones. Changes in girl's perception of outcomes from negative to positive followed the same trend as substance use, with positive perception of outcomes increasing the most heavily in the first six months postpartum.

3.1.4. Summary

Taken together, cross-sectional studies examined the prevalences of use of cigarettes, alcohol, and illicit drugs (mainly marijuana, cocaine, and heroin) in small, community samples that were predominantly white or Black, with only one study focusing on Hispanics. Young Hispanics are among the fastest growing populations in the US (Johnson & Lichter, 2008). Hispanics also have higher rates of teen pregnancy compared to whites (Mathews et al., 2010), and many face poverty and difficulties with educational attainment (Johnson & Lichter, 2008). Therefore, research on adolescent postpartum substance use needs to include Hispanics to evaluate their intervention needs.

Compared with the general population of adolescent girls, substance use is more prevalent among adolescent mothers, especially older girls and, based on Amaro et al. (1989) and Spears et al. (2010), possibly Blacks. In addition, substance use disproportionately affects girls with a prior history of substance use, a history of physical or sexual abuse, a drug-using boyfriend, lower self worth, and depression indicating that comprehensive psychosocial assessments are needed to inform integrated substance use and mental health services for this population. Although alcohol and drug use decreased prenatally, prenatal substance use was similar to and sometimes higher than use by adult pregnant women (varied by the year of data collection and the sample) and is a concern for the unborn. For example, among 8706 predominantly white (81%), college educated (70%), married (73.1%), employed (67.5%), breastfeeding (58.4%), multiparous (54.1%), and adult (>18 years) women recruited in Wisconsin from July 2002 to April 2005, 5.1% reported any alcohol use during pregnancy (Jagodzinski & Fleming, 2007). In a national sample of 94,483 predominantly white (63.8%) adult women recruited from 2002 to 2006, 10.5% reported any alcohol use in pregnancy, 16.8% reported cigarette use, and 2.8% reported any marijuana or hashish use (Muhuri & Gfroerer, 2009).

Substance use significantly increased once babies were born, especially in the first six months, pointing to the need to incorporate substance use prevention and educational efforts into prenatal care. Morrison et al. (1998) found negative beliefs about substance use decreased postpartum along the same trajectory as increasing use. Educational intervention aiming to improve the knowledge about adverse effects of parental substance use, including its biological effects (e.g., cigarette smoke, substances in breast milk) and negative impacts on parenting (e.g., difficulty reading infant cues), is one area to consider and research.

Overall, existing studies showed that alcohol and marijuana were the most commonly used substances, but rankings varied by study. Variation may relate to geographic or demographic differences in study samples, something that also requires investigation. Additionally, the age of these studies and changing patterns of substance use over the past few years require new research with more recent data to evaluate whether use patterns have similarly varied among adolescent mothers. Specifically, following marijuana use, prescription opioids are now the illicit drug used most often by youth in the US (Wu, Woody, Yang, Pan, & Blazer,

2011). Wu, Pilowsky, and Patkar (2008) found that in a national sample of American adolescents aged 12–17, one in ten reported non-prescribed opioid use. Use was higher among girls compared to boys, and a low family income and foster care placement were positively associated with use among girls, suggesting similar vulnerabilities to those found among adolescent mothers. Recent data from a nationwide sample of infants also showed that withdrawal from prenatal opioid use rose significantly from 2000 to 2009 (Patrick et al., 2012). Infants prenatally exposed to opioids, particularly in the first trimester, face a risk for birth defects, such as heart and stomach abnormalities (Broussard et al., 2011). New research should also investigate methamphetamine use, as rates of treatment admission for this drug are higher among pregnant women than non-pregnant women or men (Terplan, Smith, Kozloski, & Pollack, 2009). Methamphetamine use is more common among adolescent girls compared to boys, and its use is associated with risky sexual behavior and pregnancy (Lindsay, Albrecht, & Terplan, 2011).

