Review

Tobacco and alcohol use in the context of adolescent pregnancy and postpartum: a scoping review of the literature

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Abstract

Adolescent girls are more likely than women of other ages to smoke tobacco or drink alcohol during pregnancy. The health impacts of smoking and drinking for girls and the interconnections between alcohol and tobacco use with adolescent pregnancy underscore the urgent need for integrated approaches to prevent and reduce alcohol and tobacco use among pregnant girls/young women. This article reports on the results of a scoping review of the literature focused on adolescents’ use of tobacco and alcohol during pregnancy and postpartum. A search of CINAHL, Medline, Social Science Index and Web of Science identified 40 articles published in the two decades between 1990 and 2012 that met our inclusion criteria related to this age group, pregnancy/motherhood status, and use of both alcohol and tobacco. The review points to compelling gaps in our knowledge and our responsiveness to adolescents aged 19 and under who use alcohol and tobacco during pregnancy and the postpartum period. Research has been primarily descriptive, with separate, parallel streams of investigation to identify trends and predictors of alcohol and tobacco use, prior to, during and following pregnancy. There is a marked lack of effective interventions described in the literature that are designed to prevent or reduce alcohol and tobacco use during pregnancy among adolescent girls; and there are few examples of gender-informed prevention or treatment programmes for this population. Research is needed on interventions that attend to the context of adolescent girls’ substance use as well as their preferences and developmental needs for support that encourage sustained behaviour change throughout pregnancy and the postpartum period and that effectively address the influence of partners and friends.

Keywords: alcohol-related issues, behavioural/lifestyle interventions, scoping review, smoking cessation among young people, teenage pregnancy
Substance use among pregnant adolescents and young women, particularly heavy drinking and smoking, and their associated health/social consequences are recognised internationally as important health problems (CASA 2003, Schinke et al. 2008, Simons-Morton et al. 2009). Trends reflecting increases in rates of alcohol and tobacco use in this group, the health impacts of smoking and risky drinking (i.e. in excess of recommended guidelines) for young women and the interconnections between alcohol and tobacco use with adolescent pregnancy underscore the urgent need for effective and integrated approaches to prevent and reduce alcohol and tobacco use among pregnant adolescent girls. In this article, we report on a scoping review of the literature to summarise what is known in this subfield and to identify the limitations, gaps and trends on research with pregnant adolescents that target both alcohol and tobacco.

Background

There are troubling trends in adolescent and young women’s alcohol and tobacco use. For example, although youth smoking has declined over recent years, a higher proportion of young women aged 18–19 smoke (24.4%) compared with young men (22.2%) (Health Canada 2007). Girls are also starting to smoke at a younger age (Okoli et al. 2013). There are also vulnerable groups where life circumstances or group membership reflects inequities or subcultural norms that contribute to greater likelihood of smoking. In Canada, 46% of Aboriginal girls aged 13–18 years report smoking tobacco (van der Woerd et al. 2005) and similarly, in Australia, 50% of Aboriginal girls and young women (18–24 years) report smoking (Australian Bureau of Statistics 2006). Internationally, across many regions, the prevalence of cigarette smoking among girls and boys has become similar (Warren et al. 2008), although, in England, girls aged 11–15 years are more likely to be regular smokers than boys (HSCIC 2012a). Furthermore, tobacco use among youth is a significant marker of other substance use and negative health behaviours such as risky drinking (Adlaf et al. 2005, HSCIC 2012a).

A high proportion of adolescent girls and young women engage in risky drinking. In the 2004 Canadian Addiction Survey, over 85% of the alcohol consumption reported by females aged 15–24 years was in excess of recommended guidelines (Adlaf et al. 2005), and 17% of young women in England (16–24 years of age) reported heavy drinking in the previous week (HSCIC 2012b). In Australia, adolescent girls (10.6%) are more likely than boys (7%) to consume alcohol at levels considered potentially harmful (Australian Government Preventative Health Taskforce 2008). Young girls also report a higher prevalence of concomitant alcohol and tobacco use than young boys (Leatherdale & Ahmed 2010). Recent international research shows an increase in risky drinking, along with a narrowing of the traditional gender gap in alcohol use among adolescents in many regions of the world (Simons-Morton et al. 2009). These levels and trends in girls’ drinking become particularly problematic in the context of pregnancy.

Accumulating evidence suggests that adolescent girls are more likely than women of any other age to smoke, drink and use alcohol in excess during pregnancy (Francoeur 2001, CASA 2003, Kaiser & Hays 2005, Delpisheh et al. 2006, Bauld 2008, Lindsay et al. 2008). Prior use of alcohol and/or cigarettes is associated with increases in sexual risk taking (Hipwell et al. 2011) and as a consequence, unwanted, unplanned or unintended pregnancy due to unprotected and unplanned sex. Furthermore, adolescents tend to realise that they are pregnant later in term (Cornelius et al. 1994b) and therefore may consume alcohol while being unaware that they are pregnant. The established association between alcohol use and pregnancy can also lead to further pregnancies for an adolescent (UK Department of Health 2010).

