Original Investigation

Smoking During Consecutive Pregnancies Among Primiparous Women in the Population-Based Norwegian Mother and Child Cohort Study

Lars Johan Hauge, Ph.D., Leif Edvard Aarø, Ph.D., Leila Torgersen, Ph.D., & Margarete E. Vollrath, Ph.D.

Norwegian Institute of Public Health, Division of Mental Health, Oslo, Norway

Corresponding Author: Lars Johan Hauge, Ph.D., Norwegian Institute of Public Health, Division of Mental Health, Post Box 4404, Nydalen, N-0403 Oslo, Norway. Telephone: +47-21-07-81-04; Fax: +47-21-07-81-01; E-mail: laha@fhi.no

Received January 17, 2012; accepted May 15, 2012

Abstract

Introduction: This study investigated changes in smoking behavior across pregnancies in a sample of 10,890 primiparous women participating in the prospective population-based Norwegian Mother and Child Cohort Study (MoBa) in order to identify risk factors that may inhibit smoking cessation and promote smoking during a woman's second pregnancy.

Methods: Registry information regarding smoking, age, marital status, parity, and year of birth was applied, in addition to questionnaire assessments of own and partner's smoking behavior, educational attainment, and symptoms of anxiety and depression at weeks 17 and 30 of gestation from both pregnancies.

Results: The vast majority did not smoke in either of the pregnancies, and more women quit smoking than relapsed to smoking in their second pregnancy. Among smokers in the first pregnancy, 30.9% quit smoking by their second pregnancy. Women living with a nonsmoking partner or a partner who quit between pregnancies were more likely to quit smoking, as were women smoking occasionally in their first pregnancy. Symptoms of psychological distress and increasing number of years between pregnancies were negatively associated with smoking cessation. Among women not smoking in their first pregnancy, 2.3% did smoke during their second. Living with a smoking partner, low educational attainment, symptoms of psychological distress, and increasing number of years between pregnancies were all associated with smoking during the second pregnancy.

Conclusions: These findings, linking smoking behavior to changes taking place between pregnancies, offer new and additional insight into modifiable risk factors that may help facilitate more targeted smoking cessation interventions for women at the highest risk.

Introduction

Smoking during pregnancy poses a great threat to the unborn child and is associated with a range of negative pregnancy outcomes, such as low birth weight, stillbirth, and sudden infant death syndrome (Cnattingius, 2004; Shea & Steiner, 2008). Although these risks are well documented and despite a general declining prevalence of smoking in Norway and most industrialized countries, studies typically show that as many as 13–20% of women do smoke during pregnancy (Colman & Joyce, 2003; Helleve, Weisæth, & Lindbak, 2010; Kahn, Certain, & Whitaker, 2002; Martin et al., 2008). For many women, becoming pregnant is probably the strongest motivator for smoking cessation and a unique opportunity to modify their health behavior in order to protect their unborn child from harm (Ludman et al., 2000; Solomon & Quinn, 2004). Nonetheless, studies show that only about half of pre-pregnancy smokers do in fact quit smoking while pregnant, and a considerable proportion of quitters relapse to smoking shortly after childbirth (Hajek et al., 2001; Mullen, 2004; Schneider & Schütz, 2008; Wakschlag et al., 2003). How women's smoking behavior may change during subsequent pregnancies is much less documented (Dietz, Adams, Roach, & Mathis, 1997).

From cross-sectional studies, there is ample evidence on risk factors for smoking during pregnancy, with factors such as young age, low educational attainment, increased parity, living with a smoking partner, and symptoms of psychological distress being identified as among the most important factors (Colman & Joyce, 2003; Kahn et al., 2002; Ludman et al., 2000; Martin et al., 2008). At the same time, very little is known about how these factors, or changes in some of these factors may influence maternal smoking during subsequent pregnancies (Dietz et al., 1997). For instance, as both age and parity necessarily change from one to a later pregnancy, such changes are expected to

doi:10.1093/ntr/nts147

Advance Access publication August 1, 2012

© The Author 2012. Published by Oxford University Press on behalf of the Society for Research on Nicotine and Tobacco. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com

influence women's future smoking habits. However, changes may work in different directions, and whereas becoming older tend to lower the likelihood of smoking while pregnant, higher parity tend to increase the likelihood of smoking. Moreover, although partner smoking is probably the most critical factor for women's continuation or abstinence from smoking while pregnant (DiClemente, Dolan-Mullen, & Windsor, 2000; Schneider, Huy, Schütz, & Diehl, 2010), very little is known about how the partner's behavior or change in behavior may influence smoking during a later pregnancy. Practically, nothing is known about how the time span between pregnancies may influence maternal smoking.