3.2. Longitudinal studies

Studies after the 1990s predominantly used longitudinal data to examine substance use (Table 3). In part, this was because researchers continued to study samples established in earlier cross-sectional studies (Gillmore et al., 2006; Oxford et al., 2003). Researchers also explored whether substance use patterns established in adolescence continued into early adulthood and beyond.

Cornelius et al. (2004) investigated cigarette use among 344 adolescent mothers before, during, and six years after pregnancy to identify characteristics of adolescent women who smoked cigarettes during pregnancy and into early adulthood. Authors were concerned that these young women may not show the declines in substance use observed in similar but nulliparous samples as they aged. Recruitment occurred at a prenatal program at the University of Pittsburgh teaching hospital to examine girl's psychiatric symptomatology, medical and reproductive history, and smoking habits. At baseline (12–18 years, mean age 16.2 years), most (70%) of the sample was Black and first-time mothers (77%). Three girls were married. At follow-up, 61 (18%) were married and 84% had at least one subsequent pregnancy. When measured at baseline, 46.8% smoked in the first trimester, which rose to 58.3% by the third trimester and 60% at six-year follow-up.

Four distinct groups were identified, with the majority smoking at six-year follow-up: most women (40.1%) smoked cigarettes during their initial pregnancy and at six-year follow-up (*persistent cigarette smokers*), followed by those who never smoked (*nonsmokers*) (33.3%), did not smoke during their pregnancy but did at follow-up (19.9%) (*late-onset smokers*), and women who smoked at initial pregnancy but not at follow-up (6.7%) (*quitters*). Of note, 63% of persistent smokers doubled the daily amount of cigarettes they consumed (8.2 to 16.7, $p < 0.001$) from their teen to adult years. Discriminate function analysis indicated that whites and girls whose friends smoked in the teen years were likely to start to smoke earlier and be persistent smokers. Quitters were more likely to have mothers with increased education over late-onset or persistent smokers, and white race and lower personal education discriminated persistent smokers and quitters from late-onset smokers, suggesting that greater education may be protective against continued smoking and later initiation. Lower gravidity also discriminated persistent smokers from quitters.

Oxford et al. (2003) followed 215 women from the sample in the study by Gilchrist et al. (1996) and assessed their alcohol use at 13 time points over 10.5 years, including the quantity of alcohol typically consumed at each drinking occasion (*no alcohol in the past 6 months*, *<1 drink per occasion*, *1 drink per occasion*, *2 drinks per occasion*, and ≥ 3 *drinks per occasion*) and the frequency (*no alcohol use in the past 6 months*, *drinking 1 time a month*, *drinking 2–3 times a month*, *drinking 1 time a week*, *drinking several times a week*, and *drinking daily*). Quantity of alcohol used identified two groups characterized by high (54% of the sample) and low (46% of the sample) quantity users. Frequency of consumption identified

Table 3
Longitudinal studies of postpartum substance use among adolescents.