The health risks of tobacco and alcohol use during pregnancy are well documented. Tobacco use is associated with pregnancy complications, low-birthweight infants, still birth and sudden infant death. Alcohol use increases the risk of having a child affected by foetal alcohol spectrum disorder and other birth defects and developmental disabilities.

As tobacco and alcohol use co-occur, there is an urgent need for integrated approaches to reduce alcohol and tobacco use among pregnant and postpartum youth. The purpose of this scoping review (Davis et al. 2009, Levac et al. 2010) was to assess the current state of this subfield of research to provide a narrative overview of the literature; identify and describe what is known about pregnant adolescents’ substance use and effective interventions; identify the gaps in this field; and identify and interpret the current issues related to research on interventions for this population.

Method

We conducted a scoping review of the literature. In the first step, we identified studies focused on adolescent pregnancy and substance use by searching CINAHL, Medline, Social Science Index and Web of...
Science with the terms ‘adolescent pregnancy’, ‘teen pregnancy’ and ‘tobacco’ and ‘alcohol’ and ‘substance use’ from January 1990 to December 2012. We included all articles published in English related to pregnant adolescents 19 years of age and younger in which the authors investigated the use of tobacco or alcohol use either in isolation, in combination or in the context of other types of substance use during pregnancy or the postpartum period. The focus was restricted to pregnant adolescents aged 19 and under because in many jurisdictions, age 19 marks the legal age for alcohol consumption and other activities defined as adult; and pregnant and parenting adolescents face specific challenges related to their education completion, financial limitations and maturation processes, both psychological and physiological.

In step 2, the team discussed and refined the inclusion criteria and strategy. We found that researchers in the area of adolescent pregnancy employ different age categories in their sampling methods; for example, some constrain samples from 15 to 18 years, while others use age 17, 18 or 19 years as an upper limit, and some expand age categories to include young women over 20 years. Further complicating this field is the fact that some researchers investigating adult pregnant women and substance use include adolescents in their studies. A decision was made to include investigations with expanded age categories where the mean age was 19 years or under. This resulted in three articles added to the review (Kokotailo et al. 1994, Scafidi & Field 1997, Deardorff et al. 2005). In addition, we excluded the larger literature discussing adolescent and youth substance use or interventions in general as well as review papers. We located a few additional articles by reading the references of retrieved articles and by co-authors, who were experts in this field, identifying articles.

In step 3, we charted the qualifying studies, by reading and extracting the following information: (i) the methodology used; (ii) the characteristics of the sample; (iii) the purpose/focus of the study; and (iv) findings related to characteristics and patterns of substance use; associated risk and protective factors; major features and elements of interventions; and any recommendations for effective interventions. In step 4, the team discussed the extraction chart and decided on a broad thematic outline by which to present the results.

In the tradition of scoping reviews (Davis et al. 2009, Levac et al. 2010), the team did not conduct a quality assessment of the included studies. We focused on identifying the current state of this subfield and summarising its breadth to identify research gaps and trends relevant to the development of future research and interventions.

Results

We identified 40 articles that met our search criteria (Table 1). All of these articles were empirical reports of quantitative studies with the exception of one qualitative study (Lawson 1994). Thirty-nine of these studies were conducted in the United States. The majority of these articles \( (n = 26) \) reported results from descriptive quantitative studies. Seven articles reported results from longitudinal studies to investigate trends in the substance use patterns or the outcomes of prenatal tobacco exposure on infants. The remainder of the studies employed experimental designs \( (n = 6) \).

Of these 40 studies, five studies investigated the factors associated with alcohol use during adolescent pregnancy. Fifteen studies focused on adolescent pregnancy, prevalence and factors associated with their tobacco use, or interventions for tobacco cessation. Twenty studies examined multiple substance use including tobacco and alcohol.

In summarising these studies, we focus on what is learnt about tobacco and alcohol use during pregnancy and postpartum by discussion under three themes.

Prevalence and patterns of substance use among pregnant adolescents

Examinations of the rates of tobacco use among pregnant adolescents have pointed to concerning patterns. For example, a comparison of tobacco use among adolescent girls in a rural area of the United Kingdom \( (n = 69) \) indicated that the smoking prevalence of pregnant adolescents was 61% compared to 21% among those who were not pregnant (Seamark & Gray 1998). In a prospective study, Cornelius et al. (1995) reported that adolescent girls actually increased their tobacco use from 50% to 60% across the first and third trimesters of pregnancy. The heavier smokers were significantly more likely to drink alcohol and engage in excessive drinking in the first trimester. A questionnaire-based survey with pregnant adolescents in Arkansas yielded different results (Teagle & Brindis 1998). These authors stated that about 20% of the girls surveyed continued to use alcohol during the first trimester and that tobacco use remained at 18%. The most common substances used were cigarettes and alcohol, and use was significantly higher among white people than among African American girls.
Table 1 Studies investigating pregnant adolescents and their use of tobacco and alcohol ($N = 40$)

