



# Expecting to Quit

A Best-Practices Review of Smoking Cessation Interventions  
for Pregnant and Postpartum Girls and Women

Second Edition

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 British Columbia  
Centre of Excellence  
for Women's Health

Expecting to Quit:

A Best-Practices Review of Smoking Cessation Interventions for Pregnant and Postpartum Girls and Women

Second Edition

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# **Expecting to Quit**

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# 1. Introduction: Smoking in Pregnancy

This report examines interventions designed to reduce or eliminate smoking during pregnancy. It considers these interventions using a “better practices” methodology designed by Moyer, Cameron, Garcia, and Maule (2002, p. 124) for intervention studies published prior to 2003, and a systematic review methodology from the National Institute for Health and Clinical Excellence (NICE) (2006) in the UK for those studies published after 2003. We contextualize the results of these analyses in the wider literature on women’s health, women-centred care, and women’s tobacco use to better interpret them. These results build on those in the first edition of *Expecting to Quit* (Greaves et al., 2003), and culminate in the recommendations offered near the end of the report (in chapter 6).

## The Extent of the Problem: Trends and Issues in Smoking During Pregnancy

In industrialized nations, approximately 13 to 27 percent of women use tobacco during pregnancy (Colman & Joyce, 2003; Connor & McIntyre, 1999; Penn & Owen, 2002; Schneider, Huy, Schutz, & Diehl, 2010; Schneider & Schutz, 2008). Because they are often based on self-reported information and are drawn from various countries and subpopulations, such estimates vary widely and may significantly underestimate the actual

proportion of women who smoke while pregnant. In Canada, data from the Canadian Community Health Survey (CCHS) reveal that in 2005, 13.4 percent of women who had given birth in the previous five years reported smoking during pregnancy, fewer than the 17.7 percent reported in 2001 (Heaman, Lindsay, & Kaczorowski, 2009; Lindsay, Royle, & Heaman, 2008; Millar & Hill, 2004). Data from the United States show a similar trend over the same time period, with the prevalence of smoking during pregnancy declining from 15.2 percent in 2000 to 13.8 percent in 2005 (Tong, Jones, Dietz, D’Angelo, & Bombard, 2009).

While many of these women quit or reduce tobacco use during pregnancy, their smoking cessation is often temporary. In fact, while relapse rates vary, approximately 25 percent of women resume smoking before delivery, 50 percent within four months postpartum, and 70 to 90 percent by one year postpartum (Klesges, Johnson, Ward, & Barnard, 2001). The 2006-07 *Canadian Maternity Experiences Survey* reported that nearly half (47%) of women who had quit smoking during pregnancy had resumed smoking daily or occasionally by the time of the interview (five to fourteen months postpartum) (Heaman, et al., 2009). Recent analyses in the United States further indicate that the proportion of pregnant smokers reporting a quit attempt has actually declined over the past decade to the current level of approximately 50 percent (Klesges, et al., 2001). In short, smoking in pregnancy and postpartum remain serious public health problems.

Estimated levels of cessation during pregnancy vary, but a recent review of population- or clinic-based investigations of smoking cessation during pregnancy in developed countries indicates that more than half of all women smokers do not manage to quit smoking completely during pregnancy (rates vary between 4% and 47%) (Schneider, et al., 2010). A US study examining spontaneous cessation in low-income pregnant smokers documented only a 25 percent early-pregnancy quit rate (Ockene et al., 2002). An Australian sample had a spontaneous cessation rate of 23 percent (Panjari et al., 1997). Further, spontaneous cessation rates have been shown to vary significantly according to sociodemographic factors, including age, income, and marital status as well as the presence of a smoking partner, level of education, degree of addiction, and current and past use of alcohol and other drugs (Ebert & Fahy, 2007; Heaman, et al., 2009; Holtrop et al., 2010; Millar & Hill, 2004; Penn & Owen, 2002; Schneider, et al., 2010; Schneider & Schutz, 2008; Tong, et al., 2009).

Facilitating successful and enduring tobacco cessation during pregnancy and postpartum is an ongoing public health challenge. Tobacco cessation during pregnancy has considerable positive health ramifications for both women and fetuses, and reduces health problems

for children born of mothers who smoke. However, creating the conditions for successful tobacco cessation during pregnancy has proven to be a persistent and difficult problem affecting both women's and fetal health. Social factors affect the processes of smoking, cessation, and relapse such as women's socioeconomic status, education, and age. There are also numerous physiological factors related to pregnancy—nausea and taste and olfactory changes—that affect patterns of pregnant women's tobacco use. Combined with exposure to health education and wider social messages about pregnancy and smoking, all of these factors affect the rates of quitting in pregnancy and the prevention of postpartum relapse.

Just as policies regarding tobacco taxation and pricing, advertising and sponsorship, sales-to-minors regulations, and smoking bylaws have an effect on all members of a population, they also affect pregnant women. While there are positive effects of these tobacco-control policies and programs aimed at the general population (see, for example, Evans and Ringel, 1999, who report that increasing cigarette taxes reduces smoking by pregnant women), this report deals with those interventions and programs specifically developed for pregnant women.

Smoking in pregnancy results in serious risks both to the woman and the fetus. For the woman herself, smoking during pregnancy significantly increases her risk for cardiovascular and pulmonary diseases (Roelands, Jamison, Lysterly, & James, 2009). Other reproduction-related effects of smoking include lower estrogen levels which lead to early menopause and links to infertility (Albrecht, Higgins, & Lebow, 2000; Crawford, Tolosa, & Goldenberg, 2008). Cigarette smoking by pregnant girls and women has been shown to increase the risk of complications in pregnancy and to cause serious adverse fetal outcomes, including low birth weight, still births, spontaneous abortions, decreased fetal growth, premature births, placental abruption, and sudden infant death syndrome (Crawford, et al., 2008; Ellison, Morrison, de Groh, & Villeneuve, 1999; Lumley et al., 2009).



Maternal and paternal smoking are both associated with lower birth weight (DiFranza, Aligne, & Weitzman, 2004). Exposure to smoke affects both maternal and fetal health. One recent systematic review and meta-analysis found that women exposed to environmental tobacco smoke (ETS) “have small but significantly increased risks of having lighter babies with an increased risk of congenital anomalies and trends toward smaller heads and low birth weight” (Salmasi, Grady, Jones, & McDonald, 2010, p. 437). Another systematic review concluded that non-smoking pregnant women’s exposure to ETS reduced mean birth weight by 33 grams or more, and increased the risk of higher morbidity low-birth-weight births (<2500 g) by 22 percent (Leonardi-Bee, Smyth, Britton, & Coleman, 2008).

In summary, there is a clear increase in perinatal morbidity and mortality in smokers and their fetuses. An estimated 10 percent of all perinatal deaths are attributable to smoking (Fielding, Husten, & Eriksen, 1998). But when women quit smoking before the first prenatal visit, the risk of these complications can be reduced to the same levels as those of non-smokers. In fact, some research estimates that successful smoking cessation in pregnancy could prevent up to 5 percent of perinatal deaths, 20 to 30 percent of low-birth-weight births, and 15 percent of preterm deliveries (Crawford, et al., 2008). A study of births in Alberta, Canada, between 2001 and 2005 calculates that neonatal morbidity could be reduced by 10 to 15 percent by eliminating smoking during pregnancy (Burstyn, Kapur, & Cherry, 2010). For women, continued postpartum cessation, tobacco reduction, and relapse prevention remain crucial health issues. Their health, and the health of their children, will be better if women are nonsmokers.

## Shifts in Attention to Smoking During Pregnancy

Over the past thirty years, the problem of smoking in pregnancy has attracted increased attention in the tobacco-intervention field. As more knowledge about the effects of tobacco use on fetal health has become available, health practitioners have taken an increased

interest in improving fetal health and reducing future health-care costs for premature and low-birth-weight babies by focusing on maternal tobacco cessation. In particular, pregnancy is often assumed to be an opportunity for behaviour changes in pregnant women because pregnancy is thought to be a point of optimism and hope for a woman—a period that carries with it a focus on health.

A growing social interest in, and condemnation of, the effects of smoking on others has led to an enhanced focus on pregnant smokers, who are seen as directly increasing the risk of poor health for their fetuses. An increased attention to the effects of second-hand smoke, and the growing unacceptability of smoking in general, has meant more attention being directed to pregnant smokers, often in the form of health education and intervention. However, there is also increased interest from legal and societal perspectives, focusing on how to most effectively reduce the exposure of the fetus to maternal smoking. As a result, over three decades of research, intervention, health education, and advocacy have been devoted to increasing the rates of successful tobacco cessation during pregnancy and reducing harm to the fetus.

As recently as the 1960s, physicians (including obstetricians) were told that moderate smoking was safe during pregnancy (Oaks, 2001), but this permissive attitude has been radically transformed to one of censure and even vilification of pregnant smokers. Alongside this trend, the fetus has acquired increased status—scientifically, socially, and legally—thereby complicating the production of appropriate advice and intervention regarding smoking during pregnancy. The shift to a fetus-centric perspective in tobacco treatment mirrors legal trends in maternal drug and alcohol use, as well as the increase in fetal surgery, whereby the fetus is regarded more and more as a “patient” (Casper, 1998). The net effect of these trends has been an increased litigation about tobacco use in pregnancy and around children, often centring on family law, custody, or abuse and neglect claims (Greaves, 1996; Oaks, 2001). In short, the pressure on pregnant women smokers to quit, to hide their smoking, or to smoke outside of the public gaze has increased in recent years.

## Trends in Interventions

The health interventions designed over the past three decades to reduce smoking during pregnancy have not been resoundingly successful. Because the approach to cessation during pregnancy seems motivated primarily by a desire to lessen the deleterious effects of smoking on fetal health, it has framed the interventions on fetal health outcomes and confined them largely to the period of pregnancy. As a result, prepregnancy and postpregnancy tobacco-cessation interventions, which would focus primarily on *women's* health, have garnered proportionately less attention and emphasis. As Jacobson claimed in 1986, "in rich countries, *most* women are not pregnant most of the time," which led her to conclude that smoking cessation campaigns *ignore most women most of the time* (p. 125).

Jacobson was one of the first to provide extensive critiques of the medical profession's concentration on tobacco cessation during pregnancy, and to consider how this focus on pregnancy affected the tobacco-advocacy field. She also clearly identified the sexism inherent in this earlier approach (1981, 1986). By 1973, women had become the focus of antismoking attention, but this was due to the accumulating scientific evidence of harm to the fetus and not because of concern about women's health. Subsequently, smoking messages and intervention programs focused on women, but usually as "receptacles for future generations." This was part of a larger trend. In Canada and elsewhere, only two aspects of women's smoking—pregnancy complications and facial wrinkles—merited mention by the programmers in tobacco control until the mid-1980s (Greaves, 1996). The pregnancy campaigns were consistent with a long "uterine tradition" of understanding women's bodies and women's health, a concept described by Matthews (1987, p. 14) to name how women's reproductive value received attention over the women themselves. It was the late 1980s before most developed countries and the World Health Organization clarified a focus on women's health in their tobacco-use publications (see, for example, ASH Women and Smoking Group, 1986; Chollat-Traquet, 1992; Greaves, 1987, 1990).

Part of the realignment that emerged by 1990 reflected a growing understanding that tobacco use prior to and during pregnancy was increasingly linked to other factors such as poverty and class, and race when it is correlated with low SES. The amount of risk to the fetus resulting from maternal smoking during pregnancy was also amplified by these factors and their often-related nutritional deficits (Subar, Harlan, & Mattson, 1990). The high rates of relapse after pregnancy contributed to the reassessment.

Typically, the emphasis on smoking cessation in pregnancy has concentrated on individualistic behavioural changes in the woman herself. This narrow view has usually excluded an analysis of structural factors that matter in explaining smoking behaviour, such as poverty, class, age, education, or experience of domestic violence. However, the cessation rates for pregnant women smokers are approximately 30 to 40 percent higher than for the general population (Klesges, et al., 2001), with about 70 percent of women continuing to smoke during pregnancy. The majority of those who quit report doing so on their own without formal intervention (Anderka et al., 2010; Crawford, et al., 2008; DiFranza, et al., 2004; Salmasi, et al., 2010). Spontaneous quitters are older, more highly educated, less addicted, and less likely to have partners who smoke (Klesges, et al., 2001). The presence or absence of these factors also affects the extent of fetal risk, suggesting that tobacco use is only one factor among many in producing poor outcomes for the fetus and/or infant. As Greaves argues, "if most of the pregnant women who quit ... do so without intervention, the advice and programming directed at pregnant women should take a different focus. It makes more sense to focus on women's health as opposed to fetal health, and to press those messages long before and long after pregnancy" (1996, p. 121).

Motivational and other psychological issues also affect cessation attempts and duration, with "concern about fetal health risks" serving as the motivation for a short-term cessation among pregnant smokers. Again, similar structural factors play a role. Women in disadvantaged or marginal circumstances are less likely to be able to consider quitting when other pressures are affecting their lives and behaviour.

Finally, the emphasis on the pregnant woman's behaviour has traditionally obscured the effects of partners' smoking patterns and prevented the development of an appropriate emphasis on the partners' smoking. This has two levels of significance. First, the biological issues of fathers who use tobacco with respect to fertility and healthy fetal development have been understudied and generally underemphasized in health education and advice surrounding risks to fetal health from smoking. Second, the presence of fathers, partners, and others who smoke in the pregnant smoker's social network affects both the extent of the woman's and the fetus's exposure to smoke, as well as the likelihood that she will have support to quit. These elements affect pregnant women's attempts to quit or reduce. According to Bottorff and colleagues (2009), couples develop particular dynamics surrounding tobacco reduction, not all of them helpful to pregnant women, and these dynamics can shift and endure into the postpartum period. In short, the structural factors affecting the pregnant smoker, in conjunction with these other issues in her environment, are some elements of the problem of tobacco use during pregnancy that have often been overlooked when focusing on individual behavioural issues surrounding tobacco use in pregnant women.

Relapse rates can be understood as a significant indicator of interventions' effects. They are reported as high as 70 to 90 percent by one year postpartum (Crawford, et al., 2008; Klesges, et al., 2001; Tong, et al., 2009). In 2005, data from the Pregnancy Risk Assessment Monitoring System in the United States show that over half (51.4%) of women relapse to smoking after delivery (Tong, et al., 2009). Women who relapsed were significantly more likely to be young (under twenty-five), have fewer than twelve years of education, be unmarried, have low income (less than \$15,000/year), have had an unintended pregnancy, and have entered prenatal care during or after the second trimester (Tong, et al., 2009).

These findings indicate not only that interventions need improvement but also that different measures may be necessary to fully capture the effectiveness of interventions on tobacco cessation initiated during pregnancy. For example, we know that it is critical to

increase focus on subgroups of women smokers who have difficulty quitting, as well as on prepregnancy interventions with adolescent women and women of reproductive age. Further, increased focus on acknowledging and ameliorating the effects of structural factors on pregnant smokers, such as poverty and low education, as well as the impact of people in pregnant smokers' social systems, will likely enhance interventions in this area.

Without considering structural and social factors in women's lives, outcome measures for specific interventions are bound to be problematic and inadequate. For example, the level of spontaneous quitting is not always measured in intervention studies (or even recorded by clinicians) but it is crucial to understanding the effects of any interventions. Relapse rates during pregnancy and postpartum are also often not measured in intervention studies. Measures of harm reduction or lowering consumption are similarly underdeveloped. This leads to a lack of knowledge about how reduced consumption may affect fetal health, as well as women's health.

Measures of addiction and dependency in pregnant smokers are not always taken, which again obscures the effectiveness of the intervention on certain groups of women smokers. In many studies, the presence of structural factors affecting women's and fetal health, such as poverty and poor nutrition, go unmeasured. Finally, measures of women's health are not generally included. These exclusions serve to illustrate the field's blindness to the value and impact of women's health either on the fetus, or in and of itself.

A historical trend from "condoning to condemning" smoking during pregnancy over the past four decades has led to considerable interest in creating effective interventions for pregnant smokers, but this interest has primarily been motivated to reduce risks to fetal health. Such a fetus-centric perspective is in line with other social, medical, and legal trends regarding women, pregnancy, mothering, and fetal autonomy that have evolved in the same period. In general, these trends have blinded researchers and medical professionals to the issues of women's health and have prevented due

attention to the pre- and postpregnancy time periods. It may also have contributed to the limited perspective and relative lack of success of the many attempted interventions in tobacco use and pregnancy. Specifically, the definition of outcome measures and the inclusion of structural factors have been limited and could benefit from a more expansive view. Since the publication of the first edition of *Expecting to Quit* in 2003, there have been a few encouraging shifts in perspective: some program developers have deliberately focused more on women's health and on relevant structural factors to encourage longer-lasting cessation. For example, Action on Women's Addictions-Research and Education (AWARE; [www.aware.on.ca](http://www.aware.on.ca)), British Columbia Centre of Excellence for Women's Health (BCCEWH; [www.bccewh.bc.ca](http://www.bccewh.bc.ca)), and Families Controlling and Eliminating Tobacco (FACET; [www.facet.ubc.ca](http://www.facet.ubc.ca)) have each worked on issues such as couple dynamics, power and control issues during pregnancy, and the impact of low income on smoking during pregnancy. What follows is an examination of interventions and programs in tobacco cessation for pregnant women, in an attempt to identify better practices in this field.



## 2. Theoretical Issues in Perinatal Smoking Cessation

The complex reasons for women's smoking patterns reflect multiple and interacting psychosocial, cultural, economic, and biological influences. There are discernible social differences among women who smoke and women who do not—differences that are further accentuated in pregnancy and postpartum. Education, income, employment, and social-support networks are the key determinants of socioeconomic status that consistently indicate an inverse relationship with smoking in pregnancy.

To develop and implement interventions that work, researchers and practitioners have to be sensitive to the unique characteristics of women's subgroups. Given the contribution of smoking to the overall burden of disease, and the strong association between low socioeconomic status and smoking among pregnant women in many industrialized countries, greater effort and resources must be channelled to strategies in

the broader community to reduce social inequalities. Merging research gives us insight into genetic and biological factors that affect women, mothers, the fetus, and children whose mothers smoked during pregnancy. These significant biological factors combine with social factors in determining the initiation, maintenance, and nicotine-dependency patterns of maternal smoking.

## Social and Biological Factors that Influence Cessation

### Low Socioeconomic Status

The determinants of smoking among pregnant and postpartum women consistently reflect social disadvantage. Results from the 2005/2006 *Canadian Maternity Experiences Survey* indicate that in Canada, 22.3 percent of pregnant women with yearly incomes under \$30,000 smoke. This is more than double the 10.5 percent average for pregnant women in general (e.g., Al-Sahab, Saqib, Hauser, & Tamim, 2010). Smoking prevalence is generally highest among pregnant White women of low socioeconomic status (SES) as depicted by low income levels, low educational attainment, and low occupational status (Connor & McIntyre, 1999; Health Canada, 1994b, 1995; Jesse, Graham, & Swanson, 2006; Matthews, 2001; Millar, 1997; Ockene, et al., 2002; Ward, Weg, Sell, Scarinci, & Read, 2006). As early as 1989 in the UK, Oakley found smoking in pregnancy to be associated with material disadvantage, social stress, low social support, and lack of control over living conditions—factors that are more likely to be characteristic in the lives of women who have lower socioeconomic status (Oakley, 1989). Women in this subgroup may also have more psychological, relational, and emotional issues, and less residential security, social support, and financial resources (Fang et al., 2004) than other women. A Canadian study found that 61.2 percent of Aboriginal women smoked during pregnancy, compared to 26.2 percent of non-Aboriginal women (Heaman & Chalmers, 2005). Rates of smoking among Aboriginal women of child-bearing years far exceed those of non-Aboriginal women (Reading & Allard, 1999), in large part because low socioeconomic status is a central issue for Aboriginal people.

Overrepresentation of women with lower SES among pregnant smokers is the result of historical trends in smoking initiation and cessation. While smoking rates have declined over time, women of low SES have experienced a less steep decline relative to women in higher socioeconomic groups. Coupled with this, cessation rates during pregnancy are lower among low-

income and minority women in the US, in the order of 6 to 16 percent compared to 23 to 40 percent in more affluent populations (Centers for Disease Control, 1992; Ershoff, Mullen, & Quinn, 1989; Mayer, Hawkins, & Todd, 1990; Windsor et al., 1993). Women living on a low income are also more likely to relapse during the postpartum period (Tong, et al., 2009).

While the same set of social determinants is not documented in all studies, there is a clear pattern of findings from studies conducted in developed countries. In the UK, social class and employment class, which are more clearly delineated and measured than in Canada, have been equated with SES and studied as determinants of smoking in pregnancy. For example, Morales, Marks, and Kumar (1997), in the London Cohort Study, found that pregnant smokers and their husbands were generally working class, which was consistent with other studies that report how pregnant women who smoke are likely to be of lower social class with fewer educational qualifications, less likely to be employed, or more likely to be on social assistance (Frost et al., 1994; Graham, 1994; Nichter et al., 2010; Tappin, Ford, Nelson, & Wild, 1996). Najman, Lanyon, Anderson, Williams, Bor, and O'Callaghan (1998) found that women in the lowest family-income group in Australia had the highest rates of smoking before, during, and after pregnancy.

Socioeconomic status seems to have little to do with relapse. While cessation rates were highest in the highest income group, relapse rates after birth were similar for all income groups. Lu, Tong, and Oldenburg (2001) systematically reviewed nine published European cohort studies that examined determinants of smoking and cessation in pregnant women. Based on their classification scheme, they found a consistent and significant inverse relationship with smoking in pregnancy and maternal age, parity, SES, education, and number of previous quit attempts. A consistent and significant relationship was also found for social structure, occupation, and marital status.

Until recently, smoking-cessation strategies and interventions have mostly avoided addressing the impact of social context on smoking within pregnant women's lives (Greaves, 1996; Horne, 1995), perhaps particularly

for women of social and economic disadvantage. For example, in the 1990s, Stewart and colleagues (1996b) found that only 23 percent of women-centred cessation programs in Canada were appropriate for, or accessible to, disadvantaged women. Barriers to access include poverty, culture, language, literacy levels, and travel and childcare costs (Health Canada, 1994a; Stewart et al., 1996a; Stout, 1997). More recently, Stewart and colleagues report on an intervention designed specifically for low-income women smokers (Stewart et al., 2010). To address these women's circumstances, the intervention was designed with their input, which was obtained through focus groups. The program utilized group sessions, buddy systems, individual social support, and childcare. Its holistic approach included program elements such as crafts, yoga, meal preparation, and self-care (ibid).

Sociodemographic predictors of spontaneous quitting among pregnant women include being White, married, young, and educated (Cnattingius, Lindmark, & Meirik, 1992; Ebert & Fahy, 2007; Penn & Owen, 2002; Tong, et al., 2009). In a study of spontaneous cessation of smoking and alcohol use among low-income pregnant women, Ockene and colleagues (2002) described a constellation of addiction, life worries, and an environmental context that essentially reinforced continued smoking. Although realistic approaches to helping low-income women remain a challenge, it is important for health professionals to be aware of and acknowledge the difficulties that low-income women face. Smoking is rarely the only health challenge these women confront during pregnancy, and issues such as food and financial security, other substance use, and domestic violence may be more urgent. Even so, the social stigma of smoking in pregnancy is significant and can cause pregnant women to falsely report their smoking status if they feel that self-identification as a smoker will lead to harassment or increased feelings of guilt. Public health messages therefore need to be framed and communicated in a way that is sensitive, nonjudgmental, and relevant to the circumstances of women's daily lives.

Smoking-cessation programs among disadvantaged women typically see high attrition rates (Lacey, Tukes,

Manfredi, & Warnecke, 1991; Stewart, et al., 1996b). Disadvantaged women sometimes reject interventions because of previous negative experiences with the mainstream health-care system (Browne, Shultis, & Thio-Watts, 1999; Stewart, et al., 1996a). Stewart and colleagues (2010) addressed high attrition rates in three Canadian cities with a specially designed intervention emphasizing participatory strategies for low-income women smokers. The program utilized peer counsellors (former smokers) and familiar community locations while providing childcare to increase participation. Sessions were also scheduled for evenings and Saturdays (Stewart, et al., 2010). Women who attend unconventional support agencies such as community-based women's centres tend to trust these agencies because of their focus on the broader issues of self-efficacy, empowerment, and the underlying social and economic factors influencing women's lives. Approaches that divert attention away from "blaming the victim" and seek to accept and respect individual values, capabilities, circumstances, and culture can carry particular relevance for women from disadvantaged groups (Lumley, Oliver, & Waters, 2000).

## **Social Networks and the Role of Family Members and Partners**

Social networks and the presence or absence of social support are important factors in tobacco reduction and cessation for pregnant women smokers. There are links between domestic status and smoking during pregnancy. For example, increased risks of smoking during pregnancy have been associated with living with others who smoke (Fang, et al., 2004; Haslam, Draper, & Goyder, 1997; Ward, et al., 2006). The presence of another smoker in the home provides easy access to cigarettes and greater temptation to smoke (Edwards & Sims-Jones, 1998; Thompson, Parahoo, McCurry, O'Doherty, & Doherty, 2004; Wakefield & Jones, 1998).

Domestic status intersects with a range of other social factors as well. For example, living with a smoker was found to be associated with a sevenfold-higher risk than in those with lower education who had a nonsmoking cohabitant (Nafstad, Botten, & Hagen, 1996). Martin and colleagues reported that among 1,076 women who

smoked at conception, those who reported a continued involvement with their partner reduced the amount they smoked by 36 percent more than women who did not report any partner involvement (Martin, McNamara, Milot, Halle, & Hair, 2007). Other studies reveal that ethnicity and class may intersect with domestic status to influence smoking and smoking cessation. Non-Hispanic White and Black women reported using less substance when they were married to their partner and had access to financial support as a result of their partnership. In contrast, domestic status did not influence Hispanic women's prenatal substance use, whereas having the social support of their partner, family, coworkers, religious peers, and neighbours reduced their likelihood of smoking (Graham, 1996; Perreira & Cortes, 2006; Stewart, et al., 1996a; Stewart, et al., 1996b). Stewart and colleagues (1996a; 1996b) and Graham (1996) emphasize the link between smoking and caring work, whereby lone parents in low-income households with few connections to the external working environment rely on smoking as a coping strategy and as a mechanism for claiming personal space. In short, domestic status, and other intersecting factors such as ethnicity and class, may increase women's vulnerability to smoking during pregnancy and postpartum.

Parity has also been associated with smoking during pregnancy. The majority of studies found that women were less likely to smoke during their first pregnancy compared to subsequent pregnancies (Cnattingius, et al., 1992; Dodds, 1995; Nafstad, et al., 1996), though conflicting findings do exist (Isohanni, Oja, Moilanen, Koiranen, & Rantakallio, 1995). Similarly, the number of children in the household has been positively associated with smoking, particularly among lone mothers (Oakley, 1989).

Research has been minimal on the role of family members, aside from partners or expectant fathers, in influencing smoking and smoking cessation among pregnant/postpartum women and girls. The few notable exceptions have highlighted the importance of family interactions in influencing tobacco reduction (Edwards & Sims-Jones, 1998; MacLean, Sims-Jones, Hotte, & Edwards, 2000; Wright, Bell, & Rock, 1989). Existing research demonstrates that individual behaviour change influences, and is influenced by, all family members

and the interrelational processes between family members (Wright & Leahey, 2000). More research has been devoted to examining the role of, and interaction between, partners in smoking reduction and cessation during pregnancy (Bottorff et al., 2005; Bottorff et al., 2006; Greaves, Kalaw, & Bottorff, 2007). Partner quitting establishes interaction patterns within a relationship (Bottorff, et al., 2006; Doherty & Whitehead, 1986) and, at least among some men whose partners are pregnant, concerns about stress-induced marital discord associated with smoking cessation that made the idea of quitting too much to cope with (Wakefield & Jones, 1998).

Women report varying interactions with their partners regarding tobacco use as a result of their pregnancy. Alterations in roles, responsibilities, and interactions that typically occur during the pre-and postnatal periods compound these complex dynamics. In a study by Thompson and colleagues (2004), some smoking partners were supportive of women's attempts to reduce or quit smoking during pregnancy, by reducing their smoking around the pregnant woman or going outside to smoke, while others continued to smoke around the woman. The authors also found that men who quit or reduced the amount they smoked "disliked" or "hated" the fact that their pregnant partners continued to smoke, and this therefore led to more arguments between couples. These men also reported placing more pressure on their partners to quit during pregnancy than during the postpartum period.

In the past few years, the Families Controlling and Eliminating Tobacco (FACET) study by Bottorff and colleagues has been committed to exploring the gendered nature of tobacco use and various couple dynamics that influence smoking cessation and reduction during pregnancy and postpartum. This research reveals complex tobacco-related interaction patterns (Bottorff, et al., 2006). People tend to have: disengaged (individualized decision-making), conflictual (shaming, monitoring, hostility), or accommodating (work together/open communication) interaction patterns (Bottorff, et al., 2006). For example, for couples with a conflictual interaction pattern, smoking cessation during pregnancy may result in the "policing" of the other partner's smoking behaviour (Bottorff, et al., 2006).



Greaves and colleagues (2007) further argue that power differences enacted through relationships influence smoking and cessation. For example, partners may use verbal abuse, intimidation, and the control of finances and children as strategies to influence pregnant or postpartum women's tobacco reduction or cessation. For some couples, tobacco reduction in pregnancy is associated with heightened conflict and women's increased vulnerability to abuse. In fact, multiple studies reveal that physical abuse during pregnancy is associated with higher use of tobacco, alcohol, and illicit drugs (Heaman & Chalmers, 2005; McFarlane, Parker, & Soeken, 1996; Perreira & Cortes, 2006). To prevent the potential increase in women's vulnerability when reducing or quitting smoking during pregnancy, Greaves and colleagues (2007) suggest intervention approaches that address couples' smoking in a "delinked" fashion, addressing a woman's smoking alone, rather than in the company of her partner.