| Authors | Substances | N (age in year) | Time frame | Prevalence of use | Key findings |
|--|---|--|---|--|--|
| Cornelius, Leech, and Goldschmidt (2004) | Cigarettes | 344 (aged 12–18) | First trimester Third trimester 6 years | Cigarettes – 46.8% Cigarettes – 58.3% Cigarettes – 60% | Most girls who began smoking in their teen years (40.1%) continued to smoke at follow-up. |
| Oxford et al. (2003) | Alcohol | 215 (from Gilchrist et al., 1996 sample) | 13 time points to 10.5 years postpartum | Frequency 54% high users 46% low users Duration 11% late decliners 16% increasers 30% early decliners 43% low users | Early initiators drank more & drank more often as they aged. Those who drank in adulthood experienced more negative outcomes (e.g., involvement in crime). |
| Golder, Gillmore, Spieker, and Morrison (2005) | Alcohol, drugs (marijuana, crack or cocaine, amphetamines, barbiturates, tranquilizers, hallucinogens, inhalants, and heroin or other opiates) | 232 (aged 13–18) | 5.5 & 6 years postpartum | On a scale where 0 = no drinking and 7 = more than once per day in the past six months, the mean for frequency of drinking was 1.87 (SD = 1.75); 36% of women reported use of illicit drugs on at least one occasion in the past six months. | Women with greater attachment insecurity were more likely to engage in risky behaviors & these were mediated by low-self esteem & psychological distress. |
| Oxford et al. (2005) | Alcohol, cigarettes, drugs (marijuana, heroin, cocaine/crack, amphetamines, barbiturates, tranquilizers, psychedelics, and other narcotics) | 227 (aged 12–17) | 6 months & 6 years postpartum | Not reported | Divided into three groups, problem-prone, psychologically vulnerable, and normative, problem-prone women were more likely to engage in risky behaviors including substance use. |
| Gillmore, Gilchrist, Lee, and Oxford (2006) | Alcohol, cigarettes, marijuana, cocaine, hard drugs (crack/cocaine, psychedelics, inhalants, heroin, opium, amphetamines, barbiturates, or tranquilizers) | 233 (from Gilchrist et al., 1996 sample) | 9 time points to 11.5 years postpartum | 50% drank alcohol ~50% smoked cigarettes ~20% used drugs (not marijuana) 5% used marijuana | Rates of use were stable as girls transitioned from adolescence to adulthood & were much higher than rates in a comparison group sampled from adolescents attending school. |
| De Genna, Cornelius, and Cook (2007) | = Marijuana | 279 (aged 12–18) | 12 years postpartum | Not reported | Both marijuana use & early initiation positively associated with STI infection. External problems & marijuana use predicted greater number of sexual partners. |
| De Genna et al. (2009) | Alcohol, cigarettes, cocaine, marijuana, and other drugs | 292 (aged 12–18) | Prepregnancy Ten years postpartum | Black: tobacco – 43%, alcohol – 69%, marijuana – 40% White: tobacco – 76%, alcohol – 77%, marijuana – 45% Black: tobacco – 55%, binge drinking – 50%, marijuana – 28% White: tobacco – 70%, binge drinking – 45%, marijuana – 13% | Women in the sample had higher rates of tobacco use, binge drinking & marijuana use compared with a similar sample of women from the same state who were not adolescent mothers. |

four groups: those whose use trajectory decreased and then flattened (*early decliners*, 30%), those whose use trajectory increased slightly before periodically stabilizing and then going down (*late decliners*, 11%), those whose use trajectory increased (*increasers*, 16%), and those who maintained a flat use trajectory (*low users*, 43%). Younger age initiators drank more and drank more often and experienced multiple negative outcomes as adults (i.e., no high school diploma or GED, lacking financial independence, criminal behavior, and illegal drug use), as did late decliners and increasers. Girls who had children at younger ages were more likely to be low users than those whose babies were born in later adolescence.

Gillmore et al. (2006) examined the data from 233 adolescent mothers, also recruited as part of the Gilchrist et al. (1996) study, from the birth of their child to 11.5 years postpartum and found stable rates of substance use as girls transitioned from adolescence to adulthood and into early adulthood. Of the sample, about 50% drank alcohol at each of 9 time points, slightly less than 50% reported smoking cigarettes, around 20% reported use of other drugs (most often marijuana), and 5% used drugs other than marijuana. Polydrug use was also stable with about 15% using two substances (usually alcohol and cigarettes), and 5% using three substances or more. The authors compared results to those from the Monitoring the Future Survey (MTF) and found a lower prevalence of alcohol use but a higher prevalence of cigarette

and drug use among adolescent mothers compared to MTF responders. Of note, cigarette use was almost twice as high, marijuana use was more than twice as high, and cocaine use was almost four times higher when compared to prevalences in the MTF. Latent class analysis found three subgroups of adolescent mothers (alcohol/cigarette users, 75%; primary marijuana users, 15%; and hard drug users, 10%). Adolescent mother's drug use remained relatively stable as they transitioned to adulthood.