| Authors                  | Design                                           | Sample                                                                 | Research focus                                                                 |
|--------------------------|--------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Pregnant adolescents and tobacco use ($N = 15$) |                                   |                                                                        |                                                                                |
| Albrecht et al. (1998)   | Experimental (RCT) design with three groups      | $N = 84$ smoking pregnant adolescents, aged 12–20 years                | Examined use of peer support in the Teen FreshStart smoking cessation intervention for pregnant adolescents. |
| Albrecht et al. (1999a)  | Experimental, ex post facto design (from Albrecht et al. 1998 RCT study) | $N = 53$ pregnant smoking teens, aged 14–20 years (in intervention groups, Albrecht et al. 1998) | Compared characteristics of pregnant adolescents who decided to complete a smoking cessation intervention ($n = 41$) with pregnant teens who did not complete the intervention ($n = 12$) by examining familial, peer and interpersonal factors. |
| Albrecht et al. (1999b)  | Quantitative, descriptive                         | $N = 94$ pregnant adolescent smokers                                  | Measured the nicotine dependence of pregnant adolescent smokers collected from baseline data of adolescents enrolled in cessation intervention trial (unpublished report by Albrecht et al. 1995, cited in Albrecht et al. 1999b). |
| Albrecht et al. (2000)   | Experimental (RCT) design with three groups      | $N = 71$ pregnant adolescent smokers aged 13–19 years                  | Examined pregnant adolescents' knowledge of the health risks of smoking for the pregnant mother and foetus in relation to their decisions to quit. |
| Albrecht and Caruthers (2002) | Quantitative, descriptive (part of larger RCT tobacco intervention study) | $N = 142$ pregnant smoking teens aged 13–19 years | Described characteristics of pregnant adolescents who smoke and identified specific variables of tobacco use and possible indicators of long-term abstinence. |
| Albrecht et al. (2006)   | Experimental, longitudinal (1-year), RCT intervention | $N = 142$ pregnant smoking adolescents aged 14–19 years               | Evaluation, short- and long-term, of the effectiveness of a smoking cessation intervention for pregnant adolescents computer randomised to three groups. |
| Bottomley and Lancaster (2008) | Quantitative, descriptive                        | $N = 81$ pregnant adolescents, smokers, quitters and never smokers    | Examined the relationship between smoking and depressive symptoms in pregnant adolescents by comparing smokers and non-smokers during pregnancy at two time points. |
| Cornelius et al. (1994a) | Quantitative, descriptive                        | $N = 199$ pregnant adolescents aged 12–18 years                       | Examined tobacco use patterns over the course of pregnancy by comparing use before pregnancy and during the first and third trimesters. |
| Cornelius et al. (1995)  | Quantitative, descriptive                        | $N = 310$ infants and adolescent mothers aged 12–18 years             | Examined patterns of use of tobacco and marijuana among pregnant adolescents and the effects of these substances on infants. |
| Cornelius et al. (2007)  | Longitudinal correlational study with 6-year follow-up | $N = 357$ pregnant adolescent smokers and non-smokers aged 12–18 years | Investigated the behavioural effects of prenatal tobacco exposure on children at 6 years of age by collecting trimester-specific information from pregnant adolescents with smoking and non-smoking status and conducting 6-year follow-up. |
| Delpishen et al. (2005)  | Quantitative, retrospective cohort analysis       | $N = 534$ births of adolescent mothers 19 years or younger             | Retrospective hospital records study to determine prevalence of smoking among adolescent pregnancies and compare smoking status with low birthweight (compared with 8972 adults who gave birth during the same time). |
| Feltes (2007)            | Secondary data analysis of baseline data from another longitudinal study | $N = 108$ pregnant smoking adolescents aged 14–19 years                | Explored relationships between smoking dependence behaviour, depression anger and anxiety in pregnant adolescents. |
| Authors                  | Design                   | Sample                                                                 | Research focus                                                                                                                                 |
|-------------------------|--------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Lawson (1994)           | Qualitative, descriptive | N = 20 pregnant adolescents aged 16-18 years                          | To understand the role smoking plays in the lives of pregnant adolescents                                                                 |
| Leiner et al. (2007)    | Quantitative, descriptive | N = 163; 71 pregnant adolescents and 92 adolescent mothers             | Examined pregnant adolescents’ knowledge of tobacco-related risks to children associated with smoking during and after pregnancy.          |
| Seemark and Gray (1998) | Quantitative, comparative| N = 69; 36 pregnant adolescents and 33 non-pregnant adolescents        | Compared the recorded smoking prevalence of pregnant adolescents with non-pregnant adolescents based on records from one private general practice. |
| Cornelius et al. (1999) | Quantitative, descriptive| N = 413 offspring of adolescents aged 12-18 years                     | Examined the effects of alcohol use during pregnancy on growth and gestational age at birth of infants born to adolescents.                 |
| Deardorff et al. (2005) | Quantitative, retrospective (using path analysis) | N = 666 young women aged 18-22 who had been pregnant in the past       | Examined the role of alcohol in the timing of sexual activity and pregnancy among early-maturing adolescent girls.                      |
| DeGenna et al. (2007)   | Quantitative, retrospective and cross-sectional | N = 413 pregnant adolescents aged 12-18 years; N = 357 captured 6 years later; study based on 6-year follow-up cohort | Examined the effects of early and adverse experiences with alcohol and sex on adolescent drinking the year before and during pregnancy in adolescent mothers at the 6-year postpartum phase. |