Male partners who play a supportive role increase the chances of successful cessation for pregnant women (Fingerhut, Kleinman, & Kendrick, 1990; Lu, et al., 2001; Nafstad, et al., 1996). There is evidence that partners play a powerful role in determining whether pregnant women quit smoking and whether they are able to maintain abstinence in the postpartum period (Håkansson, Lendahls, & Petersson, 1999; Johnson, Ratner, Bottorff, Hall, & Dahinten, 2000; McBride et al., 1998; Pollak & Mullen, 1997; Wakefield & Jones, 1991). Compared to pregnant women who live with nonsmokers, those who live with a smoking partner are less likely to stop smoking during pregnancy and more likely to relapse during the postpartum period (McBride, Pirie, & Curry, 1992; Mullen, Quinn, & Ershoff, 1990). Everett and colleagues found that 80 percent of women who smoked during pregnancy were partnered with an expectant father who continued to smoke (Everett et al., 2005).

It is encouraging that more expectant fathers are likely to quit or cut back (Waterson, Evans, & Murray-Lyon, 1990) and want their partners to quit smoking during pregnancy (McBride, et al., 1998). Like pregnant women, partners often experience a change in their relationship towards smoking, with some men spontaneously quitting, while others reduce their smoking or change

when and where they smoke (Bottorff, et al., 2009). However, similar to women who smoke during pregnancy, expectant fathers with particular sociodemographic characteristics may be more likely to smoke. Expectant fathers who smoke are less likely to have an education beyond high school or to have a smoking restriction within their home; they are also more likely to drink five or more glasses of alcohol a day, have a partner who smokes, and live with rather than be married to their partner (Everett, et al., 2005). However, the majority of expectant fathers (70%) indicated trying to quit in the past year or that they were considering a quit attempt in the near future, compared to only 40 percent of the general population.

A recently conducted systematic literature review of interventions to enhance partner support for pregnant and postpartum women's smoking reduction or cessation, and cessation treatments for the partners themselves, revealed a lack of effective smoking-cessation interventions for pregnant/postpartum women that include or target partners (Hemsing, O'Leary, Chan, Okoli, & Greaves, Under review 2011). Further research is required in this area to enhance the smoking- and health-related outcomes of both the pregnant woman and her partner.

## **Race, Ethnicity, and Acculturation**

There is a lack of published material in Canada revealing smoking rates of pregnant women from different ethnic backgrounds, with the exception of limited information on First Nations populations. Most of the data here are based on information collected in the United States. In the United States, minority women fare better than White women with respect to smoking in pregnancy, counter to expectations based on their relative social and economic disadvantage. African-American and Hispanic women generally have a lower prevalence of smoking in pregnancy than White women (Andreski & Breslau, 1995; Ruggiero & de Groot, 1998; Wiemann, Berenson, & San Miguel, 1994) and immigrant women from South East Asia and the Middle East (DiClemente, Dolan-Mullen, & Windsor, 2000; Perreira & Cortes, 2006; Potter, Lumley, & Watson, 1996; Ruggiero & de Groot, 1998).

A US study by Perreira and Cortes (2006) examined the relationship between race, class, paternal health, social support, stress, health history, and tobacco use among 4,185 pregnant women in US cities. Overall, they found that smoking during pregnancy was lower among foreign-born women than women born in the United States (Perreira & Cortes, 2006). These ethnocultural groups also have higher rates of cessation in pregnancy than White women in similar socioeconomic conditions (Lillington, Royce, Novak, Ruvalcaba, & Chlebowski, 1995). From 1989 to 1998 smoking among Aboriginal (specifically American Indian/Alaska Native) pregnant women decreased by 2.8 percent to 20.2 percent, among African-American pregnant women by 7.6 percent to 9.6 percent, and among Hispanic pregnant women smoking decreased from 8 percent to 4 percent (Public Health Service and Office of the Surgeon General, 2001). Similarly, a study by Martin and colleagues found that Hispanic and Asian mothers in the US were more likely to reduce cigarette consumption compared to White mothers (Martin, et al., 2007). The level of acculturation may also have an impact on the smoking behaviours of ethnic minority women. Detjen and colleagues (2007) found that Hispanic women living in the US who measured as “highly acculturated” were more likely to smoke cigarettes during pregnancy than “less-acculturated” Hispanic women.

The evidence is inconclusive on whether or not race plays a critical role in pregnant women’s smoking cessation. In a study comparing the characteristics and correlates of quitting smoking among Black and White low-income pregnant women, Ward and colleagues (2006) argue that race was not a predictor of cessation and did not interact with other variables such as household income, pregnancy history, or smoking history to influence quit status. Factors that influenced the decision to stop smoking did not differ between low-income African American and Caucasian women (Ward, et al., 2006). In contrast, another US study found that African American women were more likely to smoke when they reported symptoms of depression, a maternal age of twenty years or older, less than a high-school education, and when they were single or lived alone and allowed smoking in the home (Orr, Newton, Tarwater, & Weismiller, 2005). A study with pregnant women in Hong

Kong found that women with a history of recreational drug use were more likely to continue smoking while pregnant. Women who were able to quit smoking were more likely to have a history of smoking fewer cigarettes. Compared to statistics for White women, this population had higher cessation rates (90%) but similar relapse rates (60%) (Kong, Tam, Sahota, & Nelson, 2008). The authors conclude that the Asian cultural context, which prioritizes family values over the needs of the individual, may have influenced Asian women’s cessation attempts (Kong, et al., 2008).

Comparable statistics are simply not available in Canada. In one of the few Canadian studies to report on ethnicity, Connor and McIntyre (1999) found that immigrant women were just over four and a half times more likely than non-immigrants to attempt to give up cigarettes during pregnancy. Another Canadian study conducted in 2010 found that pregnant women who smoked were less likely to be immigrant women (Al-Sahab, et al., 2010). It is likely that cultural values, social norms, and smoking rates in the country of origin play a large part in these differences.

## Smoking among Aboriginal Pregnant Women in Canada

In Canada the high prevalence of smoking noted in Indigenous populations appears to correspond directly with their relative social and material deprivation (Kaplan, Lanier, Merritt, & Siegel, 1997; Wiemann, et al., 1994), and the systematic historical marginalization of Aboriginal women. As we mentioned earlier in this chapter, a recent Canadian study by Heaman and Chalmers (2005) found that 61.2 percent of pregnant Aboriginal women smoked, compared to 26.2 percent of non-Aboriginal women. Non-Aboriginal women who smoked were more likely to be young, single, low-income, less educated, to use alcohol and illicit drugs, and to have received inadequate prenatal care. They were also more likely to suffer from physical abuse and violence, low self-esteem, lack of social support, and to have a higher level of perceived stress. For Aboriginal women, smoking was associated with alcohol and illicit drug use and level of education (Heaman & Chalmers, 2005). These findings indicate the importance of identifying social determinants and potential stressors that affect a

woman's cessation process and developing appropriate interventions that respond to these needs (Heaman & Chalmers, 2005). For Aboriginal women, this may include developing culturally appropriate programs that account for differences in language by tailoring the literacy level of materials and developing programs that incorporate a holistic approach (involving family, community, and environment) (Heaman & Chalmers, 2005).

A qualitative study exploring the experiences of Aboriginal women in Australia may offer some useful insights into smoking cessation among Aboriginal women who are pregnant in Canada. Wood and colleagues found that Indigenous women smoke for many of the same reasons as the general population, yet they also report additional vulnerabilities including: colonization, dispossession, racial discrimination, and socioeconomic inequalities in housing, education, employment, and income. Similarly, the researchers indicate that Aboriginal women in New South Wales often do not have access to smoking-cessation advice and services (Wood, France, Hunt, Eades, & Slack-Smith, 2008). Among these women, experiences of trauma and poverty often take precedence over smoking, because smoking is viewed as a less-immediate problem (Wood, et al., 2008). However women did report attempts to quit or reduce the amount of cigarettes they smoked (Wood, et al., 2008). Aboriginal health workers also suggested that it was easier to intervene with women who were pregnant for the first time compared with women who were already mothers. These findings suggest the need for interventions that attend to the differences between women that may increase their vulnerability to smoking during pregnancy and/or influence their ability to reduce or quit smoking.

## Maternal Age

The impact of maternal age on smoking is difficult to assess. Studies that have examined age in relation to smoking in pregnancy have reported conflicting findings. Some studies report that younger women are more likely to be smokers at the time of conception (Cnattingius, et al., 1992), and that older women have better cessation rates than younger women do (Mas, Escriba, & Colomer, 1996; Thue, Schei, & Jacobsen,

1995). Research has found that low-income, pregnant adolescents continued or even increased smoking during pregnancy to control weight and avoid dieting in the postpartum period (Klesges, et al., 2001). Similarly, a four-year cohort prospective study found that those girls who valued thinness were more likely to become established smokers, after adjusting for age, smoking status at baseline, and race/ethnicity (Honjo & Siegel, 2003). However, the girls who participated in the study were not pregnant. Conversely, there is also evidence to indicate that younger smokers are more likely to quit (Cnattingius, et al., 1992; Isohanni, et al., 1995), or to make an attempt to quit (Connor & McIntyre, 1999) during pregnancy, perhaps because they have not been smoking for as long and are therefore less dependent (O'Campo, Davis, & Gielen, 1995). For example, Dornelas and colleagues (2006) found a positive correlation between younger age and greater success in smoking cessation, but suggest that this may be due to the young women's lower nicotine dependence or relatively shorter smoking histories.

Ockene and others (2002) also found that younger age was associated with spontaneous quitting, but the effect disappeared in multivariate analysis. This highlights the potential for confounding effects between age and other social factors such as education and income. It is interesting to note that one study pointed out that young girls' (age 18 to 24) perception of their own social status was a better predictor of their postpartum smoking status, compared to the conventional measure of objective social status in terms of education level and income level (Reitzel et al., 2007).

Teenaged girls are at risk for poor perinatal outcomes, and those who smoke cigarettes are at even greater risk. It is clear that many teenaged girls who smoke during pregnancy are dependent on tobacco and need the same types of support that women need. Failed quit attempts during adolescence are often related to nicotine addiction. Girls who experience withdrawal symptoms when they stop smoking should be treated much the same as women with nicotine addiction (Eissenberg, Stitzer, Henningfield, Seidman, & Covey, 1999). However, as noted in one evidence review, there is a paucity of qualitative studies that analyze teenage pregnant

smokers' perspectives on smoking (McDermott, Dobson, & Owen, 2006). Further evidence is required to design policies and interventions that recognize and respond to the needs of young pregnant women who smoke.

## Nicotine Dependence

The amount smoked prior to becoming pregnant has been used as an indicator of dependence and may influence the relationship seen with age. In a multivariate analysis from the Norwegian Multi-Center Study (Eriksson et al., 1998), a low number of cigarettes smoked in the three months before pregnancy was the best predictor of smoking cessation. Women who smoked fewer than five cigarettes per day were eighteen times more likely to quit in early pregnancy than those who smoked twenty or more cigarettes per day (Eriksson, et al., 1998). One study conducted in 2008 revealed that smoking during the entire pregnancy was associated with heavier nicotine dependence, a longer term of smoking, fewer successful quit rates, and a greater risk of relapse (Agrawal et al., 2008). Using data from studies by Windsor and Gielen (Windsor, Boyd, & Orleans, 1998), an unpublished study of women who were exposed to a smoking-cessation intervention showed that being a light smoker (<100 ng/ml baseline saliva cotinine) predicted cessation. Similarly, in a sample of pregnant women who received public health-care support, lighter smokers (<55 ng/ml baseline cotinine) and those who had smoked for less than five years were more likely to quit (Woodby, Windsor, Snyder, Kohler, & Diclemente, 1999).

While a considerable proportion of women will spontaneously quit smoking or cut down on their tobacco use during pregnancy, there is a subgroup who do not reduce the amount they smoke. A small proportion of women actually increase smoking during pregnancy (Blalock et al., 2006; Brodsky, Viner-Brown, & Handler, 2009; Haug, Stitzer, & Svikis, 2001). This may be due to increased circulating fluid volume that dilutes nicotine—the metabolic clearance of nicotine has been reported to increase by a factor of 1.6 in pregnant women (Dempsey & Benowitz, 2001). One study (Selby, Hackman, Kapur, Klein, & Koren, 2001) found “unusually low serum concentration of nicotine” in a group of pregnant women who were heavy smokers and could not quit smoking,

thus providing evidence of a subgroup of women with a pharmacokinetic predisposition to a high rate of nicotine metabolism. These researchers call for further genetic studies to confirm this finding. A pharmacotherapy study by Benowitz and Dempsey suggested that because pregnant women metabolize nicotine faster than nonpregnant women, they may require a higher dosage of nicotine replacement therapy during pregnancy (Benowitz & Dempsey, 2004).

## The Genetics of Nicotine Dependence

Abundant evidence exists of a genetic influence on smoking behaviour (Benowitz, 2010; Ho & Tyndale, 2007; Lessov-Schlaggar, Pergadia, Khroyan, & Swan, 2008; Munafò, Clark, Johnstone, Murphy, & Walton, 2004). While research on this topic is ongoing, current data suggest that genetic influences on male and female smoking initiation and maintenance are unequal (Hamilton et al., 2006; Li, Cheng, Ma, & Swan, 2003). According to an earlier meta-analysis, heritable factors are more important in determining female smoking initiation than persistence, whereas in men, genes play a more important role in maintenance of smoking (Li, et al., 2003). However a more recent twin study suggests that genetics accounts for a lower proportion of the variance for smoking initiation among female smokers compared to males (32% vs. 71%), whereas environmental factors account for a greater proportion of explaining smoking initiation among females (68% vs. 29%) (Hamilton, et al., 2006).

While the relative male/female differences observed in genetic influence on smoking seem to be stable across cultures (Madden, Pedersen, Kaprio, Koskenvuo, & Martin, 2004), little data exist on which particular ethnic groups, if any, carry genes that predispose them to detrimental smoking outcomes. Since smoking is a polygenetic phenotype (i.e., smoking behaviour is influenced by many genes), it is extremely difficult to determine with certainty if any particular group is at increased risk. In the past decade a particular emphasis has been given to polymorphisms of the human cytochrome P450 2A6 (CYP2A6) gene, which is involved in nicotine metabolism. Available research indicates that variations in this gene among different subpopulations

may have important implications in smoking cessation (Malaiyandi, Sellers, & Tyndale, 2005). Although the frequencies of these variations in CYP2A6 genes may vary across different races (and genders within the races) (Nakajima et al., 2006), its effect on smoking behaviour and cessation within different racial groups is similar (Ho et al., 2009; Kubota et al., 2006; Malaiyandi et al., 2006). However, the current state of knowledge is such that classification based on ethnicity is not specific enough to provide improved treatment. Indeed the use of race variables in genetic studies should be approached with caution in examining complex diseases associated with smoking (Shields et al., 2005).

Advances in the understanding of smoking behaviour's genetic basis suggest that genotyping has the potential to greatly improve smoking-cessation treatments, since both pharmacological and behavioral interventions could be tailored on the basis of genetic information. This has treatment implications for all groups of smokers, but may be especially important in those who are pregnant. Wang and colleagues (2002) recently demonstrated that women who smoke who have poor nicotine-metabolizing genes are more than twice as likely to have low-birth-weight babies than are smoking mothers who metabolize nicotine and clear its toxic by-products more efficiently. More recently, Sasaki and others (2008) also found that genetic polymorphisms in smoking-associated genetic markers were associated with lower-birth-weight babies among Japanese women. However, the effects of fetal genotype on this process are unknown. These findings have important implications for the treatment of pregnant smokers and may provide better evidence-based decision making regarding the use of nicotine-replacement therapies in pregnant women who are able to efficiently metabolize the compounds produced during nicotine breakdown.

### Effects of Smoking during Pregnancy

While genetic influences on smoking are important to consider, physical environmental factors are equally influential. Some research has examined sex differences in fetal nicotine exposure on subsequent smoking behaviour later in life. For example, Oncken and colleagues (2004) found that adult females who

had been exposed to nicotine in utero were more likely to transition from initiating to daily smoking compared to their male counterparts. This finding, coupled with evidence from animal studies documenting changes in the biological arrangement of fetal nicotine receptors and other effects of nicotine exposure during gestation (e.g., Pauly, Sparks, Hauser, & Pauly, 2004), indicates that the fetal environment can have an impact on subsequent smoking behaviour.

People are generally aware of smoking's effect on women's health as well as on fetal, infant, and child health. Smoking during pregnancy is associated with adverse reproductive outcomes such as prematurity, low birth weight, sudden infant death syndrome (SIDS), and child behavioural problems. While the risks to fetal health are dose dependent, the precise mechanisms by which smoking harms the fetus are not well understood. However, there are a number of pathways through which smoking probably exerts its negative effect, namely:

1. Nicotine is a toxin at the cellular level and also has vasoconstrictive properties. Uteroplacental insufficiency has been commonly cited as the mechanism by which smoking causes fetal growth retardation and placental abruption. Researchers hypothesize that nicotine causes vasoconstriction of uteroplacental blood vessels, which reduces blood flow to the placenta and decreases delivery of oxygen and nutrients to the fetus. However, the validity of this mechanism has been questioned (Dempsey & Benowitz, 2001).
2. In addition to nicotine, cigarette smoke contains carbon monoxide, cyanide, lead, arsenic, and four thousand other potential toxins (International Agency for Research on Cancer, 2004). Carbon monoxide—a major by-product of cigarette smoking—binds to hemoglobin and decreases the blood's oxygen-carrying capacity which results in hypoxia in fetal tissue.
3. There is evidence that nicotine exposure has direct effects on the fetus's developing nervous system and that relatively small amounts of exposure can cause cell damage and reduced cell numbers.

This effect can lead to problems with neonatal respiratory control. However, the placenta does provide significant fetal protection and research suggests that episodic drug delivery produces less exposure to the fetus than continuous drug delivery (Slotkin, 2008).

4. Smoking may alter maternal/fetal nutritional status (Benowitz et al., 2000; Uusitalo et al., 2008).

Women who smoke during pregnancy have lower and decreasing folate levels while they are pregnant (Pagán, Hou, Goldenberg, Cliver, & Tamura, 2001; van Wersch, Janssens, & Zandvoort, 2002). While some think this may be due to smoking's influence on nutritional patterns (smoking alters appetite and taste), McDonald, Perkins, Jodouin, and Walker (2002) reported no dietary folate differences in smokers and nonsmokers who had significantly different serum folate levels. They hypothesize that there is a gene-environment interaction that accounts for this difference and suggest that pregnant women who smoke may benefit from higher doses of folic acid prior to conception.

5. It is likely that the mechanisms for the adverse effects of smoking in pregnancy are multifactorial and perhaps phasic (i.e., the timing and exposure of cigarette smoking may differentially affect pregnancy outcomes). Some studies suggest that negative outcomes are most pronounced with continued smoking during the second half of pregnancy (Slotkin, 1998). Although quitting smoking early in pregnancy is most desirable, quitting late in pregnancy also seems to have benefits when compared with continued smoking (Klesges, et al., 2001).

## Relapse among Pregnant and Postpartum Women and Girls

Currently, pharmacological or behavioural interventions have shown limited effectiveness at preventing smoking relapse (Gaffney, 2006; Levitt, Shaw, Wong, & Kaczorowski, 2007; Piasecki, Fiore, McCarthy, & Baker, 2002) among postpartum women and girls. In

the most recent systematic review on this topic, Levitt and colleagues found that there was no effect of advice, cessation materials, or counselling interventions on smoking quit rates, relapse prevention, or smoking reduction during postpartum. However, they noted that women's readiness to quit smoking, confidence in preventing relapse, and self-efficacy was enhanced and improved with these supports (Levitt, et al., 2007). Relapse therefore presents a significant challenge for individuals engaged in smoking cessation and for clinicians supporting their cessation efforts. Although pregnancy provides a strong inducement for many women to stop smoking, studies have revealed that up to 70 percent of the women who stop smoking for pregnancy resume smoking within the first six months after giving birth (Fingerhut, et al., 1990; Levitt, et al., 2007; Mullen, Richardson, Quinn, & Ershoff, 1997; Roske et al., 2006). These relapse rates are similar to the rates for other groups of quitters but, unlike other smokers who quit, many pregnant women typically experience periods of prolonged abstinence before they relapse. Despite this, their vulnerability to relapse, especially during the immediate postpartum period, is, at least superficially, remarkably similar to that of early quitters (Stotts, DiClemente, Carbonari, & Mullen, 1996).

## Predictors of Postpartum Relapse

Studies of postpartum relapse have identified a variety of risk factors related to a return to smoking including: "taking puffs," self-efficacy, types of coping strategies, and either not breastfeeding or early weaning (McBride, Pirie, & Curry, 1992; Mullen, et al., 1997; Nichter et al., 2008). Other factors associated with postpartum relapse include: postpartum depression (Levitt, et al., 2007; Pletsch, 2006), weight gain (Fang, et al., 2004; Nichter et al., 2007; Pletsch, 2006; Roske, et al., 2006), the experiences of stress or relationship problems (Fang, et al., 2004; Levitt, et al., 2007; Roske, et al., 2006), a lack of social support (Fang, et al., 2004; Nichter, et al., 2007), a lack of prenatal care (Fang, et al., 2004), having a partner who smokes (Fang, et al., 2004; Levitt, et al., 2007; Roske, et al., 2006), and alcohol use (Levitt, et al., 2007). Women who are younger or heavier smokers (Fang, et al., 2004), of a lower socioeconomic status (Reitzel, et al., 2007), African-American (Fang, et al.,

2004; Letourneau et al., 2007), or who have a lower education (Letourneau, et al., 2007) also report higher postpartum relapse rates. This range of factors suggests that women's smoking is complex and influenced by social, relational, and pregnancy-specific experiences. Understanding postpartum relapse is further complicated by the fact that the postpartum period represents a significant life change as women make the transition to new parenthood and that factors contributing to abstinence during pregnancy may either be absent or operate differently during the postpartum period (Klesges, et al., 2001).

One of the most influential theories in the addictions field that addresses relapse after behaviour change and provides direction for preventing relapse is Marlatt's relapse model (Marlatt & Gordon, 1985). This work conceptualizes relapse as a process influenced by cognitive and behavioural mechanisms rather than as a discrete, irreversible event. Initial uses of the substance (lapses) are distinguished from a full return to regular use (relapse). Relapse-prevention training based on this model includes skill training to anticipate and resist lapsing in high-risk situations and cognitive restructuring to deal with self-defeating attributions after the lapse. Although relapse-prevention training may be a promising approach for use with pregnant and postpartum women, some researchers are raising questions about whether women's experiences with postpartum smoking relapse are congruent with the model's explanation of relapse.

In a qualitative study focusing on the meanings that postpartum women ascribe to their experiences of smoking relapse, Bottorff, Johnson, Irwin, and Ratner (2000) describe five narratives of relapse. Significantly, in several of the narratives, women did not demonstrate the self-defeating attributions suggested as a key component of relapse in Marlatt's model. Instead, women looked forward to smoking again as a reward for temporary abstinence and described their relapse as a way to manage the stress of caring for a new baby. Because smoking was a coping strategy that had been effective in the past, they saw no other alternative but to return to smoking.

A more recent theory posited by Gaffney (2006), borrowing from Mercer (2004), categorizes the transition of becoming a mother into three stages: first is the commitment, attachment, and preparation during pregnancy. Women who quit during this stage do so mainly for the health of their fetus. Next comes the acquaintance, learning, and physical restoration phase, occurring during the first two to six weeks after birth. During this stage of trial and error, infant irritability and crying increases, becomes a potential stressor, and therefore increases the risk of relapse (Gaffney, 2006). For example, research has shown a high incidence of relapse when infant irritability peaks (Gaffney, 2006; Gaffney, Baghi, Zakari, & Sheehan, 2006; Gaffney, Beckwitt, & Friesen, 2008). Gaffney and others (2006) found that women returned to smoking when they did not know how to respond to their infants' constant crying—they were seeking relief from care-giving stressors. Finally, the "moving towards the new normal" occurs two weeks to four months following the birth of the infant. By the time women feel confident in their care-giving capabilities, after approximately four months, they have often already relapsed (Gaffney, 2006). While this model is helpful, it does not explain relapse scenarios that occur later than four months following birth. Gaffney and colleagues also suggest that other potential factors such as postpartum depression, postpartum fatigue, and having a preterm baby should be explored because these variables can interrupt the transition to motherhood (Gaffney, 2006).

Despite the fact that the stresses during the postpartum period are well documented and that stress is one of the main factors associated with smoking relapse, stress reduction has not been a strong component of relapse-prevention interventions for pregnant and postpartum women. This may be in part because stress is not a prominent component in most relapse-prevention models such as Marlatt's. By contrast, Roske and colleagues recommend that relapse prevention interventions include psychological reinforcement of women's intentions to maintain abstinence, incorporate tools and strategies for managing stressful incidents, and address women's involvement with a social network who smokes (Roske, et al., 2006).

Stages and processes of behavioural change described in the Transtheoretical Model (Prochaska, DiClemente, & Norcross, 1993) have also been used to understand the process of smoking cessation in pregnancy. Theoretically, according to the stages of behaviour change, pregnant quitters are considered to be in the action phase because they have quit smoking. However, critics have suggested that the relatively high postpartum relapse rates may indicate that women who have quit during pregnancy have not fully resolved their ambivalence about quitting and may, in fact, be more like those who are at earlier stages of the behaviour-change process (Stotts, DiClemente, Carbonari, & Mullen, 2000).

When the mechanisms that characterize smoking cessation are examined in groups of pregnant and nonpregnant women who are quitting smoking, important differences have been observed (Stotts, et al., 1996). Pregnant quitters reported significantly lower levels of experiential and behavioural change processes as well as significantly higher levels of confidence to abstain from smoking and lower levels of temptation compared to nonpregnant women in the action phase. Stotts and colleagues (1996) conclude that the change mechanisms are very different for pregnant smokers. Low utilization of cognitive-affective and behavioural coping strategies appear to underlie the relative ease with which pregnant smokers stop smoking and leads to their exaggerated sense of confidence to remain smoke-free and resulting low levels of temptation to smoke. Using these findings to explain women's high rate of relapse in the postpartum period, these researchers suggest pregnancy smoking cessation is a case of "mistaken identity." They propose that, because pregnant women's cessation efforts are essentially an externally motivated (that is, for the fetus and/or baby) rather than an internal, intentional process of change, smoking cessation during pregnancy should be considered as "stopping"—a time-limited restriction or suspension of behaviour.

As such, many pregnant quitters enter the postpartum period unprepared, and sometimes unwilling to maintain smoking cessation and consequently resume smoking soon after the baby is born. Since the Transtheoretical Model attempts to explain "intentional behavioural change," Stotts, DiClemente, Carbonari, and Mullen

(2000) raise questions about the model's usefulness in guiding interventions for pregnant and postpartum women. They call for further research to describe externally motivated or imposed cessation and its underlying mechanisms to provide a basis for more effective intervention strategies. Stotts and her colleagues (2000) have developed a potentially useful tool for identifying pregnant quitters who are "truly" in the action phase of the smoking-cessation process and those further behind in the process of change and, therefore, at high risk for postpartum smoking relapse. The three-item algorithm assesses personal goals, self-efficacy, and smoking behaviour to categorize women's "suspended" tobacco use into four stages of change for postpartum smoking abstinence (i.e., precontemplation, contemplation, preparation, and action).

Preliminary data support the use of this relatively simple tool for classifying abstinent pregnant smokers who were of higher educational and socioeconomic status levels and relatively light smokers. But we also need to recognize that women's responses to the screening questions may be influenced in part by what it is "possible" for them to say. That is, women might have good reasons for not always disclosing all the details about their behaviours. An analysis of the explanations provided by mothers who smoke suggests that dominant social discourses related to tobacco use and motherhood not only create dissonance for women but influence the way they respond to others (Irwin, Johnson, & Bottorff, 2005).

Nevertheless, given the lack of tools for clinicians who interact with pregnant and postpartum quitters, this screening tool is an innovative and promising development that may provide a basis for tailoring interventions strategies. The implication arising from Stotts's and colleagues' research is that pregnant women who have "stopped" smoking for pregnancy need intensive interventions when they enter the postpartum period if we are to support them in converting their smoking-cessation effort into a long-term commitment to cessation. In addition, such interventions will need to extend well into the postpartum period if we are to prevent late relapse.



For women who are unable to quit, reducing smoking during the postpartum period can aid in cessation. A qualitative study from Nichter and colleagues (2008) suggests that there are benefits to smoking fewer cigarettes for those women who are experiencing difficulties in quitting, including: increased self-efficacy, decreased nicotine dependency, and a greater likelihood of quitting in the future. Nichter and colleagues recommend that we envision smoking cessation as a dynamic process consisting of lifestyle changes, the shaping and maintenance of self-identity/social relations, and mechanisms for dealing with stress (Nichter, et al., 2007).

In summary, successful relapse-prevention strategies will depend on a better understanding of the range of factors that contribute to relapse and how they interact across the entire process of smoking cessation. Further exploration of the usefulness of emerging concepts such as relapse susceptibility and cessation fatigue, and reconceptualizing motivation to quit as a dynamic factor that can “wax and wane” over the cessation period, are likely to generate novel directions for interventions (Piasecki, et al., 2002). Although there is increasing recognition that the relapse experiences of pregnant quitters are unique, there are important gaps in the literature. For example, the focus on postpartum smoking relapse ignores any recognition of relapse experiences that occur prior to the birth of the baby. There is evidence that relapse prior to delivery may be as high as 21 to 25 percent among spontaneous quitters (Klesges, et al., 2001; Quinn, Mullen, & Ershoff, 1991). In addition, the smoking relapse experiences of pregnant adolescents have not been documented even though there are potentially important factors specific to this age group that influence their relapse risk. Finally, a review by Fang and co-workers reported that the interventions most likely to prevent postpartum relapse were programs that addressed the smoking habits of the partners or others living in the home and incorporated social support and positive encouragement (Fang, et al., 2004).