Concerned about persistent substance use among adolescent mothers, De Genna et al. (2009) surveyed 292 predominantly Black (71%) adolescents recruited as part of the Cornelius et al. (2004) study during pregnancy and at six and ten years postpartum and assessed age of initiation and levels of use for cigarettes, alcohol, marijuana, cocaine and other drugs. Recruitment occurred at a teaching hospital prenatal program. At enrollment, average monthly family income was \$1773 (SD = 1489), and for 77% it was their first pregnancy. At ten years postpartum, income remained unchanged, 94% completed high school or the equivalent, and 75% experienced at least three additional pregnancies. At ten year follow-up, women in the sample had higher prevalences of tobacco use, binge drinking and marijuana use compared with a similar sample of women from the same state who were not adolescent mothers. Fifty-five percent of Black mothers and 70% of white mothers reported cigarette use a decade after their teenage pregnancy,

compared with 30% of 18–29 year olds across the state, and 22% of all female adults. Half of Black mothers and 45% of white mothers reported binge drinking in young adulthood, compared with a rate of 37% for all 18–29 year olds in the state, 11% in all female adults in the state, and 17% and 18% for all white and Black adults in the state, respectively. Regarding drug use, less than 5% of females across the state used illicit drugs in the past 30 days, compared with 28% of Black and 13% of white women in the cohort. The majority of teenage mothers (64%) were tobacco users, with only 13% quitting smoking at ten-year follow-up, and a higher proportion (23%) of new-onset smokers during the follow-up period. White race, early cigarette use, peer cigarette use, low family income, and marijuana use increased the likelihood of being a persistent smoker. White race, depression, early marijuana use, and cigarette use increased the likelihood of being a persistent marijuana user.

Discrepancies in findings between Oxford et al. (2003) and De Genna et al. (2009) regarding rates and predictors of problematic drinking ten years after birth suggest race as an important predictor of substances used. The majority of Oxford's sample was white (52%). The majority of De Genna's sample was Black (71%). Studies reported here indicate that, at follow-up, white mothers were more likely to smoke cigarettes and use marijuana (Cornelius et al., 2004; De Genna et al., 2009), while Black mothers were more likely to binge drink or use illicit drugs other than marijuana (De Genna et al., 2009). Knowledge of racial differences in substances used could assist in targeting intervention and research efforts. Adolescent mothers are more likely to engage in substance use than their nulliparous peers or peers who have children later; hence, further investigation with larger, diverse samples is needed.

3.2.1. Substance use and co-existing health related problems

Longitudinal studies also explored co-occurrences of substance use and other health concerns. Golder et al. (2005) determined whether women who became mothers in adolescence had problems forming attachments as adults among 232 women (white, 49%; Black, 28%; Hispanic, 5%; others, 18%) originally pregnant before the age of 18 (mean age 16.6 years) at 5.5 and 6 years postpartum and recruited from an urban area of the Northwest. Women were asked to rate their alcohol use in the past six months on a scale from 0 (no drinking) to 7 (>once per day) and lifetime illicit drug use (marijuana, crack/cocaine, amphetamines, barbiturates, tranquilizers, hallucinogens, inhalants, and heroin/opiates). The mean for frequency of drinking was 1.87 (SD = 1.75) and 36% of women reported drug use. Attachment related avoidance (i.e., difficulty relying on or opening up to others) was positively associated with psychological distress, low self-esteem, drinking frequency, drug use, criminal behavior, and risky sex. Increased psychological distress and low self-esteem mediated drinking frequency, and low self-esteem mediated drug use. This indicates that women with poor attachment are more likely to engage in risky behaviors, such as substance use, and that psychological distress and low self-esteem influences the effect of attachment on substance use.