| Rhodes et al. (1994)    | Quantitative, descriptive | N = 183 pregnant adolescents aged 11-19 years                          | Reported frequency and intensity of drinking alcohol by African American, Hispanic and white pregnant adolescents and determined the extent to which these women quit, reduced or continued to use alcohol during pregnancy. |
| Weimann and Berenson (1998) | Quantitative, descriptive | N = 378 pregnant adolescents                                           | Identified risk factors for alcohol use among pregnant adolescents who reported alcohol use in the last 30 days, those who discontinued use by first prenatal visit and non-users. |
| Albrecht et al. (2002)  | Quantitative, descriptive | N = 53 pregnant smoking adolescents; aged 12-19 years                  | Examined the correlations between constructs from family, school (connectedness) and protective individual characteristics with health risk behaviours (tobacco, alcohol and marijuana use) in pregnant adolescents. |
| Barnet et al. (1995)    | Quantitative, descriptive | N = 125 adolescent mothers aged 12-18                                  | Examined the correlations between prevalence of substance use in the first 4 months postpartum and factors such as depressive symptoms, stress and social support in adolescent mothers. |
| Berry et al. (2000)     | Quantitative, retrospective, longitudinal cohort | N = 1541 women who reported a pregnancy younger than age 19 from among 5053 adolescent females aged 14-21 in the Nat Longitudinal Youth Survey | Examined the risk (substance use) and protective factors for specific ethnic groups regarding adolescent pregnancy (non-Hispanic white, non-Hispanic black, Hispanic, American Indian). |
| De Genna et al. (2009)  | Quantitative, longitudinal, correlational | N = 445 pregnant adolescents aged 12-18 years with follow-up 6 and 10 years postpartum | Examined the tobacco, alcohol and marijuana use prevalence among adolescent mothers at 6 years and 10 years postpartum. |
| Authors          | Design                   | Sample                                      | Research focus                                                                  |
|------------------|--------------------------|---------------------------------------------|-------------------------------------------------------------------------------|
| Gilchrist et al. (1996) | Quantitative, longitudinal, descriptive | N = 229 pregnant adolescents under 18 years | Investigated patterns of adolescent mothers’ substance use (tobacco, alcohol, marijuana and illicit drugs) pre-pregnancy, during pregnancy and 6, 12 and 18 months postpartum |
| Gillmore et al. (2006) | Quantitative, longitudinal, descriptive | N = 233 unmarried pregnant adolescents aged 17 and younger | Investigated substance use trends in unmarried pregnant adolescents from year 3.5 to 11.5 postpartum to determine patterns of use, how they compared with national trends and whether these mothers ‘mature out’ of substance use in adulthood |
| Hussey et al. (1992) | Quantitative, descriptive, prospective study | N = 241 pregnant adolescents 17 years and younger | Identified the factors related to tobacco use during pregnancy among pregnant adolescents |
| Kaiser and Hays (2005) | Quantitative, descriptive, prospective study | N = 145 pregnant adolescents aged 15–18 years | Assessed the frequency of prenatal health-risk behaviours, including substance use (tobacco, alcohol, illicit drugs) among first-time pregnant adolescents in mid-West United States |
| Kokotailo et al. (1992) | Quantitative, descriptive | N = 229 pregnant adolescents younger than 18 years | Determined the prevalence of tobacco, alcohol and other drug use among pregnant adolescents attending a pregnancy programme at Johns Hopkins Hospital, Baltimore |
| Kokotailo et al. (1994) | Quantitative, descriptive, prospective study | N = 119 pregnant adolescents under age 21 | Determined prevalence of tobacco, alcohol and drug use during pregnancy among pregnant adolescents in a small city in Wisconsin |
| Lohr et al. (1992) | Quantitative, descriptive, retrospective and prospective study | N = 241 pregnant adolescents 17 years and younger | Examined factors associated with substance use (alcohol, marijuana, cocaine and other illicit drugs) among pregnant adolescents and how use in previous year was affected by the pregnancy |
| McDonell et al. (2007) | Experimental (RCT) with 24-month follow-up | N = 197; 107 treatment adolescents and 90 controls from South Carolina aged 18 and younger | Reported results from an intervention to improve social and educational outcomes for pregnant adolescents from low-income backgrounds by reducing substance abuse, repeat pregnancies and increasing school completion and sense of well-being |
| Morrison et al. (1998) | Quantitative, longitudinal | N = 255 pregnant, single adolescents aged 12–17 years, mean 16 years | To assess the use of alcohol and drug use among pregnant and parenting adolescents and associated beliefs, intention and attitudes to substance use over time |
| Sangalang and Rounds (2005) | Quantitative, longitudinal programme evaluation | N = 91 pregnant and parenting adolescents aged 12–18 years | Investigated differences and changes in health behaviours of pregnant and parenting adolescents enrolled in an adolescent parenting programme in North Carolina |
| Scafidi et al. (1997) | Quantitative, descriptive, prospective study | N = 104 aged 13–21, mean age 18 years; 55 drug-using and 49 non-users | Identified the psychosocial stressors (especially depression) associated with adolescent pregnancy and drug use (including alcohol) |
| Spears et al. (2010) | Quantitative, longitudinal, secondary analysis of data (four time points) | N = 305 subsample of ethnic minority pregnant adolescents aged 13–18 years | Examined trajectory of substance use (nicotine, alcohol and marijuana) during pregnancy and postpartum among adolescent girls |
Patterns of alcohol use during adolescent pregnancy appear to be somewhat different from those related to tobacco. The five studies in this review that focused on only alcohol use did not report exceptionally high levels of use during pregnancy or in the postpartum: prevalence of recent alcohol use ranged from 5% to 11% and overall, pregnant adolescents reduced alcohol use throughout their pregnancy. However, in the longitudinal studies in this review, researchers described a pattern of alcohol as well as tobacco use characterised by cessation or decreased and low levels of use during pregnancy followed by rapid resumption during the postpartum, levelling after 1 year (Barnet et al. 1995, Gilchrist et al. 1996, Morrison et al. 1998, Teagle & Brindis 1998, Spears et al. 2010).