## Treatment Approaches

### Treatment of Tobacco Dependence in Young Girls and Women of Reproductive Age

Traditional approaches to helping tobacco users have involved the provision of clinical treatments, including pharmaceutical aids and counselling. However, a series of factors limits the potential of clinical treatments to make an impact at the population level. Moreover, many treatment attempts lack a solid scientific foundation and are inaccessible and underutilized.

Social factors affecting many smokers such as poverty and low education, transportation, and child-care issues (to name a few) can reduce the accessibility of treatments. Part of a comprehensive response to pregnant women who smoke could be policies that improve social determinants of health such as housing and income. At the intervention and social levels, we have to avoid victim blaming and replace the notion of smoking as a “lifestyle choice” with the acknowledgment that smoking is typically a response to social and structural issues.

The social environment can facilitate or inhibit quitting. For example, compared to smokers who received no support, those who received positive support were more likely to remain abstinent after a quit attempt while those who resided in a negative social situation were less likely to remain abstinent. A history of either physical and/or sexual abuse is further associated with higher substance use both before and after a woman has confirmed she is pregnant (Martin, Beaumont, & Kupper, 2003; McFarlane, et al., 1996). Pregnant women have reported that abuse begins or increases when they refuse to use substances with the abuser (McFarlane, et al., 1996). Research also reveals a high prevalence of smoking among pregnant women with co-occurring psychiatric and substance-use disorders (Goodwin, Keyes, & Simuro, 2007; Martin, English, Clark, Cilenti, & Kupper, 1996; McCormick et al., 1990; Zhu & Valbø, 2002).

A 2002 clinical trial involving more than five hundred heavy smokers in the US found that the most powerful predictor of long-term abstinence was how much negative effect participants experienced, and their expectations of how well nicotine replacement products might ameliorate such symptoms (Kenford et al., 2002). The tendency to experience negative effects was not only a more accurate predictor of abstinence than traditional measures of nicotine dependence, but it also accounted for most of the predictive validity of these measures (Kenford, et al., 2002). This is part of a growing body of research demonstrating that how a quitter deals with negative emotions associated with their quit attempt (as opposed to pre-existing or coexistent affective and psychological distress) has a large impact on the ability to remain smoke free (McDonald, et al., 2002). Similarly, a review by Fang and colleagues (2004) found that stress was a strong predictor of relapse in the postpartum period. Caggiula and others (2001) have underscored the importance of psychological conditioning and reinforcement in the maintenance of smoking behaviour, and called for increased consideration of smoking-associated cues in cessation strategies. While many believe the primary difficulty in quitting rests with overcoming biological factors through pharmacotherapy and other treatments, the influence of cognitive, affective, and environmental factors is also substantial. Therefore an effective cessation strategy must extend well beyond the issues of human biology to address the social, economic, and physical environment issues as well as intrapersonal factors.

## Nicotine Replacement

The issue of nicotine dependence among girls and women who continue to smoke during pregnancy has been largely ignored in the practice setting. It is widely assumed that pregnant women will be motivated to quit for “the good of the child” and therefore that it is unnecessary to consider the addictive nature of nicotine. Addiction has been defined in a variety of ways, but it is generally agreed that it can be characterized as the compulsive use of a drug that has psychoactive properties and that may be associated with tolerance and physical dependence (Kalant, 2000). Most

individuals who smoke every day are addicted to nicotine and will experience withdrawal symptoms once they stop smoking. It follows that the majority of pregnant women who smoke daily are addicted to nicotine. There is no demarcated threshold that indicates addiction: some individuals who smoke as few as five cigarettes per day can experience significant withdrawal symptoms (Kalant, 2000).

However, the adverse effects of smoking can be avoided if pregnant smokers quit smoking. Human and animal data indicate that the risk of cigarette smoking during pregnancy is far greater than the risk of exposure to pure nicotine (Dempsey & Benowitz, 2001). In those who cannot quit there is evidence that use of harm-reduction approaches such as reducing the amount smoked or using NRT (thereby limiting carbon monoxide exposure) have benefits to both the mother and the child. One study demonstrated no significant association between the duration or type of NRT used during pregnancy and reduced birth weight, although conjunctive use of more than one NRT product might have negative effects (Lassen et al., 2010).

## The Role of Harm Reduction in Perinatal Smoking Cessation

Harm reduction is a pragmatic response to drug use recognizing that “there are many reasons why people engage in higher risk behaviour and not all people are able to make the immediate changes necessary to refrain from such behaviours. Harm reduction is a set of non-judgmental policies and programs which aims to provide and/or enhance skills, knowledge, resources and support that people need to live safer, healthier lives. It encourages people to build strengths and to gain a sense of confidence” (Government of British Columbia, 2005, p. 4).

Suggested harm-reduction strategies for pregnant tobacco users include reducing the number of cigarettes smoked, stopping smoking for brief periods of time at critical points in pregnancy and around delivery, engaging in health-protection behaviours such as taking vitamins and exercising, reducing environmental tobacco smoke (ETS) exposure, and addressing partner smoking (DiClemente, et al., 2000). While complete

smoking cessation during pregnancy would have the greatest positive health impact on the pregnant woman and the fetus, reduced exposure to the health-damaging effects of tobacco is better than no change in exposure. A study by England et al. (2001) indicates that the dose-response relationship between tobacco exposure and infant birth weight is nonlinear. As such, reduced tobacco exposure needs to be further explored as a feasible approach to addressing smoking among those pregnant women who find it particularly difficult to change their smoking behaviour.

Resistance to a harm-reduction approach to tobacco use is common. Critics argue, for example, that a harm-reduction approach gives tobacco users false hope about the effectiveness of NRTs, that there is little evidence that a harm-reduction approach to smoking intervention leads to long-term quitting, and further, that such an approach serves to maintain, not reduce, harm (Fiore, Hatsukami, & Baker, 2002; Pierce, 2002; Warner, 2002). While the United States Public Health Service Clinical Practice Guidelines (Fiore, et al., 2002) cite insufficient evidence to support harm reduction as an effective strategy, Fox and Cohen (2002) argue that the failure lies with health professionals who do not implement the guidelines systematically. Consequently, the effectiveness of a harm-reduction approach to tobacco use cannot be assessed without ensuring that the strategies are implemented fully and consistently.

The potential benefits of a harm-reduction approach for some groups of smokers (e.g., pregnant women, low-income individuals, individuals with a mental illness, and heavy smokers) are significant and need to be explored (Hatsukami et al., 2002). There is evidence that a harm-reduction approach to tobacco use with pregnant women (especially heavy smokers or those who continue to smoke throughout their pregnancy) has the potential to reduce harm to both the woman and her fetus (Hanna, Faden, & Dufour, 1997; Li & Windsor, 1993; Malchodi et al., 2003).

## Smoking-Cessation Models/Programs in Substance-Use Treatment

Nicotine addiction is beginning to find a place in the wider context of substance-use-treatment settings and

interventions. Evidence suggests that among women who are using other substances, between 81 percent (Burns, Mattick, & Wallace, 2008) and 88 percent (Haug, et al., 2001) smoke during pregnancy and they are almost eleven times more likely to continue smoking during pregnancy than women smokers who do not use drugs (Burns et al., 2008). Another study found that for low-income US women who used both cigarettes and alcohol, only 25.1 percent quit smoking after becoming pregnant (Ockene, et al., 2002).

Historically, nicotine addiction has largely been ignored by the wider substance-use-treatment field, despite the high rates of tobacco use among individuals with alcohol and other substance-use problems. There is evidence that the combined effects of smoking and alcohol are even more detrimental to health than the effects of either substance alone (Blot, 1992; Castellsagué et al., 1999) and the co-use of tobacco and alcohol could create an increase in health risks among pregnant women, which is more than the sum effects of either drinking or smoking alone (Odendaal, Steyn, Elliott, & Burd, 2009). The combined health-damaging effects of tobacco and other substances have the potential to harm both the pregnant woman and her fetus.

Although cigarette smoking poses a serious threat to the health of women with addictions (including pregnant women), there has been resistance to considering nicotine a “problem drug” along with other substances in addictions-treatment programs. This resistance stems from three major sources. The most significant barrier has been the perception that addressing cigarette smoking will interfere with, and have a negative impact on, treatment for alcohol and other drugs (Chisolm et al., 2010; Fuller et al., 2007; Hahn, Warnick, & Plemmons, 1999). Second, there has sometimes been resistance from staff members who may themselves be smokers to incorporating a smoke-free environment (Bobo & Davis, 1993; Tajima et al., 2009). Finally, substance-use-treatment programs have often mirrored the societal resistance to accepting cigarette smoking as similar to other problem substances.

However, over the past decade, evidence has slowly emerged to indicate that treating nicotine addiction

does not interfere with alcohol and other drug treatment (Baca & Yahne, 2009; Hurt & Offord, 1996; Martin et al., 1997; Okoli et al., 2010). In fact, some studies have found that treating nicotine addiction in conjunction with alcohol and other drug addictions increases the chance of maintaining sobriety (Bobo, Schilling, Gilchrist, & Schinke, 1986; Orleans & Hutchinson, 1993; Trudeau, Isenhardt, & Silversmith, 1995). Treatment centres have addressed staff resistance by creating smoke-free work environments (e.g., Fishman & Earley, 1993; Knudsen, Boyd, & Studts, 2010). Some of the strategies employed in implementing such measures include offering, supporting, and paying for staff to undergo smoking-cessation programs themselves (Campbell, Krumenacker, & Stark, 1998; Tajima, et al., 2009). These measures are important. As Campbell and colleagues (1998) report, success was greatest in treatment settings in which the smoking-cessation program was staff-supported and integrated with substance-use treatment.

Examples of settings where cigarette smoking is addressed in conjunction with other substances include CODA in Portland, Oregon (Campbell, et al., 1998); the Counterpoint Unit at CPC Parkwood Hospital in Atlanta, Georgia (Fishman & Earley, 1993); the Minneapolis VA Medical Center (Pletcher, 1993) in the United States; and in Canada there is the Vancouver Aurora Centre (Poole, Greaves, & Cormier, 2003), and the Centre for Addiction and Mental Health in Toronto (Bernstein & Stoduto, 1999). At the Aurora Centre in Vancouver, British Columbia, nicotine addiction is routinely addressed as part of the substance-use-treatment program. An important factor has emerged there that affects the introduction of tobacco cessation into addictions treatment. When asked, clients have consistently identified nicotine as one of their top three problem substances, and the majority have indicated they fully support Aurora's integrated smoke-free treatment approach (Tindall, 2009). Given that the

women themselves identify nicotine as a key "problem drug" and want integrated treatment, it is imperative that addictions-treatment programs respond (Poole, et al., 2003). By integrating the tobacco-intervention field and alcohol- and other substance-use-intervention fields, it is clear that substance-use-treatment settings have the potential to intervene with pregnant tobacco users who may or may not have other substance-use issues.

## Economic Evaluations

There has been a dearth of economic evaluations of smoking-cessation interventions for pregnant women. Typically, researchers employ the following four types of economic evaluations: cost-minimization analysis (CMA), cost-effectiveness analysis (CEA), cost-benefit analysis (CBA), and cost-utility analysis (CUA). However, CBA and CEA have been the two most commonly used methods in the existing literature (Ruger & Emmons, 2008). The majority of these evaluations measure the benefit or effect based on only the short-term smoking outcomes for the women (such as quit rates), though some also take into account other outcomes such as infant health risk and money saved on averted infant death or on neonatal intensive care. Long-term outcomes such as life-years gained or saved, as well as prevention of long-term disability, were considered occasionally. One limitation of the existing economic evaluation studies we reviewed is that the measures for costs saved or benefits gained are not unified, which prevents the possibility of conducting a meta-analysis. The US Panel on Cost-Effectiveness in Health and Medicine recommends the use of cost-utility analysis as a method for conducting cost-effectiveness studies. By analyzing and reporting the economic advantages of interventions, researchers may influence policymakers' decisions regarding which programs to implement or support.



# 3. Methodology: Interventions Studied and How They Were Evaluated

There are wide population-based strategies for persuading people to quit smoking, such as taxation and pricing policies, advertising campaigns, and environmental tobacco smoke (ETS) regulations that have not been evaluated here (see, for example, Levy, Romano, & Mumford, 2004). Such comprehensive tobacco-control programs clearly affect pregnant women as a subgroup of the population. However, the interventions we considered in this report are aimed directly at pregnant and postpartum women themselves, and are generally either self-administered or given by health-care professionals. What follows is a critical analysis of those interventions, or aspects of them.

## Population

Smoking-cessation and reduction interventions aimed at girls and/or women who are pregnant or postpartum were reviewed for this report. Our team also reviewed interventions and programs tested in or aimed at specific subpopulations of this group.

prevention models that reach pregnant and/or postpartum girls and women. The review focused primarily on evidence from Canada and the United States although we also examined smoking-cessation and relapse-prevention models for pregnant and postpartum girls and women from other developed countries such as Australia and the UK.

## Body of Evidence

Our team collected information from a variety of sources about smoking-cessation and relapse-

The main source of evidence for the review was studies that evaluated the efficacy or effectiveness of a smoking intervention targeted at pregnant and/or postpartum girls/women. We retrieved evidence from

peer-reviewed journals, government reports, books, chapters from books, material presented at conferences, and material identified through expert consultation. Ninety-seven studies on the effectiveness of smoking interventions directed at our target populations were identified through this process.

To be included in the review, studies had to be published between January 1990 and March 2010. Additionally, the intervention had to be designed for pregnant or postpartum women or girls with the intent to assist them in quitting or reducing their tobacco use. The search terms and databases we used are described in Appendix B.

## Data Extraction

The first step in the review process was to extract information from each of the pieces of evidence we identified. We developed a data collection form to record information about all smoking interventions. This form was divided into five sections:

1. *Identification*. This section included the name and location of the intervention's delivery, a description of the evidence source, and a general description of the program itself.
2. *Program or Intervention Information*. This section outlined more details about the intervention, including the delivery setting, a description of the service providers, and more information about the intervention itself (e.g., the theory on which the intervention was based, the components of the program, length of the intervention, target population, and service fees).
3. *Evaluation—Participants*. When applicable, this section described the demographic characteristics and smoking behaviour of the participants in the study that was testing the intervention.
4. *Evaluation—Methodology*. For interventions that we evaluated, this section identified the general methodology, including design, measures, and timeline of the study.
5. *Evaluation—Outcome*. This section outlined the results of the study and described its limitations.

## Data Analysis: Rating the Strength of the Evidence

We used separate processes to review studies evaluating smoking interventions and program materials that had no accompanying evidence for their potential impact on the smoking behaviour of the target population (see Figures 3.1 to 3.3). Here we describe how we rated interventions and program materials with accompanying evaluation data. We describe program materials with no evaluation data later in this chapter.

Rating the strength of the evidence for the first edition of *Expecting to Quit* involved a multistep process. For all articles dated prior to 2003, this was the process we followed:

1. Any study examining the impact of a smoking-cessation intervention aimed at pregnant or postpartum women was included in the review.
2. We used a rating system similar to the one adopted by Miller and colleagues (2001) for their best-practices review of group smoking cessation. Although there were few models available for designing a rating system, we deemed Miller and colleagues' model as the most promising and appropriate approach despite several limitations (which we discuss in the next chapter). Each study identified through step 1 was designated as either a randomized controlled trial ("RCT-experimental design with random assignment of participants to groups"), a controlled trial ("experimental design with comparable treatment and control groups"), or a quasi-experimental design ("pre-test/post-test design or observational study").
3. We used questions 1 through 7 of the randomized and/or controlled trial rating scale (questions 1 through 6 for the quasi-experimental scale) to categorize studies that included the pregnancy period. Scores on all questions were summed.

Scores greater than or equal to 5 fell into the “A” category while scores below 5 fell into the “B” category (for the quasi-experimental scale, scores higher than or equal to 4 were classified as “A” and scores under 4 fell into the “B” category. Studies assigned a 0 or less did not receive a rating and were eliminated from the review (refer to the first edition of *Expecting to Quit* [Greaves, et al., 2003] for twelve studies prior to 2003 that were eliminated from the review due because they received ratings of 0 or less).

4. For studies concentrating on the postpartum period only, questions 1, 2, 3, 5, and 7 (questions 1, 2, 4, and 6 for the quasi-experimental scale) were used to categorize interventions.

5. For controlled postpartum interventions, those scoring 4 or above were classified as “A” and those scoring less than 4 were classified as “B.” For quasi-experimental postpartum interventions, those scoring 3 or above were classified as “Quasi-A” and those scoring less than 3 were classified as “Quasi-B.” Studies assigned a 0 or less did not receive a rating and were eliminated from the review.

Studies scoring 1 or above fell into one of six categories, based on their score:

1. RCT A
2. RCT B
3. CT A
4. CT B
5. QUASI A
6. QUASI B

Studies scoring 0 or less did not receive a rating and were eliminated from the review. (See Appendix A for a further description of the rated articles included in the review and details about their interventions.)

Figure 3.1: Study Rating Scale – Randomized and/or Controlled Trials

- 1) Were the groups comparable at baseline with respect to demographic variables, tobacco-use measures, and gestational week?
  - All (all variables measured; comparable on all variables) (1)
  - Some (all variables measured; comparable on some variables) (0)
  - None (some variables not measured) (-1)
- 2) Participants lost at follow-up considered smokers or adequate justification provided for why not? (Intent to treat)
  - Yes (1) No (0)
- 3) Attrition rate > 25%? (attrition due to factors other than loss of fetus)
  - Yes (-1) No (0)
- 4) Spontaneous quitters (i.e., women who quit prior to undergoing intervention) included in study?
  - Yes (-1) No (0)
- 5) Outcome assessment relies on corroboration of self-report or biochemical validation?
  - Yes, fully (2) Yes, partially (1) No (0)
- 6) Outcome assessment includes follow-up into postpartum period?
  - Yes (1) No (0)
- 7) Appropriate statistical test used for comparisons involving smoking outcome?
  - Yes (1) No (0)

Scoring: Scores on questions 1 to 7 were summed. Scores  $\geq 5$  fell into the “RCT A” or “CT A” category while scores  $< 5$  fell into the “RCT B” or “CT B” category. Studies assigned a 0 or less did not receive a rating and were eliminated from the review.

Figure 3.2: Study Rating Scale –  
Quasi-Experimental Studies

- 1) Participants lost at follow-up considered smokers or adequate justification provided for why not? (Intent to treat)  
Yes (1) No (0)
- 2) Attrition rate > 25%? (attrition due to factors other than loss of fetus)  
Yes (-1) No (0)
- 3) Spontaneous quitters (i.e., women who quit prior to undergoing intervention) included in study?  
Yes (-1) No (0)
- 4) Outcome assessment relies on corroboration of self-report or biochemical validation?  
Yes, fully (2) Yes, partially (1) No (0)
- 5) Outcome assessment includes follow-up into postpartum period?  
Yes (1) No (0)
- 6) Appropriate statistical test used for comparisons involving smoking outcome?  
Yes (1) No (0)

Scoring: Scores on questions 1 to 6 were summed. Scores  $\geq 4$  fell into the "Quasi A" category while scores  $< 4$  fell into the "Quasi B" category. Studies assigned a 0 or less did not receive a rating and were eliminated from the review.

To analyze the materials published between 2003 and 2010, which make up this second edition of *Expecting to Quit*, we employed a slightly different set of evaluation criteria. We determined the strength of the evidence using a model developed by the National Institute for Health and Clinical Excellence (NICE), an internationally respected government organization responsible for providing national guidance on promoting good health and preventing and treating ill health in the United Kingdom. All of the studies identified through the literature search from 2003 to 2010 were rated by two

independent reviewers in order to determine the quality and strength of each piece of evidence. We assessed studies for their methodological rigour and quality based on the critical-appraisal checklists provided in the *Methods for Development of NICE Public Health Guidance* (National Institute for Health and Clinical Excellence [NICE], 2006). Each study was categorized by type (as type 1 or 2) and graded on the basis of criteria such as suitable control group(s), appropriate measures, outcomes, statistical analyses, attrition rates, and other sources of bias—all of which are traditional indicators of methodological rigour for intervention studies. The grading code, "++," "+," or "-" is based on the extent to which the potential sources of bias have been minimized (see Table 3.1).

This method provides a very clear and consistent means of rating the evidence. For example, a randomized controlled trial (type 1) fulfilling most criteria and a cross-sectional (type 2) study fulfilling very few criteria would appear in the format (1++) and (2-) respectively. Based on the rating assigned to the individual studies and the number of studies demonstrating impact, evidence was rated as either "strong evidence of positive impact," "sufficient evidence of positive impact," or "insufficient evidence" for each target population (i.e., general population of pregnant women, low-income/ education pregnant women, young pregnant women).

## Identifying Effective and Ineffective Interventions and Program Components

Rated studies scoring 1 or above were divided into two groups: those showing a significant difference between treatment and control groups in smoking outcomes, and those not showing a statistically significant effect. We rated each study of an intervention as either "strong evidence," "sufficient evidence," or "insufficient evidence," based on the criteria outlined on the next page.



Table 3.1: Study Rating Overview

Type and quality of evidence	
1++	RCTs (randomized controlled trials, including cluster RCTs) with a very low risk of bias
1+	RCTs (including cluster RCTs) with a low risk of bias
1-	RCTs (including cluster RCTs) with a high risk of bias
2++	Well-conducted non-RCTs (i.e., controlled trials/quasi-experimental studies), case-control studies, cohort studies, CBA (cost-benefit analysis) studies, ITS (interrupted time series), and correlation studies with very low risk of confounding, bias, or chance and high probability that the relationship is causal
2+	Well-conducted non-RCTs, case-control studies, cohort studies, CBA studies, ITS, and correlation studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal
2-	Non-RCTs, case-control studies, cohort studies, CBA studies, ITS, and correlation studies with a high risk or chance of confounding bias, and a significant risk that the relationship is not causal
Grading the evidence	
++	All or most of the quality criteria have been fulfilled. Where they have been fulfilled the conclusions of the study or review are thought <i>very unlikely</i> to alter.
+	Some of the criteria have been fulfilled. Where they have been fulfilled the conclusions of the study or review are thought <i>unlikely</i> to alter.
-	Few or no criteria fulfilled. The conclusions of the study are thought <i>likely</i> or <i>very likely</i> to alter.

### Strong Evidence:

1. Design = RCT/CT A (or 1++/2++) *and* number of studies = minimum 2
2. Design = RCT/CT B (or 1+/2+) *or* quasi-experimental A *and* number of studies = minimum 5

### Sufficient Evidence:

1. Design = RCT/CT A (or 1++/2++) *and* number of studies = minimum 1
2. Design = RCT/CT B (or 1+/2++) *or* quasi-experimental A *and* number of studies = minimum 3
3. Design = Quasi-Experimental B (or 2+) *and* number of studies = 5

### Insufficient Evidence:

1. Design = RCT/CT B (or 1+/2+) *or* quasi-experimental A *and* number of studies < 3
2. Design = Quasi-experimental B (or 2+) *and* number of studies < 5

### Applying Plausibility Criteria

Interventions were evaluated against the following plausibility criteria:

1. Time sensitivity—Is the intervention current or still considered reliable?
2. Replicability—Is there enough information about how to implement the intervention effectively?
3. Generalizability—Is the intervention appropriate to the target population or subpopulations?
4. Cost benefit—Is the intervention worth the cost of implementation?

### Preliminary Recommendations

After looking at all the evidence and ranking material with our criteria for plausibility, we can recommend certain interventions and their program components. Our recommendations are divided into best practices, better practices, and those showing promise. We strongly recommended interventions and components backed with *strong* evidence of effectiveness that met all of the plausibility criteria as “best practices,” whereas interventions and components with only *sufficient* evidence of effectiveness despite having plausible criteria were recommended as “better practices.” When we found intervention studies that showed a significant effect but suffered from *insufficient* strength of evidence, we rated them as plausible and “showing promise.” Those interventions backed by strong or sufficient evidence but that failed to meet the plausibility criteria were also designated as “showing promise.”

## Review of Program Materials

In this review, we classified smoking-cessation methods that are primarily recognizable through their materials, rather than published academic literature, as programs. Programs may or may not have evaluation data—those with accompanying information on smoking-cessation outcomes were considered in the same way as interventions and were subjected to the review process we outlined earlier. (See the appendices for more details about evaluated program materials.)

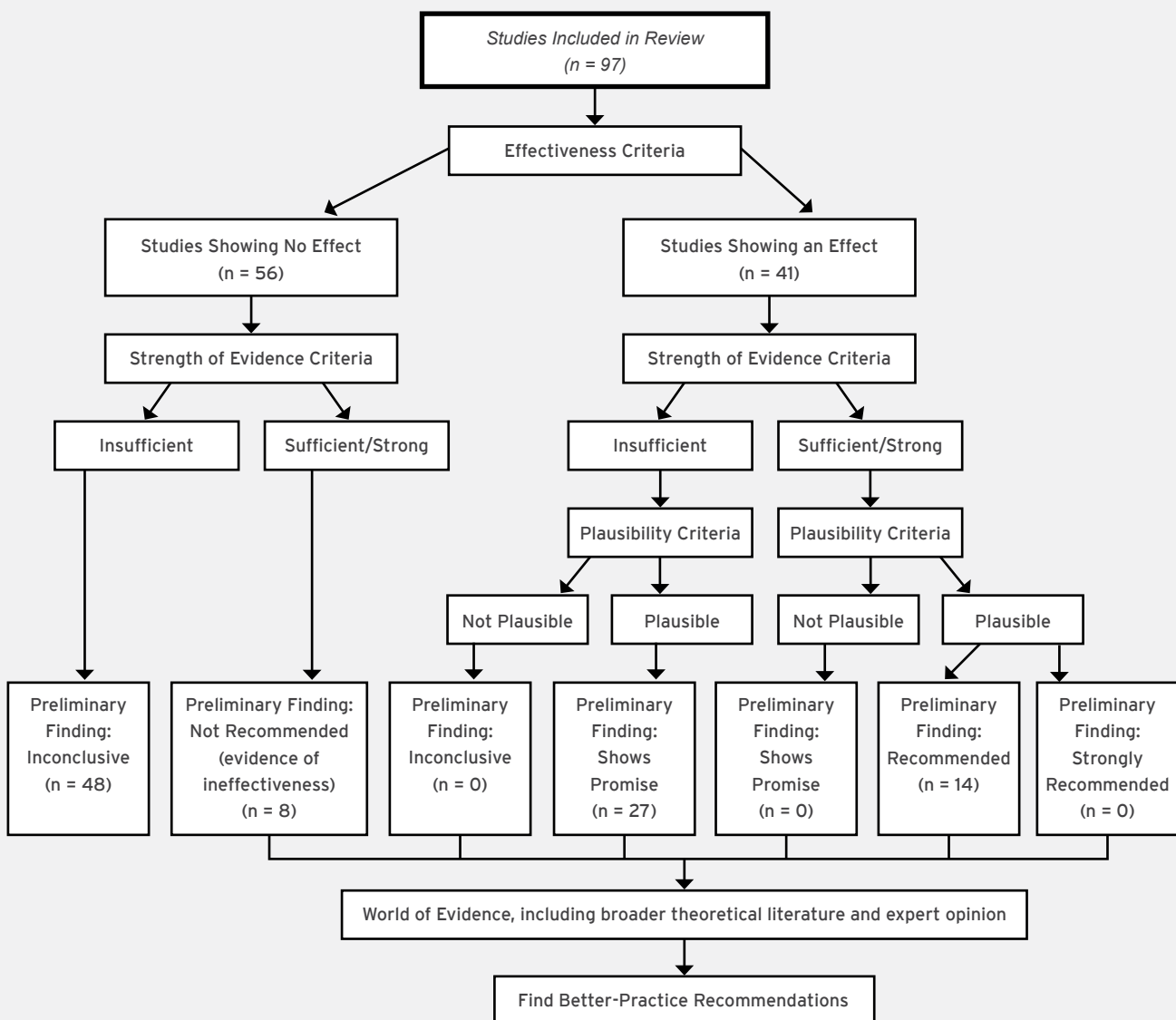
Programs for which there is no evaluation evidence underwent a different review process—we reviewed their materials for content and individual components.

Programs that use all or the majority of the components backed by evidence that also meet the plausibility criteria were classified as “showing promise.”

## Final Better-Practice Recommendations

Preliminary recommendations generated by the best-practices model were considered in the context of broader literature (described in chapters 4 and 5) to arrive at final better-practice recommendations, presented in chapter 6. These final recommendations draw on available evidence regarding both interventions and program materials, and other theoretical work.

Figure 3.3: Study Classification Scheme





## 4. Results:

# Which Cessation Interventions Are Promising for Which Women

A total of ninety-seven studies were included in our review, of which seventy-one were randomized controlled trials, nineteen were controlled trials, and seven were cohort/quasi-experimental studies. Based on evidence for their effectiveness and methodological strength (see Table 4.1), we recommended fourteen interventions, and classified twenty-seven as “showing promise.” Fifty-six interventions had weak evidence so they could not be recommended. These interventions are listed in Tables 4.1 and 4.2.

Of the interventions listed in Tables 4.1 and 4.2, approximately sixty-five were tested in the “general” pregnant smoking population (of which one study assessed women in an army medical hospital) and thirty-two were tested specifically in pregnant subpopulations, including ethnic minorities (n = 3), women of low socioeconomic status (n = 19), heavy smokers (n = 6), women in treatment for substance-

use disorders (n = 2), and teenaged girls and young women (n = 2). One study did not specify the targeted population for the intervention. We discuss the results for each of these pregnant groups separately. A detailed summary of our review of each intervention can be found in Appendix A. Please refer to Table 4.3 for a detailed description of how many studies were included and eliminated from the review.