De Genna et al. (2007) examined whether marijuana use predicted infection with a sexually transmitted disease (STI) among 279 women who were teenage mothers (12–18 years, mean age 16.32 years) at 6 years postpartum, recruited from a Pittsburgh hospital prenatal clinic. Although rates of marijuana use were not reported, the authors found that 60% of girls who initiated marijuana before age 15 reported at least one STI infection. In addition, as women smoked more marijuana the number of reported STIs increased; externalizing problems also increased odds of STI infection. Structural equation modeling provided evidence that early marijuana use was a primary predictor for sexual risk (STIs), which was mediated at least partly by a greater number of sex partners. These findings are consistent with the problem behavior theory, showing the clustering of early substance use, externalizing behavioral problems, risky sexual behaviors, and health consequences (De Genna et al., 2007; Jessor, Donovan, & Costa, 1991).

Oxford et al. (2005) characterized heterogeneous groups of adolescent mothers among 240 girls aged 12–17 (mean age 16.6 years) from an urban area in Northwest for 12 years postpartum (white, 53%; Black, 28%; Hispanic, 8%; others, 11%). Oxford et al. (2005) identified three groups of girls: problem prone (15%), psychologically vulnerable (42%), and normative (43%). Compared to the other two groups, the problem-prone group was more likely to use alcohol or drugs, to engage in criminal activities, to report periods of depression or anxiety, to experience greater partner violence, or to engage in risky sexual behaviors. They also showed worse outcomes, such as less post high school education, less financial stability, and more jail time. The psychologically vulnerable group was characterized by higher rates of substance use than the normative group. Overall, results indicate two groups of adolescent mothers characterized by prevalent substance use and unique intervention needs that warrant interventions to reduce coexisting mental health and externalizing problems.

3.2.2. Summary

Overall, longitudinal data show that substance use remained prevalent and relatively stable as girls transitioned to adulthood, with use prevalence rates much higher than the general population. This is cause for concern, as adolescent mothers are a high-risk group (e.g., less education, low family income) when compared to adolescents in the national sample. Why these girls continue to use substances at such high rates is unclear. Psychological distress and low self-esteem appear to influence continued use (Golder et al., 2005). Additional barriers to cessation include low education, affiliating with substance-using peers, and limited social support. As the Affordable Care Act (ACA) supports preventive services for substance use and disorders (screening for substance use, brief interventions, and referrals) and expands treatment coverage for behavioral health conditions (Buck, 2011; Tai, Wu, & Clark, 2012), further research on clarifying risk factors for substance use, elucidating reasons for continued use, and developing effective preventive measures is timely.

The developments of intervention efforts can be hampered by limited knowledge about this population, as findings from both longitudinal and cross-sectional studies rely mainly on small samples and consider primarily cigarettes, alcohol, marijuana, and cocaine use among white or Black participants. Some adolescent mothers are more prone to difficult life trajectories than are others. An improved classification of adolescent mothers that links distinct psychological (e.g., depression, poor attachment, low self esteem, history of abuse or neglect) and behavioral (e.g., delinquency) profiles with poor outcomes (e.g., chronic substance use, STIs) will facilitate targeting prevention efforts. The findings that early substance initiation was a better predictor of poor outcomes than current substance use status and that substance use prior to pregnancy, anxiety/depression, hostility, peer substance use, and low family income was a correlate of later use support theoretical grounding in developmental psychopathology and future work on childhood risk environments.

Current research does not address whether substance using adolescent mothers use substances in later pregnancies, but a majority of women in one sample reported later children (Cornelius et al., 2004; De Genna et al., 2009). Longitudinal data are needed to determine whether adolescent mothers who engage in postnatal substance use continue use in subsequent pregnancies and identify means to intervene. In this regard, multiple reviews address research on women specific treatment (Ashley, Marsden, & Brady, 2003; Grella, 2008; Sun, 2006). For example, Grella (2008) offers a comprehensive review that spans from treatment policy to the organizational characteristics, services, and outcomes of women specific programs. Grella (2008) reports that mothers fare better in women-only programs that allow them to maintain residence with their children. Unfortunately, treatment for postpartum women is often unavailable, not gender specific, or comprehensive (Academy of Breastfeeding Medicine Protocol Committee, 2009), and there is a recognized need for residential facilities that provide childcare (Grella, 2008).