Longitudinal studies that extended years beyond the first year postpartum point to troubling long-term patterns of substance use (Gillmore et al. 2006, Cornelius et al. 2007, De Genna et al. 2009). For example, a survey-based, longitudinal cohort study examined tobacco, alcohol and marijuana use among adolescent mothers 6 and 10 years postpartum to identify risk factors for substance use (De Genna et al. 2009). The authors’ alarming findings were that overall tobacco use increased during the 10-year period, and concurrent smoking was significantly associated with risky drinking 6 years after an adolescent pregnancy, with smokers almost two and a half times more likely to engage in drinking above the recommended guidelines. Similarly, the findings of a correlational, longitudinal study with pregnant adolescents and post-pregnancy follow-up indicated that while the smoking prevalence rate at the 6-year mark was identical to that at the third trimester (58% smokers), daily smoking consumption had increased from a mean of 7.7 cigarettes per day (CPD) at the pre-natal stage to 11.7 CPD at 6-year follow-up (Cornelius et al. 2007). It appears that adolescent mothers remain at a much higher risk of substance use than other young women.

Factors influencing substance use among pregnant adolescents

In this group of studies, researchers explored a variety of factors influencing either tobacco or alcohol use among pregnant adolescents. In some cases, relationships between smoking and alcohol use in the context of adolescent pregnancy were explored. The studies were grouped by primary focus and included studies that were either tobacco-focused, alcohol-focused or explored psychological or social factors related to substance use.

Tobacco-focused studies

Some researchers were primarily interested in exploring risk factors for tobacco use during adolescent pregnancy. Albrecht et al. (1999b) and Albrecht and Caruthers (2002), for example, investigated the nicotine dependence and characteristics of pregnant adolescent smokers in an American inner city community. After examining all demographic variables, six predictors of tobacco use were identified: degree of nicotine dependence; maximum number of cigarettes smoked in the last month; alcohol intake before the pregnancy; religiosity; maternal encouragement to quit; and the compatibility of peer and

| Authors               | Design                                      | Sample                                      | Research focus                                                                 |
|-----------------------|---------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------|
| Spears (2007)         | Experimental                                | $N = 305$ pregnant adolescents; $222 = experimental and $83 = control group; aged 13–18 years | Examined the different trajectories of use of tobacco, alcohol and marijuana by pregnant adolescents from pregnancy through the postpartum to explain the relationships between specific variables and adolescents’ substance use. |
| Teagle and Brindis (1998) | Quantitative, descriptive, prospective study | $N = 248$ pregnant adolescents aged 15–19 years | Described the ethnic differences (African American and white people) in substance use (tobacco, alcohol, marijuana, other drugs) by pregnant adolescents attending a prenatal clinic. |
| Webbink et al. (2008) | Quantitative, retrospective, descriptive survey | $N = 215$ teen mothers and $286$ twin sisters who had first child at age 20 or older | Analysed the causal effects and consequences of teenage childbearing on smoking, drinking and body size. |
| Zoccolillo et al. (1997) | Quantitative, descriptive                   | $N = 26$ pregnant girls or mothers under 18 years | Examined the presence of conduct disorder and alcohol or drug dependence among adolescent mothers. |
parent attitudes. Strong links between tobacco and alcohol were also observed, supporting the notion that pregnant adolescents who engage in one problem or risky behaviour are likely to engage in others.