Table 4.1: Effective Interventions and Programs

Author, Year	Intervention Focus	Population	Description of Intervention
Gadomski et al., 2011	Postpartum	General	Counselling, relapse prevention, tailored biological information, incentives
Reitzel et al., 2010	Relapse prevention	Low income	Information, motivational interviewing, relapse prevention, telephone counselling
Heil et al., 2008	Prenatal	Low income	Vouchers/incentives
French et al., 2007	Prenatal	General	Information, motivational interviewing, home visit, telephone support
de Vries et al., 2006	Prenatal	General	Video, self-help guide, and booklet aimed at smoking partners
Ferreira-Borges, 2005	Prenatal	General	Counselling and behavioural intervention
Higgins et al., 2004	Prenatal	General	Incentives
Hegaard et al., 2003	Prenatal	General	Information, counselling, pharmacotherapy (NRT)
Donatelle et al., 2000	Prenatal	Low income	Information, tailored information, social support, incentives
Windsor et al., 2000	Prenatal	Low income	Information, tailored information, counselling
Walsh et al., 1997	Prenatal	General	Information, tailored information, social support, counselling, incentives
O'Connor et al., 1992	Prenatal	Low income	Information, tailored information
Hjalmarson et al., 1991	Prenatal	General	Information, tailored information, counselling
Ershoff et al., 1989, 1990; Mullen et al., 1990	Prenatal	General	Information, tailored information
Edwards et al., 2009	Postpartum	Low income	Self-help guide, counselling
Hannöver et al., 2009	Postpartum	General	Information, counselling, telephone, relapse prevention
Bryce et al., 2009	Prenatal	Young women	Information, motivational interviewing, relapse prevention, NRT as needed
Pollak et al., 2007	Prenatal	General	Counselling, pharmacotherapy
Albrecht et al., 2006	Prenatal	Pregnant adolescents	Information, counselling, peer modelling, support
Avidano Britton et al., 2006	Prenatal	General (rural)	Tailored information
Dornelas et al., 2006	Prenatal	General	Counselling, telephone support
Hotham et al., 2006	Prenatal	Heavy smokers	Pharmacotherapy (NRT), counselling
Chan et al., 2005	Prenatal	General	Pharmacotherapy (bupropion)
Pbert et al., 2004	Prenatal	Low income	Brief intervention tailored to stage of change
Polanska et al., 2004	Prenatal	General	Information, counselling, relapse prevention
Cope et al., 2003	Prenatal	General	Tailored biological information
Gebauer et al., 1998	Prenatal	Low income	Tailored information, counselling, 4A approach
Wakefield & Jones, 1998	Prenatal	General	Tailored information, partner support, tailored biological information
Secker-Walker et al., 1997	Prenatal	White, educated	Tailored information, counselling
Hartmann et al., 1996	Prenatal	General	Tailored information, counselling
Lillington et al., 1995	Prenatal	Low income	Tailored information, information, counselling, incentives
Haug et al., 1994	Prenatal	General	Information, tailored information
Valbø & Nylander, 1994	Prenatal	General (heavy smokers)	Tailored information
Valbø & Schioldborg, 1994	Prenatal	General	Tailored information



Table 4.1: Effective Interventions and Programs—Continued

Author, Year	Intervention Focus	Population	Description of Intervention
Petersen et al., 1992	Prenatal	General	Information, tailored information
Burling et al., 1991	Prenatal	General	Information, tailored information
Valbø & Schioldborg, 1991	Prenatal	General	Counselling/information
Gillies et al., 1990	Prenatal	General	Information, counselling, tailored biological information (optional)
Mayer et al., 1990	Prenatal	Low income	Tailored information, counselling
Shakespeare, 1990	Prenatal	General	Information
Windsor et al., 1990, 1993	Prenatal	General	Information, tailored information

Table 4.2: Ineffective Interventions and Programs

Author, Year	Intervention Focus	Population
Cinciripini et al., 2010	Postpartum	General
Hennrikus et al., 2010	Prenatal	General
Patten et al., 2010	Prenatal	Low income (Alaskan Natives)
Winickoff et al., 2010	Postpartum	General
Stotts et al., 2009	Prenatal	General
Bullock et al., 2009	Prenatal	General
Ruger et al., 2008	Prenatal	General
Kientz & Kopperschmidt, 2006	Postpartum	General
Rigotti et al., 2006	Prenatal	General
Tappin et al., 2005	Prenatal	General
Gulliver et al., 2004	Prenatal	General
Haug et al., 2004	Prenatal	Chemical dependence
McBride et al., 2004	Prenatal	Army medical centre women (US)
Stotts et al., 2004	Prenatal	Low income
Lin et al., 2003	Prenatal	General
Malchodi et al., 2003	Prenatal	Low income
Buchanan, 2002	Prenatal	General
Moore et al., 2002	Prenatal	General
Neil-Urban et al., 2002	Prenatal	General
Schroeder et al., 2002	Prenatal	Heavy smokers
Stotts et al., 2002	Prenatal	General
Ford et al., 2001	Postpartum	General
Hajek et al., 2001	Postpartum	General
Jaakkola et al., 2001	Prenatal	General
Kapur et al., 2001	Prenatal	Heavy smokers

	Strength of Evidence (Strong/Sufficient/Supported by Expert Opinion/Insufficient)	Plausibility (Implementation Plausible/Not Plausible)	Recommendation
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise
	Insufficient	Plausible	Shows promise

	Description of Intervention	Strength of Evidence (Strong/Sufficient/Supported by Expert Opinion/Insufficient)	Recommendation
	Counselling focused on depression	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Counselling, telephone sessions	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, video, telephone, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, ultrasound, motivational interviewing, telephone counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, self-help booklet, social support	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, self-help materials, motivational interviewing, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, telephone support	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling, telephone counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, motivational interviewing	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Counselling, self-help material, incentives, partner support	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Stage-of-change-based counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Telephone counselling, partner support, relapse prevention	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Motivational interviewing	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Peer-support counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Self-help booklets	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Self-help guide, telephone	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Pharmacotherapy, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, tailored information, counselling, relapse prevention, tailored biological information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Counselling, pharmacotherapy	Insufficient	Inconclusive based on insufficient evidence of effectiveness

Table 4.2: Ineffective Interventions and Programs—Continued

Author, Year	Intervention Focus	Population
Cinciripini et al., 2000	Prenatal	General
Dunphy, 2000	Postpartum	81% African American
Hughes et al., 2000	Prenatal	General
Johnson et al., 2000; Ratner et al., 2000	Postpartum	General
Scott & McIlvain, 2000	Prenatal	Low income
Strecher et al., 2000	Prenatal	General
Van't Hof et al., 2000	Relapse prevention	General
Wisborg et al., 2000	Prenatal	Heavy smokers
Ershoff et al., 1999	Prenatal	General
McBride et al., 1999	Postpartum	General
Panjari et al., 1999	Prenatal	General
Secker-Walker et al., 1998b	Relapse prevention (spontaneous quitters)	Low income (~65% on Medicaid)
Ker et al., 1996	Prenatal	Chemical dependence treatment population
Valbø & Eide, 1996	Prenatal	General
Wright et al., 1996	Prenatal	General
Ershoff et al., 1995; Mullen et al., 1990	Postpartum	General
Kendrick et al., 1995	Prenatal	Low income
Secker-Walker et al., 1995	Relapse prevention	General
Secker-Walker et al., 1994	Prenatal	General
Rush et al., 1992	Prenatal	General
Secker-Walker et al., 1992, 1998a, Solomon et al., 1996	Prenatal	Low income (~70% on Medicaid)
Haddow et al., 1991	Prenatal	Low income
Shakespeare, 1990	Prenatal	Unspecified
Oncken et al., 2008	Prenatal	General
Øien et al., 2008	Prenatal	General
Lawrence et al., 2003	Prenatal	General
Solomon et al., 2000	Prenatal	Low income
Tappin et al., 2000	Prenatal	General
Wisborg et al., 1998	Prenatal	General
Gielen et al., 1997	Prenatal	Low income
Lowe et al., 1997	Prenatal	General (spontaneous quitters)



	Description of Intervention	Strength of Evidence (Strong/Sufficient/Supported by Expert Opinion/Insufficient)	Recommendation
	Information, tailored information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, counselling, incentives	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, tailored biological information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, computer-generated tailored information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Relapse prevention, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Pharmacotherapy	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Self-help booklet, relapse prevention, telephone counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, relapse prevention, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, tailored biological information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Ultrasound, hypnosis	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, tailored information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling, relapse prevention	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, counselling	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Tailored information, tailored biological information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Information	Insufficient	Inconclusive based on insufficient evidence of effectiveness
	Pharmacotherapy (NRT), motivational interviewing	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Brief intervention, counselling	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Self-help manual, computerized intervention, stage of change	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Counselling	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Information, counselling	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Information, counselling, incentives	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Tailored information counselling, social support (buddy)	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness
	Social support, counselling	Sufficient evidence of ineffectiveness	Not recommended based on sufficient evidence of ineffectiveness

## Methodological Limitations

There are several methodological limitations in the studies that we have reviewed so far. The studies often vary in how they define “smoker and non-smoker,” which diminishes precision and comparability among studies. There are also differences in the approach each study takes to the issue of spontaneous quitting. Some studies measure spontaneous quitting and some do not. Therefore, it is sometimes difficult to assess whether the quit rates during pregnancy are due to the intervention or are independent of the intervention. Another issue concerns those women who drop out of the study. Are these women counted as smokers or not? Many studies did state that intent-to-treat analysis was applied—that is, the drop-outs were counted as smokers. Nevertheless, this aspect was not always clear in the studies we reviewed. If such women are not counted as smokers, it could have a significant effect on the absolute rates of cessation reported in the studies.

Many tobacco-cessation interventions for pregnant smokers are deliberately tailored to meet the perceived needs of pregnant women. A tailoring process is commonly used in many of the interventions, but it is often not defined or explained in any useful detail and the criteria for tailoring components of interventions remain obscure. So while tailoring is clearly an important component of cessation interventions, the precise nature of the tailoring, and the theoretical context in which it takes place, is often difficult to identify. Moreover, studies rely on self-report measures and different time points to assess the main outcomes. For example, one of our concerns involves interventions that are developed for prenatal cessation but that also assess cessation in the postpartum period. Several studies with demonstrated positive outcomes at the end of pregnancy were not able to maintain abstinence rates in the postpartum period. It seems important to clarify and distinguish treatment approaches aimed at cessation during pregnancy as opposed to those that aim to maintain abstinence (or prevent relapse) postpartum.

There is also the general issue of effectiveness and efficacy. Interventions can be valid and supported in research settings but then fail the test when they are

applied in the “real world.” This practical issue is difficult to assess in reviewing the literature on interventions because there is little discussion of applicability issues and little description of how programs are applied or delivered. For example, some studies report assessments of clinical efficacy and adherence to clinical protocols, but the wider assessment of whether or not the intervention would pass the “real-world” test (i.e., clinical effectiveness) is often left undone.

Our assessment of program materials was hampered by the general lack of evaluation data and, where it was available, inconsistent evaluation data. This is particularly troublesome when attempting to establish better practices because many programs and materials exist or are adapted in real-life situations but they suffer from a lack of research and evaluation. In some cases, we found that components of an intervention study were such program materials (for example, self-help booklets), but again, the effects of the material component were not often assessed separately from the whole intervention, which further contributes to a lack of clarity about the effects of program materials. A final problem is the lack of an updated general registry of such programs for both clinical and research purposes.

However, the most significant overall methodological concern is the specific roles of various components in the interventions, and how they are difficult to assess independently. Most interventions contain several elements or components. As the field of tobacco cessation for pregnant smokers has evolved and expanded, multicomponent programs appear to have become the rule rather than the exception. However, the various components are often not isolated in testing, so their specific impact in these interventions is difficult if not impossible to evaluate.

## Interventions for Heavy Smokers and Teenaged Girls

Because both successful and unsuccessful interventions targeted at pregnant smokers involved multiple components, mostly we did not test the effectiveness of individual components, unless they tested nicotine

replacement therapies. It is therefore not possible to recommend with certainty any particular intervention components as efficacious. Indeed, evidence-based guidelines recommend the use of multicomponent interventions and treatments to optimize the chances of successful cessation (Fiore et al., 2008). However, we did note that some components appear repeatedly in successful interventions for pregnant smokers, especially tailored information in the form of a self-help guide and pharmacotherapy. Self-help guides may be important for supporting cessation efforts in the “general” pregnant smoker population whereas pharmacotherapy may be considered for those who are not able to benefit from other approaches.

The pregnant population is not a uniform target group. In addition to socioeconomic and cultural differences among pregnant smokers, women vary considerably in the amount of nicotine they use. Heavy smokers—those women who smoke ten or more cigarettes per day during their pregnancies—and teenaged girls obviously require different approaches and support during their cessation attempts. Although in many studies teens and heavy smokers are treated separately in statistical analyses, the degree to which interventions are tailored to meet their specific needs is unknown.

Women smoking more than ten cigarettes per day, even late into their pregnancies, also represent a distinct group for tailored smoking-cessation interventions. Six of our reviewed studies specifically addressed smoking cessation among pregnant women identified as “heavy smokers.” Interventions included the use of tailored information through a self-help guide (Valbø & Nylander, 1994), tailored information and ultrasound viewing (Valbø & Nylander, 1994), nicotine replacement therapy (NRT) (Wisborg, et al., 2000), and NRT with counselling (Hotham, et al., 2006; Kapur, et al., 2001; Schroeder, et al., 2002). The use of tailored information with and without the ultrasound viewing was efficacious (Valbø & Nylander, 1994; Valbø & Schioldborg, 1994). NRT combined with counselling was efficacious in only one study on short-term cessation (Hotham, et al., 2006). However the majority of studies using NRT with or without counselling did not demonstrate the NRT’s effectiveness.

Few cessation programs exist for adolescents, the majority of tobacco interventions for this age group being school-based initiatives to prevent initiation in the first place. It is unlikely that cessation strategies for pregnant women can be applied directly to pregnant teens, given their vastly different contextual environments and life circumstances. Only two studies met our methodological and outcome criteria for addressing smoking cessation among teenagers (Albrecht, et al., 2006) and young women (Cahill, 2009). Albrecht and colleagues considered their research as “an initial attempt to intervene with pregnant adolescent smokers in a randomized controlled trial” (Albrecht, et al., 2006, p. 409), which was confirmed by our review. Their study randomized the participants into three arms, including a controlled group with usual teenage prenatal care and two experimental groups, each with an eight-week program based on cognitive behavioural therapy. The intervention program was a modified version of the “Teen Fresh Start Program” (TFS) from the American Cancer Society. They also incorporated developmental components of Jessor’s Problem Behavior Theory (Jessor, Donovan, & Costa, 1991), which targets peer modelling and peer sanctions on smoking. The difference between the two intervention arms was that one of them included an additional nonsmoking female “buddy.” There was a significant difference on short-term cessation effects between the TFS-B (with buddy) arm and the control group (odds ratio = 3.730, CI = 1.001-13.893,  $p = .010$ ), but there was no long-term effectiveness demonstrated at one-year post-randomization follow-up for either of the intervention arms. Although the promising effect shown in the short term (eight weeks following entry) of TFS intervention plus buddy support was not adequate for making any recommendation for long-term abstinence goals, it certainly points in a direction for developing programs tailored to adolescent pregnant smokers.

Among young women twenty-five years old and younger, Bryce and colleagues (2009) conducted a cohort study made up of an intervention using motivational interviewing, relapse prevention, and NRT as needed. The study achieved a 22.8 percent quit rate at three months postintervention, which decreased to 16.5 percent after twelve months had passed. Since this study did not

have a comparison group, no strong recommendations regarding the intervention can be made. However, this study does provide some basis for conducting future studies among young pregnant women.

## Pharmacological Interventions for Pregnant Smokers

The efficacy of pharmacological interventions, including the use of NRTs and other drugs such as bupropion (Zyban), is well established in the general adult population. In nonpregnant smokers, when used as directed, NRTs in any form and bupropion in particular are generally safe. Pharmacological interventions can increase successful quit rates as much as twofold alone and even threefold when used in combination with counselling (Fiore, et al., 2008). These medications are mainly used to help minimize withdrawal symptoms that people can experience while quitting. Although there has been some suggestion that pharmacotherapies may not be as effective in women as in men (Cepeda-Benito, Reynoso, & Erath, 2004; Perkins & Scott, 2008), until recently there has been a paucity of clear evidence of these interventions' efficacy in assisting pregnant women who smoke.

The research that has been conducted suggests that, while fetal growth may not be adversely affected by the use of the nicotine patch (Schroeder, et al., 2002; Wisborg, et al., 2000), there is mixed evidence for its effectiveness on cessation (Hegaard, et al., 2003; Hotham et al., 2005; Ogburn et al., 1999; Pollak, et al., 2007; Wisborg, et al., 2000; Wright et al., 1997). The level of nicotine to which the fetus is exposed with the patch or gum has been demonstrated to be lower than that from cigarettes (Benowitz, et al., 2000; Oncken, et al., 2008). All of these studies monitored maternal cotinine level to make sure there was no more nicotine than baseline level—maternal cotinine level is said to directly reflect fetal cotinine level.

Nine reviewed studies assessed the use of pharmacotherapy for smoking cessation among pregnant women. Four studies suggested that the use of pharmacotherapy with counselling (Hegaard, et al.,

2003; Hotham, et al., 2006; Pollak, et al., 2007) or bupropion alone (Chan, et al., 2005), may be beneficial for end-of-pregnancy smoking cessation. The efficacy of pharmacotherapy seems to be increased with longer duration of use.

Based on the state of research in the field, we can make the following recommendations:

1. Behavioural therapy should be encouraged before or at least in conjunction with pharmacological intervention. It is preferable to have women quit without the assistance of pharmacotherapy but NRT can be offered as an option to those who are more challenged by nicotine abstinence. Therapies such as NRT and bupropion have potential side effects which should be explained to the woman.
2. NRT should be used with women who are unable to quit during pregnancy. Intermittent formulations of NRT (such as NRT gum) might be preferable because these formulations minimize the harm that constant exposure to nicotine (i.e., from a patch) might cause the fetus (Benowitz, et al., 2000; Dempsey & Benowitz, 2001). Some researchers have suggested that the patch should be discontinued during sleeping hours so that nicotine levels at night might be no higher than they would be with regular smoking (Kapur, et al., 2001).
3. There is currently little information available on the use of bupropion during pregnancy. One controlled but non-randomized study suggested that bupropion is more effective than a placebo for pregnant smokers (Chan, et al., 2005). However, the same study has suggested that there may be an increased risk for spontaneous abortion among women treated with bupropion during pregnancy (Chan, et al., 2005). Currently, clinicians suggest that bupropion can be used with pregnant smokers (Okuyemi, Ahluwalia, & Harris, 2000).
4. Because small amounts of nicotine can be excreted into breast milk (Dempsey & Benowitz, 2001), pregnant women are recommended to breastfeed before using NRT to minimize infants' exposure

(ASH (Action on Smoking and Health), 2007). Babies' exposure to bupropion in breast milk is relatively minimal and does not warrant enough concern to preclude its use for postpartum smoking cessation among breastfeeding mothers (Haas, Kaplan, Barenboim, Jacob III, & Benowitz, 2004).

## Incentives or Contingency-Management Interventions for Pregnant Smokers

Contingency management (i.e., using incentives) has been shown to promote smoking cessation in the general population with important considerations for pregnant women (Cahill & Perera, 2008; Donatelle et al., 2004). Incentives can enhance external motivation and reduce the reinforcing effects of smoking during a quit attempt (Donatelle, et al., 2004). Several controlled trials of contingency management on illicit drug use have been conducted with evidence of its effectiveness (see review by Lussier, Heil, Mongeon, Badger, & Higgins, 2006). These studies suggest that the timing of the payment as an incentive as well as the magnitude of the incentives play critical roles in the outcome (Lussier, et al., 2006). However, the use of incentives for smoking cessation among pregnant women has not been fully examined.

Among our reviewed studies, nine assessed the addition of incentives as part of smoking interventions. Only two studies (Heil, et al., 2008; Higgins, et al., 2004) assessed the use of a voucher-based incentive alone on smoking cessation among pregnant women. Heil and colleagues (2008) found a significantly different abstinence rate between voucher groups and non-voucher-contingent groups at the end of pregnancy (41.0% vs. 10.0%) and at twelve weeks postpartum (24.0% vs. 3.0%). However, point-prevalence abstinence at the twenty-four-week postpartum assessment was not significantly different between the contingent group and the controlled group. The results of this study confirmed the short-term efficacy of incentives on pregnant women and also the high relapse rate once they are discontinued. In a similar fashion, Higgins and others (2004) reported similar rates of smoking cessation between voucher- and

non-voucher-contingent groups at the end of pregnancy (37% vs. 9%) and at twelve weeks postpartum (33% vs. 0%).

Both Higgins and colleagues (2004) and Heil and colleagues (2008) calculated the cost effectiveness of such contingency programs. According to Heil and team (2008), the average individual cost for the voucher-contingent group is between 0 and 1,180 dollars, although they argued that this cost would very well balance the potential medical costs associated with pregnancy smoking. Higgins and colleagues (2004) reported a lower total mean voucher earning of \$397 in the contingent group and \$313 in the non-contingent group, suggesting that this method may be cost effective. Incentive programs require biochemical assessments of cessation which may increase costs.

Other studies we reviewed also assessed incentives in conjunction with smoking-cessation information and counselling (Dunphy, 2000; Gadomski, et al., 2011; Gulliver, et al., 2004; Lillington, et al., 1995; Walsh, et al., 1997; Wisborg, et al., 1998) and incentives in conjunction with partner/social support (Donatelle, et al., 2000; Gulliver, et al., 2004). With the exceptions of the studies by Gulliver et al. (2004), Dunphy et al. (2000), and Wisborg et al. (1998), incentives in conjunction with other intervention components were found to be effective at the end of pregnancy and into the postpartum period. These studies provide modest evidence to support the use of incentives alone, or in conjunction with other evidence-based intervention components (i.e., counselling) to promote smoking cessation among pregnant smokers.

Some ethical questions come to mind about the suitability of using public funds to "pay people" to do what others do anyway without being paid (Donatelle, et al., 2004). However, observations on the cost effectiveness of such incentive-based interventions may ameliorate the potential costs associated with continued smoking among pregnant women—which also places a burden on the health-care system, particularly among low-income and marginalized women who are often the recipients of incentive-based interventions.

## Smoking-Cessation Interventions for Subpopulations of Pregnant Smokers (Ethnic Groups, Low-SES Women)

Although many women spontaneously quit smoking when they find out they are pregnant, there are some subpopulations of women who find it harder to quit. These populations are often characterized by higher nicotine dependence and they face greater barriers to accessing assistance in quitting. Among these subpopulations, women who are of minority groups and who have low education and income tend to have higher rates of smoking during pregnancy than the US general public (Cnattingius, 2004). Since smoking during pregnancy is linked to poverty and low socioeconomic status, it is not surprising that these are the women who often make up the intervention populations. Ideally, best practices should arise from those interventions targeted *and* delivered to low-income and minority subpopulations.

Four US interventions from our review addressed smoking cessation targeted for women within different minority ethnic groups. Most recently, Patten and colleagues (2010) examined the use of information, videos, and telephone counselling among Alaskan Natives. There were no significant differences between the intervention and the control group (6% vs. 0%). Dunphy and others (2000) utilized information, counselling, and incentives to examine postpartum abstinence among a population of mostly African-American women (81%). They found that the intervention had the effect of maintaining abstinence for 31 percent of the treatment and control group combined, with no significant differences between the groups. In a similar fashion, Lillington and colleagues (1995) used tailored information, counselling, and incentives to assess smoking cessation among low-income Hispanic and Black women. The intervention produced significant differences in abstinence between the intervention and control groups both among Black (26.6% vs. 8.5%) and Hispanic (20% vs. 16.6%) women. Based on these studies, combinations of tailored information, counselling, and incentives may be a promising approach to smoking

cessation among minority women and/or women with low incomes.

It remains a challenge to establish the most effective interventions for low-income women, given several differences between studies in methodologies, intervention components, populations, and program-delivery settings. In the United States, one-quarter of pregnant women receive their prenatal care in health departments, federally funded health initiatives, or academic clinics, and interventions have been targeted to these predominantly low-income subgroups. Women in these settings have elevated rates of late enrolment for prenatal care, use of substances other than tobacco, and low literacy. Existing staff are often relied upon to implement the intervention. Given the challenges that staff face, such as competing priorities and limited time to engage in research tasks, the provided intervention does not always have the same intensity and consistency.

Of the nineteen studies addressing low-income women in our review, nine interventions proved to be successful in providing end-of-pregnancy/end-of-treatment smoking cessation. The successful studies used a combination of tailored information (including self-help guides) and counselling—including brief interventions (Edwards, et al., 2009; Gebauer, et al., 1998; Mayer, et al., 1990; O'Connor, et al., 1992; Pbert, et al., 2004; Windsor, et al., 2000) and incentives (Donatelle, et al., 2000; Heil, et al., 2008; Lillington, et al., 1995). These studies present evidence that combining tailored information, counselling, and the use of incentives may be promising interventions for smoking cessation among low-income pregnant women.

Tobacco reduction might also be an approach to consider for socially and economically disadvantaged pregnant women who cannot or will not quit. Women who reduce smoking by 50 percent during pregnancy give birth to infants with a higher average birth weight than do women who do not change their smoking behaviour (Li & Windsor, 1993). However evidence suggests that smoking reduction is most beneficial in terms of fetal growth only when women reduce their cigarette consumption to eight or fewer cigarettes per day (England, et al., 2001), particularly if the reduction occurs in the second and third trimesters (Prabhu et al., 2010). In addition

to the positive effects on the fetus, smoking reduction improves the woman's health and provides clinicians an opportunity to support, encourage, and empower the woman herself to engage in the process of quitting.

In short, despite the consistently high rates of smoking documented among socially and economically disadvantaged subpopulations of pregnant women, few tobacco-cessation programs have been tailored to this group. There is some evidence to suggest that smoking-cessation interventions can be effective for these women, but the relative effectiveness of specific components remains unclear. Interventions that target disadvantaged subpopulations of women likely require more intensive and focused interventions with multiple components that result in a higher "dose" of the intervention. The use of monetary incentives and the inclusion of tobacco-reduction strategies (for those unable to achieve abstinence) are promising avenues for further investigation.

## Smoking-Cessation Interventions/ Programs within Substance-Use- Treatment Settings

Of the studies included in our review, only three evaluated smoking-cessation interventions that were incorporated into programs for women with substance-use issues (Haug, et al., 2004; Ker, et al., 1996; Waller, Zollinger, Saywell, & Kubisty, 1996). Two evaluations (Ker, et al., 1996; Waller, et al., 1996) were preliminary studies that showed some promising effects. Importantly, these studies suggest that smoking-cessation interventions that are carefully tailored for substance-use settings are feasible and acceptable to women who smoke and also to the staff who work in these venues. These findings are supported by a survey of Canadian addiction programs in which over half of the 223 programs responding to the survey report providing some assistance with quitting smoking (Currie, Nesbitt, Wood, & Lawson, 2003). The emphasis on smoking cessation in these programs and the strategies used, however, vary considerably. For example, the study by Haug and others (2004) examined smoking cessation for women in opioid-dependence

treatment. The intervention employed a stage-of-change-based counselling approach. There were no significant differences between the intervention and control groups at the end of treatment, although women in the intervention group, overall, moved significantly further towards quitting smoking.

Experiences of implementing a smoking-cessation program within a residential substance-use program for pregnant and postpartum women indicate that traditional smoking-cessation programs designed for individuals who are already motivated to quit smoking are ineffective in this setting (Ker, et al., 1996). In contrast to a traditional program for motivated quitters, Ker and others' efforts to design an "involuntary smoking-cessation program" included a carbon-monoxide-monitoring system, positive reinforcement for reducing or quitting smoking, and education focused on helping women achieve a higher readiness to quit.

Positive responses to these programs, even from previously resistant smokers, suggest that these approaches have a potential application to women at varying levels of readiness to quit. Although specific recommendations for smoking-cessation interventions offered in the context of other substance use await the results of well-designed studies, it is clear that tailored cessation interventions should be offered to pregnant and postpartum women in substance-use-treatment settings—to those women requesting assistance to stop smoking as well as to those who are unmotivated to quit.

## Interventions for Relapse Prevention and Postpartum Smokers

In more recent years, tobacco-use researchers have been paying attention to relapse prevention in the postpartum period. A methodological limitation of many earlier studies lay in assessing the effects of prenatal smoking-cessation interventions on postpartum abstinence. Where many interventions had relative success in achieving end-of-pregnancy abstinence, relapse in the postpartum period was quite frequent. Thirteen reviewed

studies assessed postpartum smoking cessation. Of these, four reported success in maintaining smoking cessation. Successful interventions included the use of relapse prevention, tailored information, counselling, social support, tailored biological feedback, and the use of incentives (Edwards, et al., 2009; Gadomski, et al., 2011; Gillies, et al., 1990; Hannöver, et al., 2009). It seems that combinations of different interventions are more successful than individual interventions.

Increased interest in assisting pregnant women with long-term smoking cessation has stimulated the development of interventions and programs focused on preventing postpartum smoking relapse that include: 1) providing information and advice to women about the benefits of long-term cessation, both for their children and themselves, and 2) skill building to manage high-risk situations and slips (DiClemente, et al., 2000; Dunphy, 2000; Johnson, et al., 2000; McBride, et al., 1999; Ratner, et al., 2000; Secker-Walker, et al., 1995; Severson, Andrews, Lichtenstein, Wall, & Akers, 1997; Van't Hof, et al., 2000; Wall & Severson, 1995). The interventions have included a variety of self-help materials (in printed or video formats), tailored letters or newsletters, one-to-one brief counselling sessions (either in person or by telephone), and chart reminders. With one exception, these interventions have been individually focused on the women themselves. Project PANDA (Parents and Newborns Developing and Adjusting), however, specifically targets the partners as well as

the women with newsletters and videos during the final weeks of pregnancy and the first six weeks postpartum to help prevent a transition back to smoking (DiClemente, et al., 2000).