In the 1990s, researchers began to integrate infant and early-childhood parent training into programs for recent mothers (Grella, 2008; Suchman,

Decoste, McMahon, Rounsaville, & Mayes, 2011). Most focus on teaching women strategies to address behavioral issues (e.g., tantrums) without considering the underlying quality of the parent/child relationship, and only a handful have reported evaluation findings (Suchman et al., 2011). Many women are vulnerable to substance misuse due to poor caregiver relationships in their own childhoods (Suchman et al., 2011). From the findings reported here, it seems that this is also likely true for adolescent mothers. In the past few years, researchers began to address mother's attachment issues and capacity to recognize and respond to children's emotional cues as a way to improve parenting and decrease substance misuse (Pajulo et al., 2012; Suchman et al., 2011).

Pajulo et al. (2012) reported on a residential treatment program for severe substance-abusing pregnant and parenting adult women in Finland. The program focused on supporting abstinence and the mother–baby relationship, and it included caseworkers to assist women in developing their response capacity to infant cues and parenting skills. While the evaluation was limited by a small sample ($n = 34$), women in the program showed improved parenting skills. Suchman et al. (2011) reported on a 12-week, outpatient treatment program that used 1 h, weekly sessions to similarly assist mothers in developing their response capacity and parenting skills in New Haven, CT. At the end of sessions and 6-week follow-up, the 23 mothers who participated in the intervention had improved parenting skills over 24 mothers in a parenting education only group. Such an intervention model could be researched further in adolescent mothers and would benefit from case/control comparisons of larger samples with a focus on specific intervention elements developmentally appropriate for adolescents. Because women who enter substance abuse treatment often do so out of a desire to keep their children (Powis, Gossop, Bury, Payne, & Griffiths, 2000), such a program may help adolescents who have difficulty forming emotional attachments and are not prepared for motherhood due to their age.

Finally, longitudinal data indicate adolescent mothers are an extremely vulnerable group. As they transition to adulthood, many remain low income and continue to use substances. In addition, a large percentage appear to have multiple, later pregnancies. If identified, differences within this group could help to develop focused intervention efforts for better outcomes.

4. Discussion

Adolescent mothers report greater substance use before pregnancy compared to other adolescent females. While many stop using substances during pregnancy, an important proportion continue to use. Once babies are born, many girls self-report that they begin to use substances again, often within the first six months. In addition, multiple authors (e.g., Amaro et al., 1989, Barnet et al., 1995, Gilchrist et al., 1996, and Morrison et al., 1998) used assay measures to correct or confirm self-reported survey data. Although exact prevalence rates vary, which likely relates to demographic differences in samples, the same pattern of increased rates of substance use after girls give birth is evident. As girls transition to adulthood, their substance use remains prevalent and relatively stable compared to girls in the general population, answering the earlier question of Flanagan and Kokotailo (1999) of whether pregnancy might be protective against later substance use by these girls and supporting a need for research to identify effective means for intervention.

Little is known about substance use among non-Black minority adolescent mothers. Extant studies examine small samples of predominantly white or Black participants. There is a need for research using data from larger, diverse samples, particularly data with a representative sample of Hispanics who have higher rates of teen pregnancy than whites, and face issues of poverty and low educational attainment (Johnson & Lichter, 2008; Mathews et al., 2010). There was variation in whether alcohol or cigarettes were the most common substance used (Amaro et al., 1989; Barnet et al., 1995; Gilchrist et al., 1996), which may relate to racial or

geographic differences in samples (Table 1). The NSDUH data show that, among substance-using pregnant women, Blacks were more likely to use illicit drugs than whites or Hispanics, whites were more likely than Blacks to smoke cigarettes, and both whites and Blacks were more likely than Hispanics to use alcohol (SAMHSA, 2012). Studies of larger samples would allow analyses of racial/ethnic and geographic differences in substance use patterns and help inform prevention and intervention efforts.