These findings are similar to earlier research reported by Cornelius et al. (1994a) that identified tobacco use to be significantly related to alcohol use and that pregnant adolescents who continued to smoke into the third trimester had more friends who smoked, did not live with a parent, engaged in binge drinking in the first trimester, had experienced earlier age of first intercourse and were white people. Other studies included in this review also concluded that cigarette use is associated with, or a predictor of, alcohol and other drug use (Hussey et al. 1992, Koko- tailo et al. 1992, Teagle & Brindis 1998, De Genna et al. 2009). Conversely, adolescents who drink alcohol have also been found to be at higher risk of tobacco and marijuana use during their pregnancy (Cornelius et al. 1999). Finally, despite public education efforts, there is some evidence that a lack of awareness related to the health risks of smoking may influence smoking rates in pregnant adolescents. A school district survey in Texas concluded that pregnant adolescents and adolescent mothers have poor knowledge of the risks of smoking with regard to miscarriage and foetal health (Leiner et al. 2007).

Alcohol-focused studies
A number of studies focused on identifying risk factors for alcohol use during adolescent pregnancy. Deardorff et al.’s (2005) survey results supported the early-timing hypothesis: girls who experienced early menarche were at increased risk of problems such as alcohol use, early sexual initiation and pregnancy. Alcohol use had a strong influence on the timing of pregnancy, although the temporal order could not be determined. DeGenna et al. (2007), however, found that an earlier age of first drink predicted heavier drinking in the year before an adolescent pregnancy, and was negatively related to alcohol use during pregnancy: earlier drinkers were more likely to continue alcohol during their pregnancy. These findings were supported by Weimann and Berenson (1998) who found that among pregnant adolescents, ‘recent alcohol users’ (past 30 days) were more likely to be older than 15 years, to live at the poverty line or below, to not be in school, to use alcohol during sexual activities, to have a father who uses alcohol and more likely to report tobacco use and recent marijuana use. Specific knowledge about the effects of alcohol on the developing foetus was also associated with abstinence and decreased drinking (DeGenna et al. 2007).

Psychological factors
A small group of studies focused on describing psychological factors that may contribute to substance use. In a comparison of pregnant and non-pregnant adolescents, Berry et al. (2000) concluded that higher self-esteem decreased the odds of pregnancy. Girls’ self-esteem was also negatively correlated with alcohol use – girls with poor self-esteem drank more. In addition, low self-esteem was found by Spears et al. (2010) to predict rapid alcohol resumption in the postpartum period among adolescents. Previous childhood physical or sexual abuse also predicted higher initial use of cigarettes and a more rapid resumption of alcohol use in the first year postpartum. Similarly, in other work, connectedness with school or family was related to less substance use among pregnant adolescents (Albrecht et al. 2002). The relationship between substance use and conduct disorder was investigated in one small study (Zoccolillo et al. 1997). Almost half of the girls met the criteria for a diagnosis of either conduct or substance use disorder.

In the only qualitative study in this review, Lawson (1994) interviewed pregnant girls and concluded that the psychological role smoking plays must be addressed in interventions aimed at changing substance use patterns, because 65% of these girls smoked a pack a day, used tobacco as a way to control weight, to intentionally deliver smaller babies, and to cope with anxiety and stress in their lives.

Depressive symptoms have been the focus of attention in several studies with varying results. For example, in a secondary analysis of data from a longitudinal study, depressive symptoms were found to be higher among pregnant adolescents regardless of whether they smoked or not; however, adolescents who continued to smoke during their pregnancy were considered to be at higher risk of developing depression (Bottomley & Lancaster 2008). On the other hand, in a dissertation study (Feltes 2007), depression, anger and anxiety did not successfully predict smoking dependence among pregnant adolescents. Other researchers have reported associations between depressive symptoms and alcohol and illicit drug use (Barnet et al. 1995, Scafidi & Field 1997, Spears 2007). For example, Barnet et al. (1995) reported that 42% of adolescent mothers used alcohol and illicit drugs in the first 4 months postpartum, and these mothers appeared more depressed with higher stress levels and greater need for social support, although the directionality of use and depression was unclear (Barnet et al. 1995). Of note is a longitudinal study that reported that over 60% of the adolescent mothers using substances showed depres-
sive symptoms on their CES-D scores and that depressive symptoms were positively correlated with having a substance-using boyfriend, low self-esteem and/or a history of abuse (Spears 2007).

Social and interpersonal factors
Finally, social and interpersonal factors associated with adolescents’ substance use during pregnancy were examined (Kokotailo et al. 1992, 1994, Lohr et al. 1992, Morrison et al. 1998, McDonell et al. 2007, Spears 2007, Webbink et al. 2008, Spears et al. 2010). Findings indicate that social networks appear to be influential. For example, in a longitudinal study of the use of alcohol and other illicit drugs among pregnant adolescents in the American Northwest, the substance use of boyfriends, best friends and family members were all significantly related to adolescent girls’ use during pregnancy, but boyfriends and best friends showed more influence than family (Lohr et al. 1992). Similarly, in a retrospective study of twin sisters in Australia comparing adolescent mothers with their sisters who had a child after age 20, the authors concluded that adolescent mothers have spouses who smoke and drink at higher levels than the spouses of non-adolescent mothers (Webbink et al. 2008). Having ‘lower quality’ spouses (less education and income) or not having a spouse was found to be more significant than economic position or number of children in accounting for the adverse health outcomes in adolescent mothers. In addition, these adolescent mothers were more likely to adopt the lifestyle of their spouse or find single parenting extremely stressful. Because the social lives of pregnant and postpartum adolescents were often found to be intertwined with users, researchers advised a consideration of the substance use patterns of boyfriends, partners, husbands and/or family members when designing interventions and teaching girls skills for handling substances in the context of interactions within social networks.