Six studies in our review specifically examined interventions to prevent postpartum relapse among women who had quit smoking in the prenatal period. Of these studies, only one (Reitzel, et al., 2010) found an effect of treatment on maintaining abstinence after smoking cessation. This study involved the use of information, motivational interviewing, relapse prevention, and telephone counselling. Although there is scant evidence to recommend other studies for preventing postpartum relapse, here are two things to keep in mind for supporting continued abstinence during the postpartum period: 1) the length of time for which support may be needed to maintain long-term abstinence (support beyond the immediate postpartum period appears to be necessary), and 2) addressing other factors that influence women's ability to remain smoke free (e.g., partner smoking, women's mental health).

Although there will be challenges in promoting smoking cessation in the postpartum period, assisting women and girls in creating smoke-free homes, increasing partner support for quitting, and enhancing confidence/motivation for quitting are important goals worth considering (Ashford, Hahn, Hall, Rayens, & Noland, 2009).

Table 4.3: Studies Included in the Review

Stage of Review	Number of Studies (n)
Data collection	110
Study rating system	97 (13 ineligible)
Effectiveness criteria	41 (56 studies showed no effect)
Strength of evidence criteria	14 (27 studies had insufficient evidence)
Plausibility criteria	14 (0 studies lacked plausibility)
Recommended studies	14





# 5. Discussion:

## Promising Approaches to Perinatal Tobacco Cessation

The evidence we have examined so far has been the literature focused specifically on intervening during pregnancy (and postpartum) with women who smoke. Up to this point, the data have consisted of the published literature on intervention studies with pregnant women plus the assessment of tobacco-cessation-program materials. While we acknowledge the methodological limitations, we have still been able to present some conclusions regarding these interventions.

With this background in mind, we turn now to contextualize and critically examine the findings in the wider relevant literatures. This chapter will critically assess and identify the components of programs that independently show promise, identify and describe relevant subpopulations of pregnant smokers, and then identify some promising approaches to tobacco cessation during pregnancy that have emerged during the course of this review.

### Intervention Components

In this review we were able to identify eleven components of interventions and programs for pregnant smokers that commonly appeared in the literature. While it is impossible to isolate and measure the impact of each one independently, we can identify these eleven to isolate as important elements in tobacco cessation for pregnant smokers. However, it is not possible, based on the literature, to give precise values to each or to prioritize them.

1. **Quit Guides:** Many interventions used some form of take-home, patient-focused guide to quitting, usually incorporating some skill building, tips on reduction and cessation, and advice.
2. **Counselling:** Many interventions included some form of counselling, however brief, delivered by a range of practitioners from obstetricians to peers.
3. **Buddy/Peer Support:** Many interventions encouraged the identification and involvement of a “buddy” for the pregnant woman as social support during the cessation process.
4. **Partner Counselling/Social Context:** Some interventions included identification of the smoking patterns of the partner/father, friends, and family as key aspects of the assessment process.
5. **Information:** Many interventions included some education about pregnancy and smoking in the form of pamphlets, videos, or other educational materials.
6. **Nicotine Replacement Therapies:** Pharmacological components existed in some interventions to complement other approaches.
7. **Personal Follow-up:** Several interventions incorporated personal follow-up with a view to sustaining the impact of the other components and offering encouragement, including postpartum.
8. **Other Follow-up:** Other forms of follow-up were a distinct component, including paper-based communications to assess the effect of the intervention.
9. **Incentives:** Both financial and symbolic rewards were incorporated into some interventions.
10. **Feedback about Biological Changes:** Ultrasound images, stress tests, or other biological data were delivered back to the pregnant woman to illustrate the effects of smoking on the fetus.

11. **Groups:** Some interventions included support groups or group counselling to deliver and/or sustain the intervention.

It seems clear that multicomponent approaches are the best in this field (Public Health Service and Office of the Surgeon General, 2001, p. 555). However, it is not at all possible to identify which of these matters most and with which population of pregnant smokers. The list indicates which approaches appear most often in the effective interventions.

## Subpopulations of Pregnant Smokers

Equally important is the delineation of the subpopulations of smokers that have been separately addressed in the interventions. Clearly, the factors and variables affecting the prevalence of smoking in girls and women in general, such as poverty, socioeconomic status, education, and some minority statuses, also play out to affect the interventions' success with pregnant smokers. There are also subclasses of pregnant smokers, probably linked to the level of addiction or length of smoking career, that also affect the effectiveness and approach of the interventions. While these subpopulations are identifiable, there is not always adequate or convincing scientific evidence available to determine how various approaches specifically affect these groups.

For example, heavy smokers (those smoking more than ten cigarettes per day during pregnancy) receive different approaches than light smokers do in some of the intervention studies. However, it is not clear what the best interventions might be for this group, based on the existing literature. Similarly, spontaneous quitters are an identifiable, and sizeable, subpopulation of pregnant smokers. Despite researchers' growing interest in spontaneous quitting, the correct approach has not been determined to deal with the patterns in this group and to maintain their nonsmoking status for the duration of the pregnancy, postpartum, and beyond. In fact, spontaneous quitters, as noted, are often ignored in the study design or analysis, and therefore remain undistinguished in intervention and programming.

Similarly, women who relapse (i.e., pregnant women who quit and relapse during the pregnancy and/or postpartum) are obscure in intervention studies and programming. While they may be counted as smokers (or not, depending on the study design), they constitute a separate group of pregnant smokers that could benefit from a dedicated approach. Finally, those pregnant smokers with partners who smoke constitute an important and identifiable group whose cessation is often less frequent and, when it does occur, easily compromised.

Populations including pregnant teens, low-SES women, Aboriginal women, and various ethnic groups are all important groups to differentiate in research and practice. There has been significant attention paid to low-SES women, with numerous interventions designed for and directed specifically at this group. As chapter 4 describes, there are several general interventions that, in practice, were applied solely or mostly to low-SES women. However, there is sparse attention paid to pregnant teens, Aboriginal women, ethnocultural groups, substance-using women, or women experiencing relationship violence.

There is no available evidence to judge exactly which components work best in relation to the others or, if appropriate, in which particular balance or combination. More importantly, there is no clear evidence to date that indicates which subpopulations would benefit from which components and in which balance or combination. Finally, as we indicated, there are several underresearched and potentially undertreated subpopulations of pregnant women smokers for whom more study is critical.

## Better-Practice Approaches

Several wider literatures were consulted to frame the assessment of intervention evidence that we presented in chapter 4. From the wider literature in women's health, women-centred care, and teenaged girls' and women's smoking and substance use, it is possible to name several approaches or perspectives that could either be applied immediately to the field of tobacco cessation with pregnant smokers or with women postpartum that could

be integrated into future intervention development and research. We now turn to describe these approaches with their corresponding clinical implications.

## Tailoring

While tailoring of intervention components does take place, there needs to be a significantly increased effort to tailor programs more effectively. Much of the existing tailoring appears to be confined to stages-of-change identification (which may not accurately reflect readiness to change in pregnant smokers), with little specific tailoring to the social and economic contexts of subpopulations of pregnant smokers. It is clear from this review that there is not just one generic pregnant smoker. Indeed, similar to intervention trends with smokers in general, there ought to be increased emphasis on the specific characteristics of subgroups of smokers who have special features or experiences affecting their ability to quit.

Clinically, various methods may have to be incorporated to properly address these needs. Increased tracking of smoking patterns is required, including spontaneous quitting both during pregnancy and postpartum. This tracking should also include a mental health and/or multiple diagnosis perspective because many smokers experience other forms of substance use and/or mental health/violence issues along with smoking. Finally, these more elaborate and targeted/tailored approaches will allow for more precise and effective matches between the interventions, components, and the pregnant smokers' circumstances.

## Women-Centred Care

Women-centred care focuses on a woman's needs in the context of her life circumstances. This includes an assessment of women's diversity that demands an understanding in the context of health. It also prescribes a holistic or comprehensive view of and approach to health, including mental and physical health considerations.

This approach, when applied to pregnant smokers, indicates the need to develop a focus on *women's health* before and during pregnancy, and during and beyond

the postpartum year. As we have seen, both historically and in the current review, a focus on *fetal* health is still much more common. This approach is insufficient not only because it diminishes the value of women's health and treats the woman primarily as a reproductive vessel, but also because it fails to address a more long-term motivation for becoming and remaining abstinent from tobacco.

Clinically, this would mean that the motivation for tobacco cessation should be shifted from fetal- and "other-" centredness to the woman's own health. This requires different information, different follow-up procedures, different counselling, and biological feedback information. It represents a shift in thinking and practice that would de-emphasize the focus on cessation during pregnancy for pregnancy-related reasons and make the motivations for cessation more universal and long-lasting for girls and women.

Adopting a women-centred perspective also means that the cessation intervention would be more focused on and cognizant of the woman's social, psychological, and economic context. A key but often-overlooked question is to determine whether or not the pregnancy was planned and wanted and whether there is conflict surrounding it. Answers to these questions could immediately texture the standard notion of pregnancy as a time of hope and a key opportunity for change. In addition, this question would also illuminate some of the contextual life circumstances surrounding the pregnant woman, such as whether she is experiencing violence, and offer insight to the practitioner about the priorities and realities in the woman's life.

## Reducing Stigma

Stigma reduction is rarely considered when intervening with pregnant smokers and did not emerge in our review in any of the interventions. However, increasingly restrictive smoking policies, coupled with an overt goal towards denormalization in the current Canadian Tobacco Strategy, create an atmosphere where smokers, particularly pregnant smokers, are specifically and increasingly stigmatized.

As we mentioned, the focus on the fetus or infant has resulted in more public recognition of the effects of behaviours such as smoking, drug taking, and drinking alcohol. All of these behaviours are associated with negative social and legal attitudes to pregnant women and mothers—attitudes and discourse that trickle down into the self-image and consciousness of the pregnant smoker or new mother. So when a woman is smoking while she is visibly pregnant or in the presence of infants or small children, she will be affected by public responses to her. Indeed, the discourses surrounding mothering while using substances of any kind clearly indicate the powerful effects of evolving social norms and attitudes on mothers (Greaves et al., 2002; Martin, et al., 2007; Najman, et al., 1998; Roberts & Nuru-Jeter, 2010).

In order to engage pregnant smokers and new mothers to assist them, the effects of these increased pressures must be addressed and dealt with in clinical interventions. One way to do this would be to integrate awareness of stigma into the "five As" (ask, advise, assess, assist, arrange follow-up) when dealing with pregnant smokers. At the moment there is no evidence of any consideration of stigma and its effects on pregnant smokers.

## Relapse Prevention

Relapse is a significant problem for pregnant smokers who quit. However, it has often been measured postpartum, not during pregnancy. Relapse prevention is only belatedly emerging as a component of interventions designed for pregnant women and, indeed, was not generally applied to the spontaneous quitters in the interventions. Relapse prevention also requires that spontaneous quitters should be tracked and interventions should be designed for them. It also means that, after giving birth, women who have quit need to be re-engaged in conversations on how to deal with the new pressures to relapse once the fetus is no longer being carried and serving as a daily motivation.

Finally, since relapse is delayed while women are breastfeeding, support for breastfeeding may be useful in extending the woman's experience of nonsmoking postpregnancy. Ultimately, however, the motivation for

cessation and maintaining cessation has to be focused on the woman's health and her own reasons for quitting and maintaining quitting. Therefore, the ultimate intervention is to either begin by using the woman's health as the motivation or intervene postpartum to shift the motivation from the fetus to the woman herself.

## Harm Reduction

Harm reduction is a concept and practice from the wider substance use field that is gaining more attention in developing interventions in drug and alcohol use. It is less often applied to tobacco use, although some elements do appear in the interventions we reviewed. For example, reduction of tobacco consumption is a feature in some of the self-help guides and in some of the counselling. However, a broad-based harm-reduction approach is missing from these interventions.

Clinically, this means that *all* measures would be taken to reduce the harm to the woman and the fetus during pregnancy. For example, screening and support regarding physical abuse of pregnant women would assist in reducing a potentially significant source of harm to both the woman and the fetus.

More specific to tobacco, an emphasis on smoking *reduction* during pregnancy and postpartum would become an explicit focus in programming. Nutritional improvements should also be introduced into interventions to ameliorate the effects of smoking in the contexts of women's social and economic lives. Further, the potential benefits of monitoring and supplementing folate levels of pregnant smokers should be explored. In addition, NRTs should be integrated more fully into interventions as a way of reducing the level of nicotine and lessening the harmful effects of smoking cigarettes. Other health-producing improvements might be included in the interventions, such as encouraging more physical activity and stress-reduction techniques.

## Partner/Social Support

As we saw in the review, most interventions have typically not targeted the partner of the pregnant woman nor focused on her social environment. However, both cessation and relapse are affected by the presence of

smokers in close proximity to the pregnant woman. Therefore, in intervening, it is necessary to acknowledge the presence of smokers in the lives of pregnant smokers and to determine the dynamics of those relationships. Women smokers, in general, use smoking to organize, bind, and sometimes disengage from their social relationships (Greaves, 1996). Pregnant women have these and other complicating factors overlaid on their use of tobacco, compounded by their views regarding fetal health and whether or not these views coincide with those of their partners and friends.

In recent years, there has been more research on family, couple, and partner dynamics related to tobacco use and reduction during pregnancy and postpartum (Bottorff, et al., 2006; Greaves, et al., 2007). These efforts support better understanding of these complex issues and support the development of interventions that take into account pregnant women's and expectant fathers' issues as well as couple dynamics affecting cessation during pregnancy and postpartum. Because these dynamics and differences are significant, it is imperative to examine the issues of partner smoking using a delinked approach—that is, to deal with the woman and the partner (male or female) separately and to create interventions that do the same. It is necessary to pursue information about partner smoking behaviour and to try to intervene, but it is crucial to do so in a way that respects the complex power dynamics within couples and between friends. It is critical to acknowledge power, control, and abuse issues between partners in a way that ensures women's safety (Greaves, et al., 2007). While there are a few interventions that target partners and thereby acknowledge that pregnant smokers do not smoke in a social vacuum, more delinked interventions need to be developed. There is also an absence of intervention literature that reflects on the dynamics regarding smoking in same-sex relationships.

## Social Issues Integration

Most pregnant smokers in the Canadian population, especially those who do not spontaneously quit, are experiencing multiple social and economic pressures. Better clinical practice would acknowledge this and build an explicit awareness of it into interventions and

program materials destined for pregnant smokers. It is imperative to pay more than lip service to this central fact about pregnant smokers who do not quit, or who find it very difficult to quit. It is also essential to apply it to relapse-prevention and harm-reduction approaches.

For many pregnant women in “high priority” or “hard-to-reach” groups, issues such as unemployment, violence, poverty, multiple roles, and stress are critical in and, to some extent, blur or bury the importance of tobacco cessation and other health-seeking behaviours while pregnant. It is essential to note, for example, that up to 40 percent of first incidents of domestic violence occur while the woman is pregnant (Rodgers, 1994), but interventions rarely address this probability in our review. Similarly, issues of poverty, income adequacy, unemployment, and low education cluster to create survival pressures on pregnant smokers—for women with these issues, tobacco cessation is a low priority because smoking serves multiple purposes or “benefits” the woman in mediating her existence. Although such issues are real to many pregnant smokers, they are not as real to those creating and testing interventions.

For women who have multiple stressors and issues in their lives, it is clinically difficult to request tobacco cessation in a vacuum, without acknowledging the difficulties involved and the factors that challenge successful cessation. Ethically, it is incumbent upon clinicians to offer some social or perhaps economic exchange in return for cessation. As a starting point, clinical interventions should include steps through which women might gain awareness and acknowledgement of these issues. Second, the offer of free cessation aids, including NRTs, should be made available to pregnant smokers. Finally, and most difficult, clinicians need to reframe their cessation interventions with pregnant smokers and postpartum women in these types of circumstances in an integrated framework that considers the entire context of social and economic factors and offers a similarly wide range of solutions and aids.



# 6. Recommendations

The following recommendations span practice, research, and structural issues.

## For Practice

1. Ensure public health messages are framed in a sensitive, nonjudgmental way that is relevant to the social and economic circumstances of women's daily lives.
2. Encourage harm reduction among pregnant smokers by recommending a decrease in the number of cigarettes they smoke, brief periods of cessation at any point in pregnancy and around delivery, and health-promoting behaviours such as exercising and addressing partner smoking.
3. Recognize that motivation to quit is a dynamic factor that changes throughout any period of cessation and incorporate increased support for women throughout the postpartum period.
4. Integrate tailored treatment of nicotine addiction for pregnant smokers into substance-use-treatment programs in recognition of women's identification of nicotine as a problem drug.
5. Encourage women to use behavioural methods before pharmacotherapy in order to avoid potential teratogenic side effects that can result from the use of drugs such as bupropion and NRTs.
6. Offer nicotine-replacement therapies to women who are unable to quit smoking during pregnancy after twelve weeks gestation to reduce damage caused by inhaled smoke to both the woman and the fetus.
7. Encourage women to continue breastfeeding even if they smoke or are using NRTs to aid their cessation.
8. Increase surveillance and tracking of tobacco-use patterns, including spontaneous quitting, in clinical settings.
9. Use individualized information on smoking patterns to construct highly tailored cessation strategies.
10. Assess smokers for concurrent mental health issues/other diagnoses, since many smokers experience multiple forms of substance use and/or other mental health issues.
11. Emphasize cessation and the importance of the woman's own health, rather than primarily the health of her fetus, to foster motivation to remain smoke free pre- and postpartum.

12. Create specific interventions for the postpartum period that address motivational and stress-related issues for postpartum women.
13. Create specific interventions for women who quit spontaneously during pregnancy and postpartum.
14. Screen all women and girls of childbearing age for tobacco use.

## For Research

1. Develop more comprehensive measures of harm reduction and lowered consumption to better illuminate the relationship between dosage and fetal health outcomes.
2. Develop more comprehensive measures of outcomes that extend beyond quit and relapse rates to include attitudinal and behavioural changes, reduction, and other context-specific issues.
3. Develop and test more interventions that are specifically targeted to young pregnant smokers.
4. Conduct research exploring the genetic factors associated with nicotine metabolism with the aim of developing better-tailored approaches to cessation.
5. Develop and implement intensive postpartum-specific relapse-prevention interventions for women who have quit smoking during their pregnancies.
6. Conduct research examining the safety and utility of bupropion during pregnancy.
7. Develop and test more interventions for disadvantaged populations of pregnant and postpartum women using monetary incentives to encourage and maintain cessation.
8. Develop and test smoking-cessation interventions for the partners of pregnant and postpartum smokers.

9. Design and test interventions tailored for women and girls who continue to smoke during their pregnancies, and for those who stop smoking but relapse before delivery.
10. Examine the efficacy of particular program materials and intervention components to elucidate precisely which aspects influence cessation.
11. Examine comprehensive tobacco-control strategies with respect to their specific impact on pregnant women, particularly denormalization initiatives.

## Structural Changes

1. Allocate more resources to address the social and structural factors that influence women's smoking in order to reduce the burden that tobacco-related disease among disadvantaged groups places on women and their fetuses and infants.
2. Increase awareness and influence public attitudes about tobacco use among disadvantaged groups so that smoking is seen not a "lifestyle choice" but as a reflection of social and economic circumstances. Such an attitude change would reduce stigma associated with smoking during and after pregnancy.





## 7. Further Challenges: Bringing Attention to Three Understudied Groups

This chapter highlights three specific issues connected with smoking during pregnancy and postpartum that remain underacknowledged in research. Close analysis of statistics, data sources, and qualitative input from women and practitioners indicates that young pregnant women, women who drink alcohol and smoke during pregnancy, and pregnant women who have experienced trauma or violence constitute three specific groups with significant challenges in smoking cessation during pregnancy and postpartum. Observations by practitioners support the view that such additional challenges, disadvantages, and often complex social issues can seem formidable in either cessation, harm reduction, or relapse prevention postpartum. Perhaps this is why there are so few evidence-based interventions designed to meet these challenges that have been developed and reported in the research literature.

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Part of their complexity may be related to the function of smoking for women in general, both before and after pregnancy. Smoking cigarettes often fulfills a range of needs for women, such as enhancing coping, facilitating social relationships, aiding in identity formation, or as a source of solace (Greaves, 1996). Life course events can also increase pressures on women. For example, women overburdened by pressures of lone motherhood,

caregiving burdens, and stress often turn to smoking for coping and comfort (Graham, 1993, 1994). Women who have experienced violence, abuse, or childhood trauma are particularly attached to smoking (Greaves, 1996). These “meanings,” “functions,” or “benefits” of smoking for some women who live in challenging circumstances or who have experienced

abuse or disadvantage are an important backdrop for understanding this chapter.

Another important backdrop is the concept of “women-centred care” (BC Women’s Hospital and Health Centre & British Columbia Centre of Excellence for Women’s Health, 2004) for understanding the tailored approaches being recommended here. Women-centred care recognizes a woman’s context, which includes processes of discrimination and gender roles. It also acknowledges the importance of starting care where women are and provides opportunities for social support along with treatment. The few smoking-cessation interventions developed for women in disadvantaged circumstances (see, for example, Everett-Murphy et al., 2010; Stewart, et al., 2010) have focused on providing holistic, multifaceted responses. Issues of social context, such as food security, violence, social support, and self care figure prominently in such interventions. These components reflect and acknowledge that linear, “one-size-fits-all” treatment approaches do not address the realities of some women’s lives, and that some women need recognition of a sheaf of issues in their lives as they address nicotine dependence and smoking.

In Canada, the subgroup most likely to smoke during pregnancy is young, single, low-income women (Heaman, et al., 2009). These women present a challenge to intervention development and they experience lower success with cessation. But all too often, their experiences are complicated by the use of other substances along with tobacco, especially alcohol, and by experiences of trauma and violence, along with the effects of poverty or caregiving burdens. These intersecting and interacting factors represent challenges for practitioners and researchers alike. It is extremely important, however to increase research and to design improved interventions for these young women because their challenges persist as they age. As Gillmore and colleagues (2006) point out, women who had children as teens and exhibited higher multiple substance use (including tobacco), do not “grow out” of these patterns. According to Gillmore and colleagues’ longitudinal research (as long as eleven years postpartum), these women were still using substances (except alcohol) at higher-than-average rates. The authors recommend that

practitioners pay close attention to adult women who had early pregnancies with respect to substance-use patterns during pregnancy.

The systematic review that forms the bulk of this second edition of *Expecting to Quit* turned up little published research on interventions for pregnant and postpartum women in these three groups. Nor was there much published material on intervention design and evaluation, or even many program materials that deal with any of these three groups or their specific issues. But this lack of research does not reflect the importance of these issues. In fact, the complexity of the challenges facing both the women in these three groups and the practitioners trying to respond to them calls for accelerated research and intervention design and testing. The evidence generated by such research and evaluation would lead to furthering better practices in this field. It would also better assist some groups of women with multiple factors affecting their smoking and cessation patterns during pregnancy—women who need increased and tailored assistance.

The following discussion highlights the importance and complexity of the issues facing these three groups of pregnant and postpartum women. We investigate what we do know about these groups: how their specific issues might affect cessation; how the issues of smoking, alcohol, youth, and trauma may interact and overlap for pregnant and postpartum women and girls; and what we might learn from mainstream pregnancy smoking-cessation programs that we assessed in the previous chapters of this report. We also explore innovative approaches in other fields, such as young women’s health, alcohol treatment for women, violence services, and trauma-informed and trauma-specific treatment programs aimed at women, in order to identify possible transferable elements to future intervention development for these three groups. Finally, we revisit approaches to better practices to look at their emphasis or tailoring that could assist in each of these particular circumstances.

## Young Women and Smoking in Pregnancy: A Disquieting Picture

In Canada, young women are the subgroup most likely to smoke during pregnancy (Heaman, et al., 2009)—they also experience lower success with cessation. Their smoking and their engagement with smoking interventions are complicated by the use of other substances, experiences of trauma and violence, along with other key determinants of health.

### Research on Young Women and Smoking in Pregnancy

The *Canadian Maternity Experiences Survey* (Public Health Agency of Canada, 2009) presents a disturbing picture regarding rates of smoking for adolescents and young women during the last three months of pregnancy: more than one in four Canadian women under the age of twenty-five smokes in this period, and the prevalence rate is 28.9 percent for young women between fifteen and nineteen years old. Women under the age of twenty are at higher risk for having preterm and low-birth-weight infants (Delpisheh, Attia, Drammond, & Brabin, 2006; Delpisheh et al., 2007; Dietz et al., 2010), and pregnant adolescents under the age of fifteen who smoke have twice the risk of interpartum stillbirth than pregnant smokers fifteen years and older (Aliyu et al., 2010). Adolescent pregnant women also experience higher rates of maternal anemia than older women during pregnancy (Delpisheh, et al., 2006).

The issues in the lives of pregnant adolescent and young women smokers are many sided. Both pregnancy-specific aspects of smoking, as well as the influences on and realities of adolescent and young women's lives overall are relevant to interventions with girls and young women in the perinatal period. Adolescent alcohol use, prenatal depression, living with a smoker, and gender-based violence all have an impact on rates of smoking during pregnancy for women under twenty-five years old. Broad mixed-methods studies such as *The Formative Years* study (CASA, 2003) of adolescent girls who smoke and use other substances affirm these pregnancy-related connections as influences on, and pathways to, smoking, drinking, and other substance use by girls. They

highlight family circumstances, childhood experiences, the influences of friends and peers, community contexts, along with advertising and media messages.

Alcohol use is common in young women in Canada. The Canadian Addictions survey of 2004 found that one in ten women between the ages of fifteen and twenty-four reported heavy drinking, defined as four or more drinks on one occasion (Ahmad, Flight, Singh, Poole, & Dell, 2008). Pregnant and postpartum adolescent mothers are at substantially greater risk for substance use, binge drinking, and smoking than other young women who have not had children (De Genna, Cornelius, & Donovan, 2009), and are more likely to engage in multiple risk behaviours (Albrecht & Caruthers, 2002). A longitudinal trend analysis study in the Northwest region of the US (Gillmore, et al., 2006) provided insight into patterns of substance use by adolescent mothers up to eleven years postpartum. Substance use among mothers who began childbearing as school-aged adolescents remained relatively stable during the transition to adulthood and into early adulthood. About half of the sample reported smoking cigarettes, which is a rate almost twice as high as national age-related prevalence rates; and about 50 percent reported drinking alcohol at each time point. Considering that the large majority (75 percent) used alcohol and tobacco, the authors emphasized the need for smoking-cessation programs tailored for young mothers due to the significantly higher prevalence rates (Gillmore, et al., 2006).

A survey-based, longitudinal cohort study examined tobacco, alcohol, and marijuana use among adolescent mothers six years and ten years postpartum to identify risk factors for substance use during young adulthood and risk factors for late-onset and persistent use of these substances (De Genna, et al., 2009). This study found that overall tobacco use increased during the ten-year period, and concurrent smoking was significantly associated with binge drinking six years after an adolescent pregnancy, with smokers almost two-and-a-half times more likely to engage in binge drinking. In fact, 37 percent of the adolescent mothers reported binge drinking the year before their pregnancy and 48 percent reported binge drinking as young adults (De Genna, et al., 2009). The authors concluded that adolescent mothers

remain at a much higher risk for substance use than other young women, and are more likely to smoke and persist in binge drinking into young adulthood, compared to young women who delay childbearing (De Genna, et al., 2009).

Pregnant and postpartum adolescents also have high rates of depression: one study measured depressive symptoms in over 60 percent of adolescent mothers (Spears, 2007). An Australian study showed that pregnant adolescents who smoked were more likely to be depressed than pregnant adolescents who did not (Bottomley & Lancaster, 2008). Depression is associated with continued smoking in adolescent pregnant mothers (De Genna, et al., 2009). The CASA study (2003) found that more than one-third of high-school girls report regular feelings of sadness or hopelessness and that there is a relationship between girls' sense of hopelessness or depression and their smoking, drinking, or using drugs. This study also identified that high-school girls who smoke or drink are nearly twice as likely to report feeling depressed as those who have never smoked (47% versus 25%) or consumed alcohol (38.7% versus 20%). They further found that high-school girls who smoke or drink are more than twice as likely to have considered or attempted suicide as girls who had never smoked (37.7% versus 14.4%) or drunk (27.4% versus 11.3%).

Young pregnant women in Canada are more likely than their older counterparts to live with a smoker in the home. Almost two thirds (62.1%) of pregnant adolescents live with a smoker, as do 42.9 percent of pregnant women aged twenty to twenty-four. The prevalence drops to 22.7 percent and less for pregnant women twenty-five years and older (Public Health Agency of Canada, 2009).

Another key influence on smoking by young women is partner violence (Stueve & O'Donnell, 2007). A key study by Silverman and colleagues in the US (2001) found that girls who had experienced dating violence are at increased risk for heavy smoking, binge drinking, cocaine use, diet pill use, pregnancy, and suicide. *The Formative Years* study (CASA, 2003) found that 17 percent of high-school girls have experienced physical abuse and 12 percent have been sexually abused: girls who have been

physically or sexually abused are twice as likely to smoke (26% versus 10%), drink alcohol (22% versus 12%), or use drugs (30% versus 13%) as those who were not abused. Other studies have confirmed the link between trauma arising from childhood abuse as an influence on smoking: those experiencing any type of childhood sexual abuse before age sixteen have much higher rates of nicotine addiction than those who do not experience such abuse (Al Mamun et al., 2007).

These intersections with smoking by pregnant adolescent/young women (and for adolescent and young women smokers overall) suggest the critical need for interventions with a broader focus than tobacco, and a time frame that extends from pre-conception through and beyond the postpartum period.

## Theoretical Issues

A number of social determinants of health affect young pregnant and postpartum women's engagement with smoking cessation and harm-reduction-oriented interventions.