The substances examined also limited findings of extant studies. Although studies of more commonly used substances (i.e., cigarettes, alcohol, marijuana, and cocaine) are needed, shifting patterns of drug use over the past decade indicate a need to investigate misuse of other drugs, especially prescription opioid pain relievers, among adolescent mothers (Patrick et al., 2012). Opioid misuse is epidemic and the nation's fastest growing drug problem (e.g., overdose mortalities) (Centers for Disease Control and Prevention, 2012; White House, 2011). Adolescent females aged 12–17 who are from low-income families or who used alcohol or drugs have elevated odds of using nonmedical opioids (Wu, Pilowsky, & Patkar, 2008). Female adolescent nonmedical opioid users are also significantly more likely than their male counterparts to have experienced an opioid use disorder in the past year (Wu, Ringwalt, Mannelli, & Patkar, 2008).

Reasons for increased substance use among members of this vulnerable population are not clear from extant research. However, longitudinal data suggest that early substance use initiation (marijuana) and associated externalizing problems predict poor outcomes and that problem behavior theory is relevant to describe girl's vulnerability (De Genna et al., 2007). Problem behavior theory indicates that problem behaviors cluster because they may serve the same purposes socially, developmentally, and psychologically (e.g., peer acceptance) or that they are the manifestation of similar underlying factors (e.g., depression, poor academic performance) (DuRant, Smith, Kreiter, & Krowchuk, 1999; Jessor et al., 1991). Additional factors associated with substance use in this population include: anxiety/depression, adolescent aggression, hostility, other substance use (e.g., smoking cigarettes predicting marijuana use), age of substance use initiation, (De Genna et al., 2009), having a drug-using boyfriend, substance use prior to adolescent pregnancy (Spears et al., 2010), and peer substance use (Cornelius et al., 2004; De Genna et al., 2009). To inform prevention efforts, future research can determine the specificity of associations of such identified correlates with substance use initiation and with continued use during pregnancies.

On the other hand, some adolescent mothers' substance use may relate to self-medication as a way to cope with difficult life circumstances or to self-medicate for mental distress/illness or feelings associated with things, such as low self-esteem or problematic relationships (Henwood & Padgett, 2007; Khantzian, 1997). Barnet et al. (1995) found greater odds of substance use at four months postpartum among girls with depression. Oxford et al. (2005) identified a psychologically vulnerable group of adolescent mothers who experienced mental and physical health problems and had increased substance use. Golder et al. (2005) found that substance use was predicted by low self-esteem and psychological distress. While causality cannot be established from existing data, variables associated with substance use among adolescent mothers that may be consistent with a self-medication hypothesis are: adolescent anxiety/depression (Barnet et al., 1995; De Genna et al., 2009), a history of physical or sexual abuse, a high level of acculturation, and low self-worth, (Spears et al., 2010). Further research on understanding how self-medication influences initial and/or continued substance use may generate adolescent-specific psychological and mental health issues to inform designs of evidence-based intervention components.

Additional variables implicated in increased use among adolescent mothers were primarily contextual and include: being married (compared to unmarried) (Amaro et al., 1989), age at birth of first child (i.e., younger mothers were less likely to use substances) (Oxford et al., 2003), lower maternal education (Cornelius et al., 2004), increased

age (Amaro et al., 1989; Barnet et al., 1995), race/ethnicity (Amaro et al., 1989; De Genna et al., 2009; Spears et al., 2010), low family income (De Genna et al., 2009), and less religiosity (Spears et al., 2010). These variables also require further exploration as to why they might relate to substance use in this population.

5. Conclusions

Adolescent mothers are uniquely vulnerable and at risk for increased substance use compared with their nulliparous peers. Due to their young age, they are likely to have subsequent pregnancies that substance use could affect pervasively (Cornelius et al., 2004). Even removing the biological consequences of prenatal substance use, postpartum use remains a precursor of child abuse (US Department of Health and Human Services, 1999). The consistent finding that substance use rates rise once babies are born represents a failed intervention opportunity. Better knowledge of factors that increase problematic substance use risk and use patterns among adolescent mothers is the first step toward developing effective interventions to address this problem.

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