Interventions
We located few intervention studies specifically targeting substance use among pregnant adolescents. Susan Albrecht has pioneered, modified and evaluated tobacco cessation interventions and their components for this population (Albrecht et al. 1998, 1999a, b, 2000, 2002, 2006, Albrecht & Caruthers 2002). She has conducted three randomised controlled trials that have investigated the value and positive influence of a peer-buddy in smoking cessation multicomponent interventions (Albrecht et al. 1998); a comparison of pre- and post-intervention tobacco risk knowledge (Albrecht et al. 2000); and the short- and long-term effects of a smoking cessation intervention comparing usual care with the peer-buddy programme (Albrecht et al. 2006). These studies demonstrated the potential value of tailored interventions for pregnant adolescents to support tobacco reduction. In a comparative experimental study, she concluded that strong parental disapproval of tobacco use influenced adolescents to participate and that programme designers should consider the involvement of parents in cessation interventions (Albrecht et al. 1999a).

Results of a longitudinally designed evaluation of a programme to support parenting skills for adolescent mothers indicated that after 1 year of services, girls’ use of cigarettes and alcohol increased substantially. Cigarette use rose from 2% at programme entry (during pregnancy) to 20% at programme completion (1 year postpartum) (Sangalang & Rounds 2005), reflecting the need to address gender-related factors influencing substance use and related stressors faced by adolescent mothers.

We located only one intervention study for pregnant adolescents that addressed substance use in general (McDonell et al. 2007). The goal of the intervention for this multi-faceted RCT field study was to reduce substance use (including tobacco and alcohol) and also improve well-being, reduce repeat pregnancies and increase school graduations. The 24-month, women-centred programme design considered the many social needs of pregnant adolescents such as life skills training and connections with community organisations, using an individualised case management approach to matching adolescents to supportive services. Results were promising in that the project reduced substance use during a time it may have accelerated, and treated adolescents were closer to grade achievement than controls after completing the programme. Additionally, treated adolescents perceived themselves as more capable, less impulsive, having more social supports and better problem solvers than the controls. Nevertheless, the South Carolina study reported an attrition rate of 42% over the 2 years.

Discussion
This scoping review provides a thematic narrative overview that captures current understandings of pregnant adolescents’ tobacco and alcohol use. Research in this subfield has focused primarily on quantitative assessments of the prevalence and patterns in adolescent girls’ use of tobacco and alcohol during pregnancy and postpartum. The research has been primarily descriptive, with separate, parallel
streams of investigation to identify trends and predictors of alcohol and tobacco use, prior to, during and following pregnancy. The emergence of additional longitudinal work since Flanagan and Kokotailo’s (1999) review provides support for a pattern of postpartum substance relapse among this population. As a set, the studies provide a picture of patterns of use and the psychological, interpersonal and social factors influencing use; however, little research has focused on interventions or best practices for health and social care practitioners who may work with these adolescents and their families. Based on current rates and trends in adolescent girls’ alcohol and tobacco use, as well as the considerable health risks of use of alcohol and tobacco in pregnancy, singly and in combination, there is a need for increased attention to the development of effective and integrated approaches to prevention and treatment.

The state of the research also indicates that there are four compelling gaps in our knowledge, which limit our responsiveness to adolescents who use alcohol and tobacco during pregnancy and the postpartum period. Each is described in the following sections.

Limitations in research approaches

The first-person voices and narratives of adolescents and young mothers have been largely neglected in research. Qualitative research could illuminate their perspectives as well as the social context of their alcohol and tobacco use, include the viewpoints of partners or family members and possibly inspire ideas for helpful prevention and support strategies. Many young mothers (and fathers) using alcohol and tobacco have limited resources and face barriers related to poverty, transportation and childcare, as well as insufficient social support systems and self-efficacy needed to make positive health behaviour changes or productively address structural pressures in their lives (Greaves & Hemsing 2009). The failure to draw on qualitative research designs may result in future treatment and prevention programmes that do not adequately or effectively respond to the complex needs of pregnant and child rearing adolescents.

Lack of effective interventions

Although the adverse effects of prenatal alcohol and tobacco are well known, there is a marked lack of effective interventions described in the literature that are designed to prevent or reduce alcohol and tobacco use during pregnancy among pregnant adolescents and young women. Programmes should be developed that target both alcohol and tobacco and social challenges this population faces, rather than perpetuate the ‘substance by substance’ approach. For many young women, their health and pregnancy issues are intertwined and support is needed for multiple, interrelated issues (British Columbia Perinatal Health Program 2010). Instead of single-issue care, professionals and clients would greatly benefit from an integrated approach that addresses both alcohol and tobacco use, as these issues frequently present together during routine care episodes, and pregnant girls and young women tend to use these substances together. In addition, acknowledging the tendency for relapse to alcohol and tobacco use in the postpartum period through innovative approaches that are responsive to this target audience and tailored to their social realities is important (Barnet et al. 1995, Gilchrist et al. 1996).