Being younger and having lower education were found to be significant factors in postpartum smoking in a New Zealand study (Hotham, Ali, White, & Robinson, 2008). Pregnant younger women and pregnant women with less education are less likely to follow health recommendations, including not smoking (Crozier et al., 2009). Parackal and others (2007) recommend increased efforts to reach and engage young women with low educational attainment, including tailored public health antismoking messages to young women with lower educational levels. Heavey (2010) argues for ongoing pre-conception education on smoking cessation and related health risks at every healthcare visit. At the structural level, in a social-determinants-of-health framework, Higgins and colleagues (2009) suggest increasing educational attainment to reduce smoking prevalence in adolescents and young women.

Financial and social support factors are also at issue. Limited resources and insufficient social support are structural barriers to smoking cessation and adopting other healthy behaviours among those with lower social status (Greaves & Hemsing, 2009). In a UK study, early

motherhood combined with social and/or educational disadvantage was found to increase the risk of being a smoker (Graham, Hawkins, & Law, 2010).

Relational factors are particularly important to smoking among adolescent and young women, prior to and during pregnancy. A study of nonpregnant adolescents found that smoking plays a role in social bonding (Baillie, Lovato, Johnson, & Kalaw, 2005). Both peer and parental attitudes affect the smoking behaviours of pregnant adolescents (Albrecht & Caruthers, 2002). A Canadian study (Francoeur, 2001) demonstrated that pregnant adolescents' use of alcohol and tobacco are strongly correlated with family and friends' use, as did a US study of this population (De Genna, et al., 2009). Much more research is needed on the social influence of parents, family, partners, and boyfriends on smoking and cessation in pregnant young women.

Two other gendered health and social issues also have a special impact on pregnancy for adolescents and young women: weight and body image and pregnancy intention. One study revealed how low-income, pregnant adolescents continued or even increased smoking during pregnancy to control weight and avoid dieting in the postpartum period (Klesges, et al., 2001). For many adolescents and young women, pregnancy was unintended: the *Canadian Maternity Experiences Survey* (Public Health Agency of Canada, 2009) found that over 72 percent of pregnancies were unintended for girls between fifteen and nineteen years old and over 43 percent were unintended for women twenty to twenty-four. The pregnancies' unplanned nature negatively impacts the young women's health behaviours, including tobacco use (Dott, Rasmussen, Hogue, & Reefhuis, 2010). Heavey (2010) suggests that identifying whether young girls and women are desiring pregnancy or not is critical to fostering discussions about health and risk, and to providing pre-conception education. She recommended that teen girls are offered teaching about healthcare risks such as smoking cessation, body weight control, interpersonal violence, and the need for folic acid and that they should be prime recipients of pre-conception education at every healthcare visit.

Instability in adolescent girls' lives may also have a bearing on engagement and retention in smoking interventions in pregnancy. According to *The Formative Years* study (CASA, 2003), adolescent girls who have moved frequently—six or more times in the past five years—were found to be nearly three times more likely than those who had not moved to report current smoking (35.3% versus 13.5%). Transitions such as the move from elementary to middle school were also points where the risk of starting or increasing smoking and drinking was high, and were linked to girls' view that smoking and drinking were ways to be rebellious. Exposure to the entertainment media and alcohol and cigarette advertising, which “shower girls and young women with unhealthy and unrealistic messages about smoking, drinking and weight loss” (CASA, 2003, p. 2) is another powerful force in girls' lives, difficult to counteract in tobacco-cessation and reduction messaging.

Because there is a paucity of qualitative studies that present and analyze adolescent pregnant smokers' perspectives on smoking (McDermott, et al., 2006), we miss this valuable source of information on influences and preferences for support. In general there are a wide range of immediate social influences, which affect girls' and young women's smoking, that need to be factored in the design of supportive interventions—including but not limited to education level, financial resources, peer and family influences, frequent moves, perception of weight control as a benefit of smoking, pregnancy intention, and the power of media pressures. The relationship between pregnancy at a young age and later health concerns such as smoking and drinking also warrants extended support well past the pregnancy and immediate postpartum period.

## Interventions for Pregnant Adolescents Who Smoke

In our evidence review, the two approaches that show promise for pregnant adolescents include multiple components. Bryce and co-authors' (2009) approach utilizes education, motivational interviewing, optional NRT, and relapse prevention. The quit rate at one year is 16.5 percent in their intervention. The second approach applies education, counselling, peer modelling,

and support with an eight-week program based on cognitive behavioural therapy—a modified version of the “Teen Fresh Start Program” from the American Cancer Society (Albrecht, et al., 2006). Albrecht and colleagues (Albrecht, et al., 2006; Albrecht, et al., 2000; Albrecht, Payne, Stone, & Reynolds, 1998) have tested the effectiveness of a range of tailored multilevel interventions to identify the positive influence of peer-buddies as a core aspect of supporting change in smoking for adolescent girls.

Spears, Stein, and Koniak-Griffin (2010) followed a diverse sample of US pregnant teens through the postpartum period, measuring their patterns of substance use. They recommended that a range of risk factors such as use before pregnancy, partner substance use, childhood abuse, and a longer time after childbirth be addressed in interventions. In particular, addressing longer-standing issues such as childhood abuse would enhance young women’s ability to maintain changes. Otherwise, relapse to previous levels of substance use will persist. Similarly, Stueve and O’Donnell (2007) report that partner violence victimization was an independent risk factor for continued smoking among a sample of inner-city US girls and young women. They suggest that if improvements in smoking-cessation rates are to be achieved, public health efforts must address factors underlying early and continued smoking.

Given the co-occurrence of adolescent girls’ smoking with other health concerns such as alcohol and other substance use, depression, dating violence, and issues with body image, it seems reasonable, when tailoring smoking interventions for pregnant adolescent girls, to draw on best practices in prevention that have been identified for these related health issues. Amaro and colleagues (Amaro, Blake, Schwartz, & Flinchbaugh, 2001) reviewed research on influential variables for substance use among girls and young women, highlighted gender differences in risk factors and protective factors, and assessed the potential of traditional theories to account for gender-specific developmental pathways. For interventions to be effective, they concluded, “it is important to integrate and address the critical intersection of gender-role socialization and gender-role development, girls’ tendency toward internalization, their

strong relationship orientation, and power inequities in intimate relationships” (Amaro, et al., 2001, p. 281).

In another study this research team also reviewed the literature on preventive substance-use interventions for young adolescent girls (Blake, Amaro, Schwartz, & Flinchbaugh, 2001). They found considerable evidence for which programs are effective: those that address multiple substances—tobacco, alcohol, and other drugs—and also the gendered personal, social, and environmental factors that contribute to substance use. They also found interventions that provide social-skills training to improve skills in navigating relationships and resisting negative peer pressure, and that promote social bonding and self-efficacy overall, may have the most salience with girls. They made note of the potential importance of female role models and also of the need for tailored interventions for boys and young men, given their central influence on the substance use of girls and young women. Although little research has looked at the influence of partners for adolescent girls who smoke, there is research that identifies young women’s misperceptions about what male partners find attractive. This suggests that support for navigating tobacco-related interaction patterns with boyfriends may be an important component of tailored smoking interventions reaching adolescents and young adults (Blake, et al., 2001; Bottorff et al., 2010; Schneider, et al., 2010).

A number of current health-promotion programs in Canada and the US that are engaging and supporting adolescent girls with gender-specific developmental tasks are built upon the social theoretical framework articulated by Blake and colleagues. They include: the “Go Grrls” program (LeCroy & Daley, 2001; LeCroy & Mann, 2008), the Girls’ Circle program (Steese et al., 2006), the Voices program (Covington, 2004), the Girls Action Foundation’s girls’ empowerment groups (Girls Action Foundation, 2009), and the Girls Talk program (Centre for Addiction and Mental Health, 2005, 2008). Each of these programs are concerned with increasing social support; improving relationships with peers, intimate partners, parents, family and community; creating safe space to discuss how violence affects girls’ lives; as well as strengthening relationships among girls and between girls and older women. They use

strength-based skill-building approaches that build on protective factors related to avoiding substance use, support coping strategies, promote awareness of how to obtain help, and assist girls in accessing resources and planning for the future. They promote understanding of gender and cultural identity and provide opportunities for establishing a healthy body image, learning about sexuality, building critical-thinking skills, and improving and maintaining high self-esteem. They also focus on creating safe space in which to hear girls' and young women's own perspectives on the issues facing them and the supports they need.

Blake and co-authors (2001) also recommend extending the settings in which tobacco and other substance-use interventions take place to include after-school programs, school health clinics, recreational facilities, community-based girls' clubs, and through peer counselling and support groups. Indeed, unlike programs for older pregnant women, a range of settings beyond the physician's office may hold promise for the engagement and support of pregnant girls. For example, computer-based interventions are one setting for possible intervention. Schinke and Schwinn (2005) developed and tested a gender-specific intervention for preventing smoking and other substance use among adolescent girls. Analyses of pretest and post-test gain scores showed that girls who had been involved in the computer-based intervention possessed a larger repertoire of stress-reduction methods; reported lower approval of cigarettes, alcohol, and drugs; identified more healthy ways to deal with stress; reported lower likelihood of cigarette use or alcohol consumption if best friends offered a smoke or drink; and held stronger plans to avoid cigarettes, alcohol, and drugs in the next year (Schinke & Schwinn, 2005).

Schinke and colleagues (2009) also tested a computerized gender-specific, parent-involvement intervention program aimed at preventing smoking and other substance use among adolescent girls. Following program delivery and one year later, girls who had been involved in the intervention had increased protective factors such as communication with their mothers, knowledge of family rules about substance use, non-acceptance of peer substance use, problem-solving skills,

and the ability to refuse peer pressure to use substances. Girls' mothers reported greater improvements after the program in their communication with their daughters, establishment of family rules about substance use, and monitoring of their daughters' discretionary time. Given the importance of parental disapproval of smoking found by Albrecht and colleagues (1999) and given the importance of parental support of adolescent girls and young women related to reproductive health and pregnancy overall, interventions that involve and support both girls and their mothers are an important component of smoking interventions for pregnant adolescent and young women smokers.

Beyond computer-based interventions, online girls' community spaces such as Kick Action (<http://www.kickaction.ca/>) and Girls Inc (<http://www.girlsinc.org/girls-inc.html>) are designed to increase protective factors related to girls' health through promoting critical analysis of media, community leadership, and action on social change. These may prove to be relatively inexpensive ways of countering mass-media messaging, especially compared to the price of successful mass media prevention campaigns (Worden, Flynn, Solomon, & Secker-Walker, 1996).

In summary, to effectively support adolescent girls and young women during pregnancy and to prevent health risks related to longer-term tobacco and other substance use, there is an urgent need to expand the scope and duration of our tobacco interventions, and for general support to promote girls' and young women's health. Such expanded interventions have to address and prevent harms associated with a constellation of connected issues such as alcohol and other substance use, childhood abuse and dating violence, smoking and other substance use by partners and others living with girls, issues with body image, overall self-esteem, and depression. Promising practices in the prevention of substance use overall and the promotion of girls' empowerment, which are grounded in social theory and emphasize building and enhancing self-efficacy, will be important to integrated approaches.

## Link to Best-Practices Approaches

Of the recommended approaches to addressing smoking among pregnant women, several are particularly applicable to addressing the needs of young women.

*Tailoring* approaches are well justified to integrate education and support for reducing and quitting smoking: in more settings, over time (beyond pregnancy and immediate postpartum), and linked to a range of connected health and social experiences.

A *harm-reduction* approach is particularly important when working with younger people who are at a time in their development when experimentation and risk taking are normal (and approaches that focus only on cessation may not be immediately appealing). Starting where adolescent girls and young women “are at,” building on what is important to *them*, listening for their interests and readiness, assisting in nonjudgmental ways that connect their smoking to coping with dating violence and other harms, are all relevant to a harm-reduction stance with pregnant girls and young women.

*Partner social support* is vital in the adolescent context where partners’ substance use plays a significant role in girls’ and young women’s smoking, and orientation to peers and partners is high. Although acceptance of gender-specific approaches is still slow to gain momentum, supports that address the different influences on and health impacts of smoking for young women and men, and factor in the high rate of violence against girls, are essential.

*Social issues integration* needs to be the central focus of an approach with adolescent girls and young women. Dating violence, coexisting heavy alcohol use, positive body image, self harm, depression, school connectedness, support during key life transitions, poverty and accessing resources, child abuse, positive gender identity development, self worth, understanding sexuality, support for making informed choices, finding purpose, and cultural identity—the social issues that could be explored and integrated are extensive.

## Alcohol and Tobacco Use During Pregnancy

### Research on Women Who Use Both Alcohol and Tobacco when Pregnant

Approximately 10 to 14 percent of women in Canada report drinking alcohol during pregnancy (Greaves & Poole, 2007; O’Campo & Johnston, 2009; Public Health Agency of Canada, 2009). In Canada, and similar industrialized countries, approximately 13 to 27 percent of women use tobacco during pregnancy (Colman & Joyce, 2003; Connor & McIntyre, 1999; Penn & Owen, 2002; Schneider, et al., 2010; Schneider & Schutz, 2008). The overlap of these behaviours is assumed to be significant, and the *Canadian Maternity Experiences Survey* from 2005/06 showed that 13.3 percent of women reported having smoked and consumed alcohol during their pregnancy (Al-Sahab, et al., 2010). In particular, groups such as Inuit or Aboriginal women in Canada reported significantly higher rates of consuming both alcohol and tobacco, ranging between 13 (Mehaffey, Higginson, Cowan, Osbourne, & Arbour, 2010) and 45 percent (Muckle et al., 2011). Additionally, young pregnant women who smoke are more likely to use drugs, alcohol, and marijuana during pregnancy, enhancing and complicating the risks to health.

Many practitioners think that smoking, alcohol consumption, and drug use are underreported during pregnancy, either at the time or retrospectively. Stigma and social pressure and expectations contribute to underreporting because pregnant women and mothers are reluctant to divulge such information out of fear of censure and threat, as well as shame and guilt (Poole & Isaac, 2001). Although it is therefore challenging to accurately estimate rates of use, a survey of over one thousand low-risk pregnant Irish women nonetheless revealed fairly high rates of smoking and alcohol use during pregnancy (Donnelly et al., 2008). The authors report that 23 percent of the women said that they had used illegal drugs prior to pregnancy, 29 percent were ex-smokers and 28 percent current smokers, and 53 percent were drinking alcohol during pregnancy. Smokers were at double the risk of using other drugs and their level of alcohol use was a predictor of illegal



drug use. By contrast, an Australian sample of over seven hundred low-risk women surveyed by Hotham and others (2008) reveals that use of alcohol, tobacco, and cannabis reduced among pregnant women, compared to prepregnancy usage rates. However, tobacco use was still at 18 percent during pregnancy and alcohol use was at almost 12 percent. That said, among these women, there were no differences in substance use by trimester. Women with previous pregnancy losses were significantly more likely to use tobacco and alcohol and younger women were more likely to use tobacco and cannabis, with no age-related differences in alcohol consumption. The Centers for Disease Control in the US investigated binge drinking during 2001 to 2003 and found that of 188,000 women, 2 percent of pregnant women and 13 percent of nonpregnant women engaged in binge drinking, meaning approximately 6.7 million American women of childbearing age engaged in binge drinking during the period. This pattern was enhanced among young women aged eighteen to twenty-four, and among current smokers (Tsai, Floyd, Green, & Boyle, 2007).

It appears that the combined use of substances such as drugs, alcohol, and tobacco during pregnancy has an enhanced deleterious effect. Aliyu and others (2009) report that alcohol and tobacco combined significantly increase the risk of giving birth to “small for gestational age” (SGA) babies, when compared to alcohol alone. The greatest risk was among women who smoked and consumed five or more drinks per week, a finding that led the authors to suggest that there was significant interaction between prenatal alcohol consumption and smoking and the risk of delivering an SGA infant. Dew and co-authors (2007) found that the combined effects of alcohol, drugs, and tobacco were associated with 18 percent of preterm births, while alcohol and drug use in combination was associated with 20.8 percent of preterm births and the use of all three associated with 31.4 percent of preterm births.

Burns, Mattick, and Wallace (2008) studied over 4,300 records of women who used drugs, alcohol, and tobacco at the time of childbirth, and concluded that the drug users not only smoked at a higher rate, but also smoked more cigarettes per day. Among women in the drug-using group, smoking significantly increased the risk of poor

fetal growth, prematurity, and admission to the special care nursery. A similar Canadian study (Burstyn, et al., 2010) analyzed over 150,000 instances of neonatal intensive care unit (NICU) admission, resuscitation, and low Apgar scores in Alberta and concluded that smoking, alcohol, and drug use all contribute to neonatal morbidity. However, maternal smoking was by far the most common risk factor. The authors estimate that 10 to 15 percent of neonatal morbidity would be reduced by controlling maternal smoking.

Patterns of alcohol use and smoking were examined in a large study of women at the eighteen-week point of pregnancy in Norway. Alvik and others (2006) in a population-based study found that 89 percent of women reported alcohol use pre-pregnancy and 23 percent reported drinking after the twelfth week of pregnancy. Binge drinking was reported by 59 percent in the pre-pregnancy period and by 25 percent during weeks zero to six. Change of drinking patterns occurred at the time of pregnancy recognition for 85 percent, even though 78 percent had planned the pregnancy. Fetal welfare was given as the main reason. An English longitudinal study by Crozier and colleagues (2009) followed over 1,400 women pre- and during pregnancy and postpartum, to assess changes in alcohol and tobacco-use behaviours during pregnancy. In general, women lowered their smoking levels from 27 to 15 percent and their alcohol consumption (to meet UK guidelines of four units per week) from 37 to 10 percent. However, younger women and women with low education were the least likely to make these changes.

Alcohol, tobacco, and illicit drugs were studied in a cross-US study in 2006. Arria and co-authors (2006) found in their analysis of over 1,600 pregnant women that those who used drugs (specifically methamphetamines) and those who smoked were more likely to be single and less educated; they also attended fewer than eleven prenatal visits and utilized public financial assistance. In a prospective study of 121 multidrug users in the UK, levels of alcohol use dropped, while tobacco and cannabis use levels did not change during the course of pregnancy (Moore et al., 2010).

A few studies have followed young pregnant women and young mothers to monitor their changes in patterns of substance use. De Genna, Cornelius, and Donovan (2009) followed a group of teen mothers for ten years assessing their ongoing patterns of substance use. They found that race and SES were significant predictors of use and cessation, and that early tobacco use remained a predictor of adult tobacco use. While young women may not necessarily “mature out” of substance use during pregnancy, they do reduce their alcohol use more than they reduce other substances, according to Gillmore and others (2006) who followed young women for eleven years postpartum. Kaiser and Hays (2005) also report that alcohol was the substance most likely to be modified during pregnancy.

Ethnoracial and ethnocultural factors also affect substance use, including alcohol and tobacco, during and after pregnancy. For example, Spears, Stein, and Koniak-Griffin (2010) report in a US sample of ethnic minority women that Latinas were more likely to use alcohol during and after pregnancy, compared to Black and White women. By contrast, Black women were more likely to smoke during and after pregnancy, compared to other groups. Variations among different groups of Black pregnant women in the US have been noted by Elo and Culhane (2010), who found that immigrant Black pregnant women are less likely to smoke, take drugs, or use alcohol during pregnancy, compared to Black women born in the US. In Canada, small studies with Inuit and Aboriginal women reveal high rates of alcohol and tobacco use during pregnancy. Muckle and colleagues (2011) found that 91.9 percent of Inuit pregnant women drink during pregnancy, 36.3 percent use marijuana, and 45.7 percent smoke during pregnancy. Similarly, Mehaffey and team (2010) found that Inuit smoking rates during pregnancy were 81 percent between 2003 and 2005, with 13 percent of smokers reporting alcohol use and 18.3 percent reporting use of illicit drugs, specifically cannabis. They also report that those women smoking more than ten cigarettes per day were also more likely to be drinking alcohol during pregnancy.

## Theoretical Issues

The use of alcohol and tobacco during pregnancy is often understood as part of a spectrum of health-risk behaviours carried out by pregnant girls and young women. Kaiser and Hays (2005) contend that health risk behaviours are underreported for pregnant teens, with their sample of young women aged fifteen to eighteen in the US reporting higher rates of such behaviours than national trend data. In a study of 145 first-time pregnant teens, Kaiser and Hays (2005) assessed changes during pregnancy in a range of behaviours. Of three substance-use behaviours, alcohol was most often modified, followed by street-drug use. They concluded that health-risk behaviours captured by birth certificate data are underreported for all age groups, and the prevalence of health-risk behaviours in this sample of pregnant teens was often greater than the most recent national trend data available.

While there is a widespread assumption that women deny or underreport alcohol use during pregnancy in antenatal interviews, Parkes and co-authors (2008) contend that such interviews can and do still provide valid information. Part of the reason for any underreporting or lack of disclosure is related to the potentially double stigma and shame associated with the use of alcohol and/or tobacco during pregnancy, and, increasingly, during early mothering. This stigma can be manifested internally and externally. It creates pressure within women to hide or minimize their use—at the same time it produces pressure from others such as partners, family, community members, or practitioners to conform to a nonsmoking, nondrinking ideal or else face censure. The effects can be complex. A qualitative study of women investigating why they did not go to alcohol treatment during pregnancy indicates that they felt shame, guilt, and fear (primarily of child apprehension) (Poole & Isaac, 2001). All of these feelings (i.e., internal stigma) combined to prevent disclosure and treatment seeking. External stigma, on the other hand, can operate to condemn pregnant and mothering women who smoke or drink by exposing them to partner pressure (Greaves, et al., 2007), public admonition (Greaves & Poole, 2004), or media blame (Greaves, et al., 2002). Both internal and external stigma play out in a lack of meaningful

and respectful attention to women who display these behaviours, especially those who have more socially complex backgrounds which leave them more vulnerable to not seeking or getting appropriate help.

Intervening during pregnancy has often been considered “a window of opportunity” for pregnant women to make change (Rayburn & Phelan, 2008) and practitioners have often approached change during pregnancy from this vantage point. As we have seen in the systematic review, this assumption and approach drives the development of many pregnancy-related tobacco-cessation interventions. This approach assumes that women will be “other directed” by concern for the fetus, that pregnancy marks a positive turning point, that the pregnancy was desired, that the women are ready to change, and that they are capable of making changes during this time. This approach has relied in part on the “Stages of Change” theory (Prochaska, DiClemente, & Norcross, 1992) being applied to pregnant women, but Stotts and others (2004; 1996; 2000) have questioned the appropriateness of this theoretical application to pregnancy and pregnant women.

The underlying assumption about pregnancy being a “window of opportunity” is that women are motivated by improving health for a fetus and improving circumstances for a potential baby. While this motivation may often exist, it often needs to be activated via more tailored, respectful, harm-reduction-oriented approaches. Motivational Interviewing (MI) has been found to be very useful and effective in supporting change with women who drink alcohol in the pre-conception period and during pregnancy (Floyd et al., 2007; Handmaker, Miller, & Manicke, 1999; Handmaker & Wilbourne, 2001), and could be a likely approach for women who both drink alcohol and use tobacco during pregnancy. MI requires more intensive encouragement, a desire to build on the strengths and desires of pregnant women, and to foster harm reduction in a wide range of ways. This includes reduction of cigarettes per day or other harm-reduction approaches rather than complete abstinence, if reducing smoking is not possible.

## Designing Interventions for Women Who Both Drink and Smoke During Pregnancy and Postpartum

In the systematic review of better practices in tobacco cessation for pregnancy and postpartum, no studies or interventions were identified that specifically and deliberately focused on pregnant women who both drank alcohol *and* smoked during pregnancy. However, there may be lessons to be learned from a previous systematic review of alcohol-use screening tools, brief alcohol interventions, and intensive interventions during pregnancy (Parkes, et al., 2008). This review turned up thirty-eight studies, including twenty interventions. This literature highlighted the significant multiple issues facing pregnant women who drink during pregnancy. For example, Flynn and colleagues (2003) report that when assured of confidentiality, 15 percent of pregnant women in a Michigan sample reported alcohol use and also linked it to tobacco use. Indeed, the authors suggest that “prenatal clinical encounters should consistently include assessment of tobacco use both as an independent risk to the infant as well as an indicator for co-occurring high risk alcohol use” (Flynn, et al., 2003, p. 85). The Parkes and team review (2008) found that self-administered screening methods were superior to practitioner-administered ones, and that screening was more effective than usual practice in identifying alcohol use among pregnant women.

Screening on its own, or divorced from considerations of social context, however, is not better practice. Some brief alcohol interventions utilize sensitive interviewing to elicit information that incorporates MI techniques, relationship-building between client and practitioner, goal-setting in keeping with readiness, inclusion of social-support network, education, harm reduction, and a holistic approach. MI was the most common feature of the interventions addressing alcohol during pregnancy. Generally, these brief interventions were successful in reducing alcohol use during pregnancy. Some aimed more widely at women of childbearing age, thereby targeting women prior to pregnancy, and giving them choices to increase contraceptive usage instead of reducing drinking (see Parkes, et al., 2008, for detail).

The more intensive alcohol interventions were notably all aimed at women throughout pregnancy and postpartum. In other words, the reach of these intensive interventions recognized the complexities and the length of time required for change. They included enhanced prenatal care, home visiting, and a range of ongoing supports for women and their children as they made changes. One Canadian study of the program called “Breaking the Cycle,” part of the Prenatal Nutrition Program, also included outreach to isolated, homeless, and marginalized women, and fostered their early engagement with services. Like the other successful intensive interventions, there was a focus on increasing accessibility to services, individualized work with women, developing nonjudgmental and respectful attitudes among providers, and a focus on self-identified needs (Parkes, et al., 2008).

It is notable that in a few studies we mention, reported alcohol use reduces during pregnancy, even when tobacco use does not. What can we learn from better practices in intervening with pregnant and postpartum women who use alcohol that might be highlighted to address tobacco use as well? Here are some of the key features of the effective alcohol interventions:

- Prepregnancy interviewing
- Discussing alcohol use with all women
- Trust-building and respect from the practitioner
- Tailoring for subpopulations
- Addressing other substances and issues, including violence
- Harm-reduction philosophy
- Motivational interviewing techniques
- Emphasis on creating access to services

Historically, some practitioners have held to the view that multiply challenged groups, such as those who have drug or alcohol addiction as well as nicotine addiction, should not be asked to quit smoking while dealing with such other issues. Women in these situations, despite having high rates of smoking along with alcohol use, have therefore not typically been offered treatment for nicotine dependence. This has also likely contributed to the lack of intervention development and research on integrating and tailoring smoking cessation with alcohol treatment.

Compounding such practitioner reluctance, Herzig and co-authors (2006) found that health practitioners had differing outlooks on intervening with pregnant patients on alcohol, smoking, drugs, and domestic violence. Practitioners tend to be ambivalent about alcohol abstinence, confident about screening for smoking, inconsistent about drug testing, and pessimistic about discussing domestic violence patterns. This revealing study highlights the impact of practitioner readiness to address the realities of women’s lives, particularly those who smoke and drink alcohol during pregnancy. This lack of a unified approach, and this pattern of ignoring these vital linkages, is detrimental to women. Given the overlap in use of alcohol and tobacco, however, and the links to other social issues such as violence, it is time to exchange better practices between these fields.

## Link to Best-Practice Interventions

All of the recommended better-practice approaches identified in this edition of *Expecting to Quit* could be applied to women who both smoke and drink alcohol during pregnancy. Additional suggestions can also be derived from the scant intervention literature.

*Pre-conception Care.* Comprehensive women-centred care focuses on women’s health before and following pregnancy, a perspective that has often been omitted in interventions on both smoking and drinking during pregnancy. Adding a clear commitment to pre-conception care is a more specific and additional enhancement that could assist in reducing the prevalence of smoking and drinking during pregnancy. Heavey (2010) suggests that identifying whether or not young girls and women are desiring pregnancy is critical to fostering discussions about health and risk, and to providing pre-conception education. Heavey carried out a retrospective chart review and concluded that teen girls require thorough teaching about healthcare risks such as smoking cessation, body-weight control, and interpersonal violence (as well as the need for folic acid) and that they should be prime recipients of pre-conception education at every healthcare visit.

*Integrated Messaging.* Burns, Mattick, and Wallace (2008) encourage research to identify the models of tobacco cessation most suited to women who also use other substances during pregnancy. In the same vein, Aliyu and colleagues (2009) suggest a “dual message” approach to women during pregnancy that highlights the interactive effect of both drinking alcohol and smoking cigarettes during pregnancy and its impacts, particularly on the infant. They highlight the relevance of developing “dual message” health-education programs that stress the deleterious effect of joint exposure to alcohol and nicotine in pregnancy. Dew and co-authors (2007) go further, suggesting dealing with alcohol, drugs, and tobacco together and simultaneously—a “triple message”—in order to decrease preterm births. An integrated messaging could also be tailored to local, regional, or subpopulation needs. For example, a twenty-two-state study in the US identified race-related differences in reducing alcohol during pregnancy. Tenkku and others (2009) found that non-White women were less likely to reduce alcohol use and reduce binge drinking during pregnancy, factors the authors suggest help explain race-related patterns of FAS.

*Addressing Interpersonal Violence and Childhood Abuse.* The better-practice approaches emphasize “social issues integration” as part of a complete response to smoking in pregnancy, including a full awareness of domestic violence. Enhancing this with a clear awareness of childhood abuse and its residual effects is a recommended enhancement for women who both smoke and drink during pregnancy. Spears, Stein, and Koniak-Griffin (2010) followed a diverse sample of US pregnant teens through the postpartum, measuring their patterns of substance use. They recommend that a range of risk factors such as use before pregnancy, partner substance use, childhood abuse, and a longer time since childbirth be addressed in interventions. In particular, addressing longer-standing issues such as childhood abuse would enhance adult women’s ability to maintain changes. Otherwise, relapse to previous levels of substance use will persist.

Similarly, Stueve and O’Donnell (2007) report that partner violence victimization was an independent risk factor for continued smoking among a sample of inner-

city girls and young women in the US. They suggest that if improvements in smoking-cessation rates are to be achieved, public health efforts must address factors underlying early and continued smoking. In a brief intervention conducted in a prenatal-care waiting room (Flynn, Walton, Chermack, Cunningham, & Marcus, 2007), 30 percent of women reported violence, use of alcohol, and depression. Specifically, violence was significantly related to alcohol misuse, but cigarette use, less education, and reporting depression were most strongly associated with violence.

*Intervening by Addressing Determinants of Health.* In numerous studies, low education is correlated with alcohol and tobacco use during pregnancy. Some authors therefore suggest that strategies to increase educational attainment should be included with more conventional tobacco-control policies in efforts to reduce smoking among girls and young women (Higgins, et al., 2009). Kandel and colleagues (2009) suggest that public health campaigns for reducing tobacco use should target women with low education and that those interventions should focus on the range of social conditions as well as individual behaviours that negatively impact women’s lives. Others suggest wider screening for psychosocial factors affecting pregnancy (Harrison & Sidebottom, 2008). While this is a potential improvement to interventions, it is not completely clear what the actual prevalence of alcohol use during pregnancy is by education level. There is some evidence that middle-class women who are moderate drinkers should also be a targeted audience for messaging regarding the dangers of drinking during pregnancy (Ahmad, et al., 2008). However, in a New Zealand study of women of reproductive age, the authors report that “having a higher level of education and higher household income were significant factors for alcohol consumption, while being of younger age and of lower educational status were significant factors for tobacco consumption” (Parackal, et al., 2007, p. 40). Pregnancy lowered the odds of alcohol consumption, but not tobacco use in the less-educated young women.

*Stigma Awareness.* Another better-practice approach is “reducing stigma.” Given the dual stigma associated with both drinking and smoking during pregnancy and early

mothering, this is particularly, or doubly important when considering better practices for women who both drink and smoke. Approaches to reducing stigma need to be cognizant of both internal and external sources of stigma and shame, and need to highlight stigmatizing attitudes and behaviours of practitioners and intervenors.

## Experience of Trauma, Smoking, and Pregnancy

There is a high correlation between smoking and the experience of trauma (Amstadter et al., 2009; Fu et al., 2007; Helstrom, Bell, & Pineles, 2009), which persists during pregnancy (Bailey & Daugherty, 2007; Fanslow, Silva, Robinson, & Whitehead, 2008; Flynn, et al., 2007; Goedhart, van der Wal, Cuijpers, & Bonsel, 2009; Stueve & O'Donnell, 2007). Pregnant women who are experiencing trauma or who have a history of trauma may have more difficulty achieving tobacco cessation. Trauma is very prevalent and can affect every aspect of a person's life, including one's response to health-promoting programs (Fallot & Harris, 2009). Because standard approaches to discussing tobacco use with pregnant women and to providing support have not factored in the unique needs of those with trauma, and because practitioners can sometimes be directive or even confrontational, accessing help may seem unsafe to women with trauma histories.

The most-often-reported type of trauma affecting pregnant women is intimate partner violence (IPV). Whereas the average smoking rate among pregnant women is up to 27 percent in some developed countries (Penn & Owen, 2002; Schneider, et al., 2010; Schneider & Schutz, 2008), among pregnant women with a history of IPV it climbs to 50 percent or more (Bailey & Daugherty, 2007; Fanslow, et al., 2008; Morland et al., 2007). These findings are consistent with the data among nonpregnant women with and without a history of IPV. Smoking rates that hover between 15 and 20 percent in the general population soar to close to 60 percent among women who have experienced rape or IPV (Acierno, Kilpatrick, Resnick, Saunders, & Best, 1996; Lemon, Verhoek-Oftedahl, & Donnelly, 2002; Weaver & Etzel, 2003; Weinbaum et al., 2001), and even higher

for those with comorbid substance use disorders (SUD) (Currie, Hodgins, el-Guebaly, & Campbell, 2001; Haug, et al., 2001) or psychiatric disorders (PD) (Davis, Bush, Kivlahan, Dobie, & Bradley, 2003; Flick et al., 2006; White & Grilo, 2006) According to one study, a history of IPV increases the likelihood of smoking a pack or more of cigarettes a day by up to four times (Loxton, Schofield, Hussain, & Mishra, 2006).

There are trauma-informed models of care in different areas of health and human services (e.g., Covington, 2008; Hopper, Bassuk, & Olivet, 2010), but they have rarely been used to address smoking cessation among pregnant women in particular. Key elements of these trauma-informed models are consistent with best practices with pregnant women in this *Expecting to Quit* document, especially social issues integration, which helps to contextualize the smoking and understand how the experience of trauma manifests in the woman's behaviour.

## Research on Women's Experience of Violence, Trauma, and Smoking When Pregnant

There is a limited amount of research explicitly connecting tobacco use during pregnancy to trauma and even less literature about interventions or models to approach tobacco cessation among pregnant women who have experienced trauma. However, there is considerable literature about substance use among pregnant women, violence against pregnant women, and substance use among trauma survivors, which collectively forms a picture of how these issues intersect.

Trauma is often implied as a risk factor for smoking or other types of substance use during pregnancy, but since trauma is ill-defined, the evidence is not always specific. Most of the literature focuses exclusively on IPV during pregnancy and mentions smoking among a range of associated sequelae. Estimated rates of IPV among pregnant women in the United States in population-based studies vary from approximately 3 percent to 20 percent (Gazmararian et al., 1996), but some local studies reveal much higher rates, of up to 80 percent (Bailey & Daugherty, 2007). In many studies, pregnant

women reporting past or current IPV were more likely to smoke, smoked greater quantities, and were less likely to quit or reduce smoking than women with no history of IPV (Bailey & Daugherty, 2007; Nelson, Uscher-Pines, Staples, & Grisso, 2010; Seng, Sperlich, & Low, 2008; Stueve & O'Donnell, 2007). Some disparities also persist between women experiencing physical IPV versus non-physical (e.g., psychological) IPV, with the former group smoking in higher numbers (Bailey & Daugherty, 2007).

Experiences of violence, then, are a significant risk factor for smoking during pregnancy. While most of the literature focuses on past or current IPV, other types of violence may have similar effects. The experience of childhood violence has also been identified as a risk factor for tobacco use during pregnancy (Nelson, et al., 2010; Seng, et al., 2008). In one study of pregnant women experiencing IPV, seven of twenty-five women reported experiencing abuse at the hands of someone other than their partner as well; the sample exhibited high overall rates of smoking (Bhandari et al., 2008).

In the few studies where trauma among pregnant women is explored, violence figures prominently in the analysis. Morland and colleagues (2007) found in their sample of pregnant women with posttraumatic stress disorder (PTSD) that 75 percent had witnessed family violence as a child and 68.8 percent had a history of physical abuse by a partner. Moreover, although violence was not the most commonly reported type of trauma experienced before pregnancy (natural disasters were), "PTSD among pregnant women occurred nearly exclusively as a result of interpersonal violence experienced before the pregnancy" (Morland, et al., 2007, p. 306). The researchers measured other types of trauma which also result in PTSD or subclinical PTSD: previous miscarriage, previous abortion, natural disaster, being stalked or robbed, and bearing witness to violence against others were all listed as types of trauma experienced by those with PTSD. Among the study subjects with PTSD, 50 percent smoked during pregnancy. These findings suggest that, while personal violence may be the strongest predictor of trauma-related smoking in pregnant women, other risks factors should also be attended to.

## Theoretical Issues

Because trauma is not consistently defined, research linking trauma and tobacco use in both pregnant and nonpregnant women is difficult to integrate. By far the most-often-cited type of trauma in the women's health literature is violence against women (IPV and/or childhood physical or sexual abuse), and this might be the most relevant type of trauma for understanding the use of tobacco among pregnant women. In fact, intimate partner violence (IPV) may begin or intensify during pregnancy: it is estimated that 40 percent of first incidents of IPV occur when the woman is pregnant (Rodgers, 1994). However, trauma could also include a variety of life-shattering events: being witness to violence (especially war or large-scale conflict), experiencing race- or gender-based discrimination, being abandoned as a child, surviving a serious accident, experiencing a natural disaster, etc. (Covington, 2008; Felitti & Anda, 2007; Morland, et al., 2007). Hopper and colleagues (2010, p. 80) define trauma as "an experience that creates a sense of fear, helplessness, or horror, and overwhelms a person's resources for coping"; their focus is on homelessness as a form of trauma. Fallot and Harris (2009) suggest that 55 to 90 percent of the population has experienced at least one traumatic event, and that the lifetime average of traumatic events experienced is nearly five. Other researchers have also found that "exposure to trauma peaks between the ages of 16 and 20 years, suggesting that trauma and subsequent PTSD often occur before childbearing" (Morland, et al., 2007, p. 304). These estimates suggest that the research focusing on current IPV alone underrepresents the true extent of trauma among pregnant women, and that integrated trauma-informed approaches to prenatal care are worthwhile.

Just as there is no single definition of trauma, there is no single method of identifying trauma among clinical subjects. In the literature on IPV, self-reporting is the standard method of data collection, although its limitations are acknowledged (Bailey & Daugherty, 2007; Bhandari, et al., 2008). A diagnosis of PTSD can confirm trauma but its absence does not disconfirm it. Even where PTSD screening is consistently applied, not all experiences of trauma result in PTSD, and

PTSD symptoms can be identified at a subclinical level (Morland, et al., 2007). Depression, stress, and anxiety may be linked to trauma but can also exist independently. We therefore lack a full understanding of both the extent of trauma among pregnant women and the role of different types of trauma in influencing pregnancy behaviours and outcomes. A more comprehensive understanding of trauma would provide a better framework for understanding its relationship to tobacco use among pregnant women and designing more suitable interventions to reach this population.

The relationship between trauma and pregnancy is also complex because of confounding factors. Trauma is frequently correlated to a number of other difficulties during pregnancy, such as poverty, psychiatric disorders (PD), and substance-use disorders (SUD), making it difficult to attribute specific outcomes to trauma exclusively (Bhandari, et al., 2008; Feldner, Babson, & Zvolensky, 2007; Kalman, Morissette, & George, 2005; Zvolensky, Feldner, Leen-Feldner, & McLeish, 2005). The degree of harm introduced by trauma during pregnancy may be different for the mother and the fetus. Past or ongoing experiences of trauma are correlated to delayed prenatal care and obesity, and even though trauma experienced during pregnancy may not itself be injurious to the fetus, it can cause stress and increase the likelihood of risky behaviours that are (such as smoking and the use of other substances) (Bailey & Daugherty, 2007; Taggart & Mattson, 1996). Clinical approaches that emphasize only the health of the fetus may overlook the woman's need to deal with her own trauma and the many layers of stress that frequently coexist among traumatized pregnant women. Women experiencing IPV, for instance, also frequently experience such stressors as legal battles, financial dependence, transportation barriers, and social isolation (Bhandari, et al., 2008).

Tobacco, though harmful, is widely used as an aid for minimizing other types of harms and pain (Greaves, 1996). Its biochemical effects may effectively diminish stress and the pain associated with ongoing or lingering trauma. It can be used to deal with symptoms associated with mental illnesses or other addictions, which are also common among trauma survivors. Furthermore,

nicotine withdrawal can introduce or exacerbate trauma-like effects, such as depression and anxiety (Johnson, MacDonald, Reist, & Bahadori, 2006). For these reasons, it is not surprising that pregnant women who have experienced trauma smoke in greater numbers and have more difficulty reducing their dependency on tobacco than other pregnant women. Pregnancy is already physically and emotionally disruptive; relinquishing a habit that can provide calm, structure, and psychosocial control may pose an even more formidable challenge during this stressful time.

For obvious reasons, traditional approaches to promoting smoking cessation among pregnant women, with their strong emphasis on fetal health and the mother's responsibility to change her behaviour, are therefore less effective with trauma survivors. First, the trauma survivor may have a greater dependency on tobacco as a coping mechanism because of her increased burden of stress. Second, in light of other harms and coping strategies that are common among trauma survivors (such as the use of illicit substances), tobacco may seem comparatively harmless, and the survivor may have worked hard to reduce her chemical dependence to just this substance. Finally, individuals who have experienced trauma may be less responsive in general to healthcare interventions, since "being vigilant and suspicious are often important and thoroughly understandable self-protective mechanisms in coping with trauma exposure" (Fallot & Harris, 2009). There is an obvious need for trauma-informed care that understands tobacco use during pregnancy in context and empowers the pregnant woman to address her stress in more health-promoting ways.

## Trauma-informed Smoking Interventions

There is overwhelming evidence in the literature of the correlations between traumatic experiences, particularly violence, and the use of tobacco and other substances during pregnancy. However, the literature is mostly descriptive and provides few examples of interventions to address tobacco use among pregnant trauma survivors. This gap speaks to the importance of a trauma-informed approach and further research on the



interventions that facilitate or inhibit smoking cessation among this particular population.

Aside from designated in-patient programs for SUD and PD, most pregnant women receive basic prenatal care from family physicians. Studies of physicians' counselling practices with women in prenatal care suggest that most are comfortable addressing the dangers of smoking during pregnancy, but less comfortable screening and counselling for domestic violence (Herzig, et al., 2006; Taylor et al., 2007). Since domestic violence is a strong predictor of both tobacco use and the likelihood of tobacco cessation during pregnancy, those who provide prenatal care would benefit from trauma-informed strategies to better understand this correlation and provide tailored care. Trauma-informed models developed for primary care practitioners in general (Schachter, Stalker, Teram, Lasiuk, & Danilkewich, 2008) and those for support of trauma survivors in a range of other contexts, may be instructive here (Covington, 2008; Fallot & Harris, 2009).

Trauma-informed care is a term increasingly used to describe approaches that are sensitive to the needs of trauma survivors without necessarily providing highly specialized services (Hopper, et al., 2010; Moses, Huntington, & D'Ambrosio, 2004). Trauma-informed care is usually considered cost effective because it improves outcomes without requiring costly training or the hiring of experts. It is characterized by trauma awareness (understanding trauma and being alert to the potential traumatic histories of clients accessing a service), an emphasis on safety (avoiding potential triggers for retraumatization, providing physical and emotional safety), empowering environments (giving clients personal control), and emphasizing clients' strengths and skill building (Hopper, et al., 2010). These ends can usually be achieved through the reorganization of existing spaces and procedures.

Trauma-informed care has most often been applied to the treatment of PD and SUD, and studies indicate that this approach is more successful than conventional ones at reducing psychiatric symptoms and substance use, especially where approaches are integrated (Cocozza et al., 2005; Morrissey et al., 2005). While there is scant

literature about the application of trauma-informed care to pregnant women in particular, multiple studies have demonstrated its benefits for women with co-occurring conditions (Elliott, Bjelajac, Fallot, Markoff, & Reed, 2005; Fallot & Harris, 2005; Gatz et al., 2007).

We expect that trauma-informed approaches to treating pregnant women who smoke would have similar benefits without demanding that service providers such as family physicians become experts in the identification and treatment of trauma. When contrasted with traditional approaches to smoking-cessation messages, trauma-informed care would be less confrontational and judgmental. It acknowledges the therapeutic role that smoking can play in the life of a traumatized woman and validate her addiction by pointing to the biological and social "benefits" of her smoking. This can lead more naturally to destigmatization and to the development of constructive strategies to reduce tobacco use, including NRT or other coping mechanisms. Women who are predisposed because of trauma to resist certain interventions might feel more empowered to change their behaviour in this context, even if the trauma itself cannot be eliminated.

Unfortunately, embedding trauma-sensitive approaches in prenatal care may not be sufficient to reach the population most in need of assistance with smoking cessation during pregnancy. Research shows that women experiencing trauma during pregnancy are less likely to begin prenatal care promptly or to receive the recommended care throughout pregnancy (Morland, et al., 2007). It is characteristic of individuals with trauma to be wary of "helpful relationships" and service programs, and women experiencing IPV may also be prevented or deterred from seeking appropriate prenatal care by their abusive partner (Bhandari, et al., 2008; Fallot & Harris, 2009). Access to prenatal care and potential assistance with smoking cessation may be especially prohibitive for rural women (Bhandari, et al., 2008). Creative outreach approaches and the development of safe counselling spaces are thus essential to improve services for pregnant smokers experiencing trauma.

Further research is also needed to better understand the impact of trauma other than IPV on pregnant women and the applicability of general trauma-informed approaches to this population. The overwhelming focus in the literature on violence, and IPV in particular, speaks to the severity of this problem but may also mask other sources and symptoms of trauma that influence tobacco use during pregnancy. Trauma must also be recognized as both current and lingering. For example, the “Adverse Childhood Experiences” study shows that nine different types of childhood trauma have persistent negative health impacts in adults, including higher rates of smoking (Felitti & Anda, 2007). An integrated understanding of trauma and the complex array of long-term health impacts could lead to more appropriate and successful interventions with traumatized women. Finally, more disaggregated data are necessary to better understand the causal pathways between tobacco use and SUD, PD, alcohol, and other risk factors during pregnancy.

## Link to Best-Practice Recommendations

Of the recommended approaches to addressing smoking among pregnant women, several are particularly applicable to women who have experienced trauma—many are already reflected in models of trauma-informed care. First, *tailoring* would help to create safe, comfortable environments in which traumatized women are more likely to disclose their tobacco use and work with health professionals to reduce it. A generic approach that is not sensitive to the role of trauma in women’s lives is likely to drive women away, or even risk retraumatizing them. Models of trauma-informed care provide specific suggestions for tailoring a care environment to the needs of this population (Hopper, et al., 2010).

Second, *women-centred care* is critical to a trauma-informed approach because it recognizes that smoking is a woman’s response to personal challenges (which often have a gendered nature, such as IPV) and is not an isolated decision about her pregnancy. A woman experiencing trauma likely has a number of health issues in addition to tobacco use and pregnancy—she may be experiencing violence, suffering from depression or PTSD, etc.—and the tobacco use may in fact be a form of self-therapy. She will likely respond better to woman-centred approaches that acknowledge her need for safety and healing than traditional ones that admonish her for harming the fetus.

Third, *social issues integration* is an inherent component of trauma-informed care. Women experiencing trauma are typically burdened with a host of stressors (financial, legal, social, and so on) that can compromise their resources for reducing tobacco during pregnancy. Trauma-informed care is designed to meet the client in her own, real-life circumstances and work with her to build strengths and coping skills (Hopper, et al., 2010). By integrating social issues into standard care, practitioners can better understand the causes of smoking during pregnancy and the kinds of support that traumatized women need to move past using tobacco as a coping mechanism. Clinicians cannot merely assume that quitting smoking is a high priority for a pregnant woman before developing an appreciation of the other pressures and priorities in her life. Trauma-informed care and social issues integration are models for making this critical shift in perspective.

# Afterword: The Challenge Going Forward

The first edition of *Expecting to Quit: A Best Practices Review of Smoking Cessation Interventions for Pregnant and Postpartum Girls and Women* was published in 2003. It has been translated and utilized in countries around the world. This second edition has updated the research on these topics and reviewed the original best-practices recommendations. In this edition, we have reviewed research and intervention development in the years since the first edition was published. The reported rates of smoking during pregnancy in Canada and the US have slightly declined since 2003. However, the postpartum relapse rates appear to be just as high, thereby calling into question the overall effectiveness of public health campaigns and interventions.

In short, despite the ongoing seriousness of this women's health issue, and the serious impact of tobacco use or exposure to tobacco on the woman, fetus, infant, and child, there has been a limited, sustained positive impact on the issue of smoking during pregnancy and postpartum. It has also become even more important to monitor smoking trends among subgroups of the Canadian population, such as Aboriginal girls and women, in order to develop appropriate responses.

While there has been more investigation of nicotine-replacement therapies and harm-reduction techniques aimed at helping women reduce or quit, researchers

and practitioners are also recognizing the psychosocial aspects of tobacco use during pregnancy and relapse patterns during postpartum. For example, there is now very clear evidence, especially in countries such as Canada, that age, income levels, and other structural factors affect smoking and relapse rates during pregnancy and postpartum. However, the factors affecting health inequities as they apply to pregnant women and low-income mothers are numerous and they are often assumed to fall outside of the health system's typical domain. There is also emerging insight into the effects of couple, family, and household dynamics on the patterns of women's smoking, reduction, or cessation,

both during and after pregnancy. These insights have deepened our understanding of the influence of women's lived experiences on their smoking and relapse patterns; they also point to the complexities in measuring and understanding these influences. New approaches for understanding women's smoking during pregnancy challenge us to design more innovative and realistic interventions that take into account real-life issues and pressures facing women during pregnancy, postpartum, and early motherhood.

These types of research have clearly highlighted the need for a much greater understanding of the experiences of young women, low-income women, and women with other issues such as alcohol use, violence, or past or current trauma. The importance of these issues and their influences on women's efforts to reduce, quit, or stay quit remains difficult to quantify with complete precision, but are clearly worth our attention and follow-up. Chapter 7 explored the research investigating these links to give further background on their importance vis-à-vis developing better practices for pregnant and postpartum women and girls who smoke. It is not a systematic review of interventions aimed at these groups of women, but rather a compilation and analysis of research linking these issues with smoking. The chapter builds on observations, qualitative research, and feedback from practitioners about the challenges faced by both women and intervenors in addressing smoking during pregnancy and postpartum.

We hope that the next few years will see a more focused effort among researchers, intervention developers, and program funders to design, measure, and evaluate programs or initiatives that specifically aim to help young pregnant smokers, those who drink alcohol as well as smoke, and those who have experienced violence and/or trauma in their lives. The importance of helping all of these women cannot be underestimated: they constitute the groups most likely to smoke during pregnancy, and they are least likely to quit and most likely to relapse. However, they also constitute three (not mutually exclusive) groups that stand to benefit considerably from tailored and sensitive interventions. While their options for improving health are more limited than other pregnant smokers, they will go on to enjoy long years of health if we are successful. Improving their health will improve both their lives and the lives of their children.



# **Appendix A**

## **Studies Published after 1990 Included in the Review**

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Cinciripini et al., 2010, RCT 1+	US	Postpartum	N = 257 T = 128 C = 129	Clinics General population	1st and 2nd trimester
Gadomski et al., 2011, Case-control 2+ (CT)	US	Postpartum	N = 618 T1 = 378 T2 = 22 T3 = 152 C = 66	Clinic and Community General population	Varied
Henrikus et al., 2010, RCT 1-	US	Prenatal	N = 82 T = 54 C = 28	Home General population	1st and 2nd trimester
Patten et al., 2010 RCT 1+	US	Prenatal	N = 35 T = 17 C = 18	WIC clinic Alaskan Natives (low income)	1st and 2nd trimester
Reitzel et al., 2010, RCT 1+	US	Relapse prevention	N = 251 T = 136 C = 115	Clinic and telephone sessions Low income	3rd trimester
Winickoff et al., 2010, RCT 1+	US	Postpartum	N = 101 T = 48 C = 53	Hospital General population	Postpartum
Bryce et al., 2009 Cohort 2+ (QUASI)	Scotland	Relapse prevention	N = 79	Hospital, homes, local community Young women (less than 25 yrs)	NR
Edwards et al., 2009, Cross sectional 2+ (QUASI)	US	Postpartum	N = 11210 T = 8445 C = 2765	WIC Clinics Low income	3rd trimester
Hannöver et al., 2009 RCT 1+	Germany	Postpartum	N = 644 T = 299 C = 345	Homes General population	Postpartum
Stotts et al., 2009, RCT 1+	US	Prenatal	N = 360 T1 = 120 T2 = 120 C = 120	Clinic General population	2nd trimester
Bullock et al., 2009, RCT 1+	US	Prenatal	N = 695 T1 = 170 T2 = 175 T3 = 179 C = 171	Telephone General population	Varied

\* = significant differences between groups  
NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	10 sessions	5 postdoctoral fellows in clinical psychology	Counselling focused on depression	3 and 6 months postpartum	3 months: T = 19% C = 18% 6 months: T = 7% C = 9%	Not reported (NR)
	4 sessions	Counsellors, social workers, smoking-cessation specialists	Counselling, relapse prevention, tailored biological information (biomarker feedback), incentive vouchers	End of pregnancy, 12 months postpartum	End of pregnancy: T1 = 61% * T2 = 50% T3 = 60.5% * C = not reported 12 months Postpartum: T1: 9% T2: 0% T3: 44% * C = not reported	NR
	6 sessions	Counsellor	Counselling, telephone sessions	End of pregnancy, 3 months postpartum	End of pregnancy: T = 13% C = 3.6% 3 months postpartum: T = 9.3% C = 0%	NR
	5 counselling sessions (1 face-to-face, and 4 telephone)	Trained counsellor	Information, video, telephone counselling	82 days post-randomization	T = 6% C = 0%	NR
	8 sessions	Counsellors	Information, motivational interviewing, relapse prevention, telephone counselling	8 weeks postpartum 26 weeks postpartum	8 weeks postpartum: T = 41.9% * C = 27.8% 26 weeks postpartum: T = 22.8% * C = 16.5%	NR
	1 counselling session	Trained study staff	Information, counselling	3 month postpartum	T = 9% C = 3%	NR
	16 months long, with 3 months follow-up and 12 months follow-up	Midwife	Information, motivational interviewing, relapse prevention, NRT as needed.	3 months and 12 months post-intervention	3 months: 22.8% 12 months: 16.5%	3 months: 30.4% 12 months: 10.1%
	3 sessions	Nurses, nutrition staff	Self-help guide, counselling	Postpartum	T = 24.2% * C = 20.9%	NR
	3 sessions (1 face-to-face, 2 telephone sessions)	Counsellor	Information, Counselling, telephone, and relapse prevention	Follow-ups at 6, 12, 18, and 24 months postpartum	6 months: T = 7% * C = 1% 12 months: T = 7% * C = 2% 18 months: T = 9% * C = 1% 24 months: T = 9% C = 4%	NR
	3 sessions	Nurses, Master's level counsellors	Information, ultrasound, motivational interviewing, telephone counselling	End of pregnancy	T1 = 18.3% T2 = 14.2% C = 10.8%	NR
	20 phone contacts (9.5 to 17 minutes each)	Nurses	Information, self-help booklet, social support	Time prior to delivery, Postpartum visit	Time prior to delivery: T1 = 17.0% T2 = 22.0% T3 = 19.2% C = 17.2% Postpartum visit: T1 = 12.4% T2 = 11.4% T3 = 13.5% C = 13.3%	NR

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Heil et al., 2008 RCT 1++	US	Prenatal	N = 82 T = 40 C = 42	Clinic Low income	Varied
Oncken et al., 2008 RCT 1++	US	Prenatal	N = 194 T = 100 C = 94	Clinic General population	2nd trimester
Øien et al., 2008 Cohort 2++ (CT)	Norway	Prenatal	N = 3839 T = 2051 C = 1788	Clinic General population	1st trimester
Ruger et al., 2008 RCT 1+	US	Prenatal	N = 220 T = 110 C = 100	Clinic General population	Varied
French et al., 2007 Case-Control 2++ (CT)	US	Prenatal	N = 219 T = 122 C = 97	Home & phone support General population	3rd trimester and postpartum
Pollak et al., 2007 RCT 1+	US	Prenatal	N = 181 T = 122 C = 59	Clinic General population	Varied
Albrecht et al., 2006 RCT 1++	US	Prenatal	N = 142 T1 = 45 T2 = 47 C = 50	Clinic Adolescents	Most in 2nd trimester
Avidano Britton et al., 2006 Case-control 2++ (CT)	US	Prenatal	N = 194 T = 101 C = 93	Clinic General population (Rural)	2nd trimester
de Vries et al., 2006 Cluster-RCT 1++	Netherlands	Prenatal	N = 318 T = 141 C = 177	Clinic General population	2nd & 3rd trimesters
Dornelas et al., 2006 RCT 1+	US	Prenatal	N = 105 T = 53 C = 52	Clinic General population	Varied
Hotham et al., 2006 RCT 1	Australia	Prenatal	N = 40 T = 20 C = 20	Clinic Heavy smokers	Varied

\* = significant differences between groups

NR = Not reported



	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	From intake to 24 weeks postpartum	Nurses	Vouchers/incentives	End of pregnancy, 3 months postpartum, 6 months postpartum	End of pregnancy: T = 41.0% * C = 10.0% 3 months postpartum: T = 24.0% * C = 3.0% 6 months postpartum: T = 8.0% C = 3.0%	NR
	8 sessions (2 counselling and 6 visits)	Trained research assistant, nurses	Pharmacotherapy (NRT), motivational interviewing	6 weeks post-treatment, 32-34 weeks gestation, 6-12 weeks postpartum	6 weeks post-treatment: T = 13.0% C = 9.6% 32-34 weeks gestation: T = 18% C = 14.9% 6-12 week postpartum T = 11.0% C = 9.6%	32-34 weeks gestation: T = -5.7 cigs/day * C = -3.5 cigs/day
	8-10 sessions	Various providers	Brief intervention, counselling	6 weeks postpartum	T = 7.6% C = 5.8%	NR
	3 home visits	Nurse	Information, self-help materials, motivational interviewing, counselling	6 months postpartum	T = 6.3% C = 10.0%	NR
	4 contact points	Nurses	Information, motivational interviewing, home visit, telephone	3 months postpartum, 6 months postpartum	3-month postpartum: T = 26.4% * C = 12.4% 6-month postpartum: T = 21.5% C = 10.2%	NR
	6 sessions (face-to-face or by phone)	Support specialists	Counselling, pharmacotherapy (NRT)	38 weeks gestation, 3 months postpartum	38 weeks gestation: T = 18.0% * C = 7.0% 3-months postpartum: T = 17.0% C = 14.0%	NR
	8 sessions	Nurses & peer leaders	Information, Counselling, peer modeling, support	8 weeks post randomization, 1 year postpartum	8 weeks post randomization: significant group difference between T1 and Control group * 1 year postpartum: no significant group difference	NR
	1 session with unspecified number of follow-up visits	Nurses	Tailored information	28 weeks gestation, Postpartum	28 weeks gestation: T = 29.1% C = 31.3% Postpartum: T = 25.0% * C = 15.6%	28 weeks gestation: T = 3.7 cigs/day C = 4.0 cigs/day Postpartum: T = 5.1 cigs/day * C = 8.1 cigs/day
	2 contacts	Midwives	Video, self-help guide and booklet aimed at smoking partners	6 weeks post-intervention, 6 weeks postpartum	6 weeks post-intervention: T = 19.0% * C = 7.0% 6 weeks postpartum: T = 21% * C = 12%	NR
	1 counselling session, bimonthly prenatal and monthly postnatal calls	Counsellors	Counselling, telephone support	End of pregnancy, 6 months postpartum	End of pregnancy: T = 28.3% * C = 9.6% 6-months postpartum: T = 9.4% * C = 3.8%	NR
	12 weeks of pharmacotherapy plus 5 minutes counselling	Midwives	Pharmacotherapy (NRT), counselling	Last antenatal visit	T = 15.0% * C = 0.0%	T = 35.0% C = 20.0%