Gender influences

There are few examples of gender-informed prevention or treatment programmes for this population despite the fact that these approaches to substance use have been strongly encouraged for girls and women (Blake et al. 2001, Poole et al. 2010). An integrative review on substance use recommended that gender-specific interventions for girls address self-esteem, body image, depression and anxiety (Amaro et al. 2001). Interestingly, girls who engage in regular physical activity hold a more positive sense of self, greater mood and psychological well-being, and experience less anxiety, depression and psychological stress than girls who are inactive (Higgins et al. 2003). Eliciting information for bolstering physical activity in this population could be a novel, feasible and important aspect of a comprehensive intervention to reduce alcohol and tobacco use during pregnancy/postpartum. The inclusion of a physical activity component to a smoking cessation intervention targeting young women in particular has been suggested (McDermott et al. 2009), but, to our knowledge, such an intervention has yet to be conducted. The American Lung Association ‘Not-on-Tobacco’ cessation programme for adolescents is the most widely used and most promising tobacco intervention programme in the United States, based on social cognitive theory and designed to be delivered to gender-specific groups (Branstetter et al. 2009). The programme components include recreational and physical activity and could possibly be adapted for pregnant youth outside the school system to address alcohol use and social contextual factors such as boyfriend’s, partner’s and family’s substance use.
Social and interpersonal influences

Finally, social and interpersonal influences in girls’ lives have not been adequately considered. This is evident in the virtual absence of attention paid to the influence of pregnancy-involved adolescent boys and young men in adolescent girls’ use of alcohol and tobacco during pregnancy and postpartum, despite evidence that boyfriends are often central to girls’ substance use (Blake et al. 2001). The role of boyfriends and partners in adolescent substance use during pregnancy has been identified as an important risk factor by some researchers (Bottorff et al. 2010, Schneider et al. 2010). For this reason, we advocate that the adolescent mother be considered as part of a complex social web, rather than simply as an individual with behaviours that need to be changed. Future research and interventions aimed at sustaining behaviour change may need to consider the influence of partners and friends on substance use and provide sensitive means by which to curb this influence. The failure to do so overlooks a crucial influence on tobacco and alcohol use in adolescents and could undermine the effectiveness of new interventions.

Although programmes that address substance use within the complexity of challenges faced by this group often include pharmacotherapies, nicotine replacement therapy and alcohol pharmacotherapies for pregnant adolescents have not been adequately studied to recommend their use. Even with non-pregnant adolescents, alcohol-related pharmacotherapies are used sparingly, due to health-related side effects, possible interactions with other drugs, challenges with monitoring use and compliance, as well as interest in helping adolescents to establish self-regulation skills, which will serve them well in managing substance use throughout their lives.

Early entry into motherhood and lone motherhood, as well as greater disadvantage with respect to childhood circumstances, education and current disadvantage combine to increase the risk of being a smoker and significantly reduce the odds of quitting in pregnancy. Recent research in the United Kingdom on life course influences highlights how important it is to recognise typical life trajectories of young mothers and address social disadvantage in interventions with adolescent girls and women (Graham et al. 2010). The neglect of these social factors may actually result in increased substance use of tobacco and/or alcohol over time (Sangalang & Rounds 2005).

There are limitations to this scoping review. A major challenge in conducting this review was inconsistency in the definitions of adolescents/teens and women. The review was also limited to publications in English. Accordingly, it is possible that some studies were not identified using the search strategies outlined in this paper. Although a meta-analysis may be possible on a sub-group of studies, because this field of research is at a nascent stage, we pursued a scoping review. The legal issue of minors possessing cigarettes and alcohol may influence the participation and recruitment of adolescents in research studies and their disclosure of use has not been adequately considered in this field of research (Moolchan & Mermelstein 2002). Although alcohol use, smoking and cannabis use may occur together, we have focused on alcohol and tobacco use because, unlike cannabis, the adverse health effects of these substances are well established for women and their infants.

Conclusion

This scoping review describes research on adolescents’ use of tobacco and alcohol during pregnancy and postpartum published over the past two decades. It confirms that research has for the most part considered alcohol and tobacco use in parallel streams of investigation as opposed to investigating the interconnections and the potential of integrated interventions. There is a clear need for effective and integrated approaches to prevent and reduce alcohol and tobacco use among pregnancy-involved adolescents. Yet, there are few examples of gender-informed prevention or treatment programmes in the literature. Intervention-based research needs to attend to the context of adolescents’ substance use and their preferences and developmental needs for support; to promote sustained behaviour change throughout pregnancy and the postpartum period; and to sensitively address the influence of partners and friends. The lack of qualitative studies in this field of research needs to be resolved to inform the development of the appropriate content of such interventions. All of these identified gaps need to be rectified in research, practice and policy development to address the significant population of pregnant adolescents who smoke and drink alcohol, along with their involved partners and friends.

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