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Kientz & Kupperschmidt, 2006 RCT 1-	US	Postpartum	N = 11 T = 6 C = 5	Clinic General population	3rd trimester to postpartum
Rigotti et al., 2006 RCT 1+	US	Prenatal	N = 442 T = 220 C = 222	Telephone General population	Varied
Chan et al., 2005 Case-control 2+ (CT)	Canada	Prenatal	N = 44 T = 22 C = 22	Clinic General population	1st trimester
Ferreira-Borges, 2005 Case-control 2++ (CT)	Portugal	Prenatal	N = 57 T = 33 C = 24	Clinic General population	Varied
Tappin et al., 2005 RCT 1+	Scotland	Prenatal	N = 762 T = 351 C = 411	Home General population	Mostly in the 2nd trimester
Gulliver et al., 2004 RCT 1-	US	Prenatal	N = 20 T = 10 C = 10	Clinic General population	Varied
Haug et al., 2004 RCT 1+	US	Prenatal	N = 63 T = 30 C = 33	Clinic Chemical dependence	Varied
Higgins et al., 2004 Case-control 2+ (CT)	US	Prenatal	N = 58 T = 31 C = 27	Clinic General population	Varied
McBride et al., 2004 RCT 1+	US	Prenatal	N = 625 T1 = 193 T2 = 192 C = 198	Telephone Army medical centre women	Varied
Pbert et al., 2004 Cluster-RCT 1+	US	Prenatal	N = 550 T = 272 C = 278	Community clinics Low income	Varied
Polanska et al., 2004 Cluster-RCT 1+	Poland	Prenatal	N = 293 T = 149 C = 144	Home General population	Varied

\* = significant differences between groups  
NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	36 weeks gestation to 6 weeks postpartum	Nurses	Information, telephone support	Postpartum	T = 83.3% C = 60%	NR
	Counselling during pregnancy and over 2 months postpartum	Counsellors	Tailored information, counselling, telephone counselling	28 weeks to term, 3 months postpartum	28 weeks to term: T = 10.0% C = 7.5% 3 months postpartum: T = 6.7% C = 7.1%	Achieved 50% reduction: 28 weeks to term: T = 29.2% C = 21.7% 3 months postpartum: T = 17.7% C = 16.2%
	One contact	Physicians	Pharmacotherapy (bupropion)	Anytime during pregnancy	T = 45% * C = 13.6%	12 women reduced the number of cigarettes per day by the same amount as the control group.
	2 sessions	Nurses	Counselling and behavioural intervention	2 month follow-up	T = 33.0% * C = 8.3%	T = 3.7 cigs/day * C = 6.7 cigs/day
	2 to 5 home visits	Midwives	Information, motivational interviewing	Post-treatment assessment	T = 7.4% C = 8.8%	T = 4.0% C = 6.3%
	One session	Clinical psychologist	Counselling, self-help material, incentives, partner support	One month follow-up	T + C = 54%	Reduction from 9.7 (baseline) to 3 to 8 cigs/day
	4 sessions	Master's level research associates	Stage-of-change-based counselling	10 week follow-up	No difference between groups	No difference between groups
	From intake to 24 weeks postpartum	Various providers	Incentives	End of pregnancy, 3 months postpartum, 6 months postpartum	End of pregnancy: T = 37.0% * C = 9.0% 3 months postpartum: T = 33.0% * C = 0.0% 6 months postpartum: T = 27.0% * C = 0.0%	NR
	6 phone contacts	Counsellors	Telephone counselling, partner support, relapse prevention	28 weeks of pregnancy, 6 months postpartum, 12 months postpartum	28 weeks of pregnancy: T1 = 61.0% T2 = 59.0% C = 60.0% 6 months postpartum: T1 = 37.0% T2 = 36.0% C = 33.0% 12 months postpartum: T1 = 35.0% T2 = 32.0% C = 29.0%	NR
	Several contacts through appointments or telephone during pregnancy and to postpartum	Various providers	Brief intervention tailored to stage of change	9 months, 1- month postpartum, 3 month postpartum	9 month: T = 26.0% * C = 12.0% 1 month postpartum: T = 26.0% * C = 11.0% 3 month postpartum: T = 10.0% C = 5.0%	NR
	4 to 9 home visits	Midwives	Information, counselling, relapse prevention	Before delivery	T = 43.3% * C = 16.7%	NR

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Stotts et al., 2004 RCT 1+	US	Prenatal	N = 54 Group breakdown not specified	Clinic Low income	1st and 2nd trimesters
Cope et al., 2003 RCT 1+	UK	Prenatal	N = 192 T = 109 C = 83	Clinic General Population	Varied
Hegaard et al., 2003 Case-control 2++ (CT)	Denmark	Prenatal	N = 647 T = 327 C = 320	Clinic General population	Varied
Lawrence et al., 2003 Cluster-RCT 1++	UK	Prenatal	N = 918 T1 = 305 T2 = 324 C = 289	Clinic General population	1st and 2nd trimester
Lin et al., 2003 Cohort 2- (QUASI)	US	Prenatal	N = 202 T = 101 C = 101	Clinic & Home General population	Varied
Malchodi et al., 2003 RCT 1+	US	Prenatal	N = 142 T = 67 C = 75	Clinic Low income	1st and 2nd trimester
Buchanan, 2002, CT-B Rating = 1	US	Prenatal	N = 48 T = 20 C = 28	Telephone calls General population	2nd trimester
Moore, 2002, CT-B Rating = 3	UK	Prenatal	N = 1527 T = 724 C = 803	Home General population	1st trimester
Neil-Urban et al., 2002, QUASI-B Rating = 2	US	Prenatal	N = 22	Home General population	1st and 2nd trimester
Schroeder et al., 2002 QUASI-A Rating = 5	US	Prenatal	N = 21	Clinic Heavy smokers	3rd trimester
Stotts et al., 2002, RCT-B Rating = 1	US	Prenatal	N = 169 T = 134 C = 135	Telephone support General population	3rd trimester
Ford et al., 2001 QUASI-B Rating = 1	New Zealand	Postpartum	N = 149	Home General population	Varied
Hajek et al., 2001, RCT-B Rating = 4	UK	Postpartum	N = 1120 T = 545 C = 575	Clinic General population	1st trimester

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NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	4 sessions	Counsellor	Motivational interviewing	Post-treatment assessment	T = 14.3% C = 18.0%	NR
	At most 36 weeks	Midwives	Tailored biological information, information	36-week visit	T = 16.2% * C = 0.0%	T = 27.6 C = 37.6 (urine nicotine test)
	9 sessions	Midwives	Information, Counselling, pharmacotherapy (NRT)	37 weeks gestation	T = 7.0% * C = 2.2%	NR
	3 contact points	Midwives	Self-help manual, computerized intervention, stage of change	30 weeks gestation, 10 days postpartum	30 weeks gestation: T1 = 5.6% T2 = 4.3% C = 1.7% 10 days postpartum: T1 = 8.1% T2 = 4.7% C = 3.5%	NR
	5 contact points	Various providers	Counselling	Anytime during pregnancy	T = 32.0% C = 29.0%	T = 71.0% * C = 37.0%
	2 sessions	Various providers	Peer-support counselling	36 weeks gestation	T = 24.0% C = 21.0%	T = 9.1 cigs/day C = 4.5 cigs/day
	8 sessions (telephone calls)	Advance practice nurse, nurse, physician	Information, tailored information, counselling	Time of delivery, 2 weeks postpartum	Time of delivery: T = 90% C = 68% 2 weeks postpartum: T = 80% C = 61%	Time of delivery: T = 1 cigs/day * C = 5.9 cigs/day 2 weeks postpartum: T = 2 cigs/day * C = 6.1 cigs/day
	5 self-help booklets mailed weekly	Midwife, self-administered	Self-help booklets	End of 2nd trimester	T = 18.8% C = 20.7%	NR
	Self-help quit guide and monthly telephone calls	Nursing students	Self-help guide, telephone	6 months post-intervention	T = 18%	40% had reduced the amount they smoked at follow up
	Counselling sessions not specified (possibly 4 sessions)	Counsellor	Pharmacotherapy (NRT), counselling	1 year post-intervention	T = 10%	NR
	3 sessions (8 self-help booklets)	Professional and nurse health educators	Tailored information, counselling	6 months postpartum	T = 14.6% C = 17.1%	NR
	Up to 14	Health educator	Tailored information, counselling	6 months postpartum	At the last visit: T = 18.8% (only 3.4% were cotinine validated)	Number of cigs/day decreased from 18 (before pregnancy) to 9 (last visit)
	1 session	Midwife, self-administered	Information, tailored information, counselling, relapse prevention, tailored biological information (expired CO readings)	At delivery, 6 months postpartum	At delivery, T = 22% C = 20% 6 months postpartum: T = 7% C = 8%	NR

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Jaakkola et al., 2001, CT-B Rating = 2	Finland	Prenatal	N = 458 T = 306 C = 152	Clinic General population	1st prenatal visit (not specified)
Kapur et al., 2001, RCT-B Rating = 4	Canada	Prenatal	N = 30 T = 17 C = 13	Clinic and telephone sessions Heavy smokers	1st and 2nd trimester
Valanis et al., 2001, CT-B Rating = 1	US	Prenatal	N = 3083 T = 2055 C = 1028	Clinic General population	1st prenatal visit
Cinciripini et al., 2000, RCT-B Rating = 3	US	Prenatal	N = 82 T = 42 C = 40	Home General population	2nd trimester
Donatelle et al., 2000, RCT-A Rating = 6	US	Prenatal	N = 220 T = 112 C = 108	Telephone sessions Low income	2nd trimester
Dunphy et al., 2000, RCT-B Rating = 2	US	Postpartum	N = 62 T = 30 C = 32	81% African American	Delivery
Hughes et al., 2000 RCT-B Rating = 4	Canada	Prenatal	N = 110 T = 56 C = 54	Clinic General population	2nd trimester
Johnson et al, 2000; Ratner et al, 2000 RCT-B Rating = 3	Canada	Postpartum	N = 251 T = 125 C = 126	Clinic, Telephone General population	Delivery
Scott & McIlvain, 2000, RCT-B Rating = 4	US	Prenatal	N = 233 T = 114 C = 119	Clinic Low income	2nd trimester
Solomon et al., 2000 RCT-A Rating = 5	US	Prenatal	N = 151 T = 77 C = 74	Clinic, and telephone support Low income (~75% on Medicaid)	1st trimester
Strecher et al., 2000, RCT-B Rating = 3	US	Prenatal	N = 173 T = 88 C = 85	Clinic General population	2nd trimester
Tappin et al., 2000, RCT-A Rating = 5	UK	Prenatal	N = 100 T = 50 C = 50	Home General population	2nd trimester
Van't Hof et al., 2000, RCT-B Rating = 2	US	Relapse prevention	N = 287 T = 141 C = 146	Hospitals General population	Postpartum (Right after delivery)
Windsor et al., 2000, CT-A Rating = 5	US	Prenatal	N = 265 T = 139 C = 126	Maternity care sites Low income (Medicaid recipients)	1st trimester

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NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	During regular prenatal visits (unspecified number)	Public health nurse	Information, counselling	At delivery	T = 19.0% C = 14.5%	Average reduction rate similar
	4 sessions (with weekly phone calls)	Researcher/physician for phone calls	Counselling, pharmacotherapy (NRT)	8 weeks after initial visit	NR	NR
	A few minutes of intervention at regular scheduled prenatal and postnatal visits	Nurse	Information, tailored information, social support, counselling	1 year postpartum	T = 38.8% * C = 28.9%	NR
	6 self-help sessions and follow-up phone calls	Self-administered (video)	Information, tailored information	End of treatment, 1 month postpartum	End of treatment: T = 12% C = 7.5% 1 month postpartum: T: 7.5% C: 5%	NR
	10 sessions	Trained WIC or SOS staff	Information, tailored information, social support, incentives	8 months gestation, 2 months postpartum	8 months gestation T = 32% * C = 9% 2 months postpartum: T = 21% * C = 6%	NR
	1 session	Nurse	Information, counselling, incentives	4-8 weeks postpartum	T + C = 31% maintained cessation  No significant difference between groups	NR
	1 session (with follow-up throughout pregnancy)	NR	Tailored information, tailored biological information (expired CO readings)	12 months after initial visit	No significant differences in the 12 months rate of maintained cessation between intervention and control groups	NR
	9 sessions (8 by phone and 1 6-month interview)	Nurse	Information, tailored information, counselling	12 months postpartum	T = 21.0% C = 18.5%	Daily smoking rates similar
	2 sessions	Self-administered	Tailored information	Delivery	T = 10.1% C = 4%	NR
	1 counselling session and proactive telephone peer support	Physician, midwife, peer supporter	Counselling, peer support	Delivery	T = 18.2% C = 14.9%	NR
	Tailored smoking cessation messages after each prenatal visit	Self-administered	Tailored information, computer-generated tailored information	3 months postpartum	T = 9.6% C = 9.2%	NR
	4 sessions	Midwife	Motivational interviewing, counselling	Late pregnancy	T = 4% C = 8%	T = 6% C = 10%
	3 sessions	Nurse, Paediatric provider	Relapse prevention, counselling	6 months postpartum	T = 58% C = 62%	NR
	1 session	Medicaid maternity care staff	Information, tailored information, counselling	60 post-intervention	T = 17.3% * C = 8.8%	T = 21.7% C = 15.8%

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Wisborg et al., 2000, RCT-B Rating = 2	Denmark	Prenatal	N = 250 T = 124 C = 126	University hospital research unit  Heavy smokers	After the first trimester
Ershoff et al., 1999, RCT-B Rating = 2	US	Prenatal	N = 332 T1 = 111 T2 = 120 T3 = 101	Telephone calls  General population	Primarily first trimester
McBride et al., 1999, RCT-B Rating = 3	US	Postpartum	N = 897 T1 = 297 T2 = 294 T3 = 306	Home  General population	1st and 2nd trimester
Panjari et al., 1999, RCT-B Rating = 1	Australia	Prenatal	N = 1013 T = 476 C = 537	Clinic  General population	1st and 2nd trimester
Gebauer et al., 1998, CT-B Rating = 4	US	Prenatal	N = 178 T = 84 C = 94	Clinic and telephone sessions  Lower income	2nd trimester
Secker-Walker et al. 1998b, RCT-B Rating = 4	US	Relapse prevention (spontaneous quitters)	N = 92 T = 44 C = 48	Clinic  Low income (~65% on Medicaid)	2nd trimester
Wakefield & Jones, 1998, CT-B Rating = 3	Australia	Prenatal	N = 220 T = 110 C = 110	Hospital  General population	1st trimester
Wisborg et al., 1998 CT-B Rating = 2	Denmark	Prenatal	N = 265 T = 139 C = 126	A routine antenatal care clinic  General population	2nd trimester
Gielen et al., 1997, RCT-A Rating = 5	US	Prenatal	N = 391 T = 193 C = 198	Clinic  Low income	3rd trimester
Lowe et al., 1997, RCT-A Rating = 5	Australia	Relapse prevention	N = 106 T = 52 C = 54	Clinic  General population	Initial prenatal visit
Secker-Walker et al., 1997, RCT-B Rating = 4	US	Prenatal	N = 60 T = 30 C = 30	Clinic  General population	At 1st prenatal visit
Walsh et al., 1997, RCT-A Rating = 5	Australia	Prenatal	N = 252 T = 127 C = 125	Urban public prenatal clinic  General population	1st and 2nd trimester

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	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	11 weeks	Midwives	Pharmacotherapy (NRT)	30 weeks gestation, 3 months postpartum, 1 year postpartum	30 weeks of gestation: T = 28 % C = 25% 3 months postpartum: T = 21% C = 18% 1 year postpartum: T = 15% C = 14%	NR
	4-6 weekly phone calls	Self-administered, health educator, nurse, computerized telephone program	Tailored information, counselling	34 weeks gestation	T1 = 22.5% T2 = 16.7% T3 = 20.8%	NR
	Up to 4 sessions	Trained counsellors, self-administered	Self-help booklet, relapse prevention, telephone counselling	12 months postpartum	T1 = 8% T2 = 8% T3 = 5%	NR
	4 sessions	Trained midwife	Information, counselling	Late pregnancy	T = 11.9% C = 9.8%	NR
	1 phone interview	Nurse, self-administered	Tailored information, counselling, 4A approach	~24-30 weeks gestation	T = 15.5% * C = 0%	NR
	5 sessions	Nurse, nurse-midwife	Tailored information, relapse prevention, counselling	1 year postpartum	T = 68% C = 78%	NR
	2 sessions	Midwives	Tailored information, partner support, tailored biological information (demonstration of effects of smoking on fetal heart rate)	24-34 weeks gestation  6 months postpartum	24-34 weeks gestation: T = 6.4% * C = 1.8 %  6 months postpartum: T = 4.5% C = 3.8%	NR
	At least 1 session	Midwives	Information, counselling, incentives	30 weeks gestation	T = 1% C = 1%	NR
	1 session (and reinforcement at subsequent clinic visits)	Peer health counsellor, physician, nurse, self-administered	Tailored information, counselling, social support	Delivery	T = 6.2% C = 5.6%	NR
	1 session (with reinforcement at subsequent visits)	Health educator, nurse, physician	Social support, relapse prevention, counselling	Delivery	T = 80% C = 76%	NR
	5 sessions	Nurse, midwife	Tailored information, counselling	36 weeks gestation	T = 19.2% * C = 0%	NR
	3 sessions	Physician, midwives	Information, counselling, incentives	4 weeks after the first visit, 34 weeks gestation, 6-12 weeks postpartum	4 weeks after the first visit: T = 16% * C = 2% 34 weeks gestation: T = 13% * C = 6% 6-12 weeks postpartum: T = 10% * C = 1%	NR

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
Ker et al., 1996, CT-B Rating = 1	US	Prenatal	N = 22 T = 14 C = 8	Clinic Chemical dependence treatment program	Varied
Hartmann et al., 1996, RCT-B Rating = 4	US	Prenatal	N = 207 T = 107 C = 100	Clinic General population	2nd trimester
Valbø & Eide, 1996, RCT-B Rating = 3	Norway	Prenatal	N = 145 T = 67 C = 78	Hospital General population	2nd trimester
Wright et al., 1996, QUASI-B Rating = 2	US	Prenatal	N = 3291	10 prenatal care sites General population\)	Varied
Ershoff et al., 1995; Mullen et al., 1990, RCT-B Rating = 4	US	Postpartum (spontaneous quitters)	N = 171 T = 87 C = 84	Home General population	1st and 2nd trimester
Kendrick et al., 1995 RCT-B Rating = 1	US	Prenatal	N = 5572 T = 2508 C = 3064	Clinic General population	2nd trimester
Lillington et al., 1995, RCT-B Rating = 2	US	Prenatal	N = 555 T = 155 C = 400	Clinic, home Low income (Hispanic and Black women)	Varied
Secker-Walker et al., 1995, RCT-B Rating = 3	US	Relapse prevention	N = 133 T = 68 C = 65	Clinic General population	2nd trimester
Haug et al., 1994, RCT-B Rating = 3	Norway	Prenatal	N = 350 T = 252 C = 98	Clinic General population	Varied
Secker-Walker et al., 1994, RCT-B Rating = 3	US	Prenatal	N = 600 T = 300 C = 300	Clinic General population	2nd trimester
Valbo & Schioldberg, 1994, RCT-B Rating = 3	Norway	Prenatal	N = 300 T1 = 98 T2 = 101 C = 101	Hospital Heavy smokers	2nd trimester
Valbø & Nylander, 1994, RCT-B Rating = 2	Norway	Prenatal	N = 104 T = 54 C = 50	Hospital Heavy smokers	2nd trimester
Windsor et al., 1993, Windsor et al., 1997, Anonymous, 1997, RCT-B Rating = 4	US	Prenatal	N = 811 T = 400 C = 411	Urban public prenatal clinic General population	2nd trimester

\* = significant differences between groups

NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	Daily education sessions throughout stay at treatment centre	Nurse	Information, tailored biological information (expired CO readings)	>61 days after initial visit	NR	Treatment group reduced smoking to nearly non-smoker levels
	Counselling at each prenatal visit (unspecified # of sessions)	Physician, volunteer counsellor, self-administered	Tailored information, counselling	Last prenatal visit	T = 20% * C = 10%	Reduced consumption by half or more: T = 51% * C = 30%
	2 sessions	Hypnotist (an anaesthesiologist)	Ultrasound, hypnosis	Delivery	T = 10% C = 10%	T = 42% C = 46%
	1 session	Prenatal care providers (physicians, nurses, midwives, or social worker)	Tailored information	At each prenatal visit. Average number of visits as well as the timing not reported.	T = (range from 0% to 45% by clinic)	NR
	9 sessions (1 visit plus 8 weekly booklets)	Health Educator, self-administered	Information, tailored information	6 months postpartum	T = 38.3% C = 36.4%	NR
	2 sessions	Physician, nurse, self-administered	Information, counselling	12 weeks postpartum	T = 6.1% C = 5.9%	NR
	1 session	Bilingual health education counsellor	Tailored information, counselling, incentives	6 weeks postpartum	T (Black) = 26.6% * C (Black) = 8.5%  T (Hispanic) = 20.0% * C (Hispanic) = 16.6%	NR
	5 sessions	Nurse, midwife	Tailored information, counselling, relapse prevention	54 months postpartum	T = 50.9% C = 50.0%	NR
	Up to 5 sessions	Physician	Information, tailored information	18 months post-intervention	T = 6% * C = 0%	No difference in reduction between intervention and control
	5 sessions	Nurse, midwife	Tailored information, counselling	54 months postpartum	T = 10.8% C = 9.7%	NR
	1 session	Midwife	Tailored information	Delivery	T1 = 12% * T2 = 5% * C = 3%	T1 = more reduction than other groups
	Self-help materials	Midwives and obstetrician (only for the ultrasound part), the material for cessation is self-help manual	Self-help guide, ultrasound, information	Delivery	T = 20% * C = 4%	T = 65% C = 38%
	3 sessions	Female health counsellor (cessation session) and nurse (brief advice)	Information, tailored information	4-8 weeks after the first visit  End of pregnancy	4-8 weeks after the first visit: T = 14% * C = 8.5%  End of pregnancy T (Black) = 18.1% * C (Black) = 10.7% T (White) = 10.0% C (White) = 5.2%	4-8 weeks after the first visit: T = 16.8% C = 12.3% End of pregnancy T (Black) = 12.9% * C (Black) = 11.6% T (White) = 21.1% * C (White) = 13.4%

Author, Year, and Study Rating	Country	Intervention focus	Sample Size	Settings and Participants	Trimester of Intervention
O'Connor et al., 1992, RCT-A Rating = 5	Canada	Prenatal	N = 224 T = 115 C = 109	Clinic Low income	2nd trimester
Petersen et al., 1992, RCT-B Rating = 1	US	Prenatal	N = 224 T1 = 71 T2 = 75 C = 78	Clinic and home General	Varied
Rush et al., 1992, RCT-B Rating = 2	UK	Prenatal	N = 319 T = 175 C = 144	Clinic and home General	2nd trimester
Secker-Walker et al., 1992, 1998a, Solomon et al., 1996 RCT-B Rating = 3	US	Prenatal	N = 276 T = 135 C = 141	Clinic Low income (~70% on Medicaid)	2nd trimester
Burling et al., 1991, RCT-B Rating = 4	US	Prenatal	N = 139 T = 70 C = 69	Clinic General	3rd trimester
Haddow et al., 1991 RCT-B Rating = 3	US	Prenatal	N = 2848 T = 1423 C = 1425	Clinic Low income	Varied
Hjalmarson et al., 1991, RCT-A Rating = 6	Sweden	Prenatal	N = 723 T = 492 C = 231	Clinic General population	1st trimester
Valbø & Schioldborg, 1991, CT-B Rating = 4	Norway	Prenatal	N = 200 T1 = 50 T2 = 50 T3 = 50 C = 50	Hospital, mailed pamphlets to homes General population	2nd trimester
Gillies et al., 1990 CT-B Rating = 2	UK	Postpartum	N= 881 T= 474 C= 407	Clinic General population	Varied
Mayer et al., 1990, RCT-B Rating = 3	US	Prenatal	N = 219 T1 = 72 T2 = 70 C = 77	Clinic Low income=	Varied
Shakespeare, 1990, RCT-B Rating = 1	UK	Prenatal	N = 307 T = 157 C = 150	Unspecified	1st and 2nd trimester
Ershoff et al., 1989, Ershoff et al., 1990; Mullen et al., 1990. RCT-A Rating = 5	US	Prenatal	N = 242 T = 126 C = 116	Home General population	1st and 2nd trimester

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NR = Not reported

	Intensity of Intervention	Provider	Intervention Components	Time Points	Cessation Length	Tobacco Reduction
	1 session	Public health nurse	Information, self-help guide, telephone follow-up	6 weeks postpartum	T = 13.8% * C = 5.2%	NR
	1 session	Self-administered, obstetricians, nurse-practitioners	Tailored self-help guide, information	8 weeks postpartum	T1 = 29% * T2 = 35.6% * C = 9.7%	NR
	2 or more sessions	Psychologists	Counselling	Delivery	T = 10.6% C = 4.7%	NR
	5 sessions	Nurse, midwife	Tailored information, counselling	1 year postpartum	T = 18.4% C = 10.9%	NR
	1 session	Nurse	Information, tailored information	28th week of pregnancy 34 weeks of pregnancy	28th week: T = 11.6% * C = 1.4% 34th week: T = 3% C = 5.7%	NR
	2 sessions	Physician	Tailored information; tailored biological information (serum cotinine readings)	One month after initial visit	T = 15.8% C = NR	T = 17.5% reduced consumption by 50%
	1 session	Obstetrician, midwife, self-administered	Information, tailored information	8 weeks postpartum	T = 10.4% * C = 5.2%	NR
	Up to 6 sessions	Psychologist, physician	Counselling, information (verbal), information (written)	12 months post-intervention	T1 = 16% * T2 = 6% T3 = 8% C = 6%	In all three intervention groups, more than 1/3 reduced their smoking to almost half.
	3 sessions	Researcher	Information, counselling, tailored biological information (optional)	6 months postpartum	T = 22% * C = 11%	NR
	1 session	Health educator	Tailored information, counselling	4.7 weeks postpartum	T1 = 6.9% * T2 = 7.1% * C = 0%	NR
	2 sessions	Midwife	Information	34 weeks gestation	Cessation and reduction combined: T = 48.4% C = 14.9%	
	9 sessions (1 visit plus 8 weekly booklets)	Health Educator, self administered	Information, tailored information	End of pregnancy and 6 months postpartum	End of pregnancy: T = 22.2% * C = 8.6% Significant 6 months postpartum (among those who quit at delivery): T = 33.3% C = 42.8%	NR

# Appendix B

## List of Search Terms and Description of Ratings Process

### List of Databases Searched and Keywords Used

Database	Keywords
<ul style="list-style-type: none"> <li>• <i>EMBASE</i></li> <li>• <i>Medline/Pubmed</i></li> <li>• <i>PsycINFO</i></li> <li>• <i>Cochrane Database of Systematic Reviews (CDSR)</i></li> <li>• <i>Database of Abstracts of Reviews of Effectiveness (DARE)</i></li> <li>• <i>Cochrane Central Register of Controlled Trials</i></li> <li>• <i>Social Sciences Index, Sociological Abstracts, and</i></li> <li>• <i>SIGLE (International System for grey literature)</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Smok* and cessation and pregnan*</i></li> <li>• <i>(Tobacco or smok) and mother and (cessation or quit)</i></li> <li>• <i>pregnancy and tobacco and (cessation or quit)</i></li> <li>• <i>Pregnancy and smoking cessation and intervention</i></li> <li>• <i>Pregnan* and smok* and cessation and (program or intervention)</i></li> <li>• <i>Teen and pregnant and smoking</i></li> <li>• <i>Pregnant and relapse and smoking</i></li> <li>• <i>Pregnancy and bupropion</i></li> <li>• <i>Pregnant and nicotine replacement</i></li> <li>• <i>Postpartum and relapse and smoking</i></li> <li>• <i>Pharmacotherapy and pregnant and smoking</i></li> <li>• <i>Socioeconomic status and smoking and pregnancy</i></li> <li>• <i>Education and smoking and pregnancy</i></li> <li>• <i>Ethnicity and smoking and pregnancy</i></li> </ul>
*also used author searches, and interventions cited in various review articles	

### Description of Ratings Process

Interventions were rated independently by two reviewers. When disagreement occurred, a third rater was used. These formed the basis of the preliminary recommendations. The team discussed the interventions in some detail in the context of the theoretical literature, and identified the various components, approaches, and subpopulations that were important.

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