Using data following 10,890 primiparous women into their second pregnancy, this study expands findings from previous cross-sectional studies by investigating changes in women's smoking behavior across pregnancies, in order to identify risk factors that may inhibit smoking cessation and promote smoking during a woman's second pregnancy.

Methods

Study Design and Participants

This study is based on the prospective population-based Norwegian Mother and Child Cohort Study (MoBa), conducted by the Norwegian Institute of Public Health (Magnus et al., 2006). Participants were recruited from 1999 to 2008 at their first prenatal ultrasound examination in Norwegian hospitals and maternity units having more than 100 births annually. Altogether 52 units participated nationwide. Calculations including the years from 2000 to 2006 show that a total of 398,849 deliveries were registered in the Medical Birth Registry of Norway, of which 73,579 pregnancies were enrolled in MoBa (18.5%). Informed consent was obtained from each MoBa participant upon recruitment, and 42.4% of invited women consented to participate. Among women invited to participate with a second pregnancy, the corresponding consent percentage was 36.2 (Nilsen et al., 2009). During the complete recruitment period, the consent percentage was somewhat reduced to a total of 38.5%. The present cohort includes about 108,000 children, 90,000 mothers, and 71,500 fathers in total.

This study is based on version 6 of the quality-assured data released for research in spring 2011, using data from primiparous married or cohabiting women who completed questionnaires at weeks 17 and 30 of gestation, yielding a total of 45,369 participants. Of these, 10,890 women participated twice in the MoBa study and completed questionnaires also at weeks 17 and 30 of gestation during their second pregnancy. In addition, this study used data from the Medical Birth Registry of Norway, which contains information about all births in Norway (Irgens, 2000). The study was approved by the Regional Committee for Medical Research Ethics in Southeastern Norway.

Measures

Maternal smoking was assessed by self-report items at gestation weeks 17 and 30, in addition to face-to-face interviews when the women were hospitalized to give birth, as reported to the Medical Birth Registry of Norway. At gestation week 17, the

women were asked to report if they had ever smoked and, if so, if they smoked three months prior to the pregnancy and if they were currently smoking. At gestation week 30, the women were asked to indicate their current smoking status in addition to retrospectively report their smoking status at gestation week 17. At both assessment points, smoking was assessed as a categorical variable coded *no*, *occasionally* and *daily*. If the woman reported occasional smoking at either source, both at present or at retrospectively, she was coded as an occasional smoker for the respective pregnancy, over-riding possible prior reports of non-smoking. Similarly, women reporting daily smoking at either source were coded as daily smokers, over-riding possible prior reports of nonsmoking or occasional smoking.

Psychological distress was assessed using a five-item short version of the Hopkins Symptom Checklist (SCL-5), administered at weeks 17 and 30 of gestation (Strand, Dalgard, Tambs, & Rognerud, 2003). The scale measures symptoms of anxiety and depression and typical items are *Feeling fearful* and *Worrying too much about things*, all measured on the four-point scale *not bothered*, *a little bothered*, *quite bothered* and *very bothered*. The SCL-5 showed adequate internal consistency at both assessment points in both pregnancies ($\alpha \geq 0.78$). To obtain a robust measurement of psychological distress during pregnancy, a pooled mean score of the SCL-5 at weeks 17 and 30 from each of the pregnancies was computed and showed adequate temporal stability in both the first ($r = 0.58$) and second pregnancies ($r = 0.59$).

Information regarding age, marital status, parity, and year of birth was retrieved from the Medical Birth Registry of Norway. Educational attainment and partner's smoking status prior to and during the pregnancy were assessed by self-report of the women at week 17 of gestation in both pregnancies.

Statistical Analysis and Procedure

This study aims to investigate changes in smoking behavior across two consecutive pregnancies. To investigate quitting smoking prior to the second pregnancy, a subsample of women smoking in their first pregnancy was applied. Based on reports of partner's smoking status during the first and prior to the second pregnancy, a variable was computed reflecting nonsmoking partners, partners who quit smoking between pregnancies, and partners who maintained smoking. In addition, a variable reflecting whether the woman was an occasional or daily smoker during the first pregnancy was included. To investigate smoking during the second pregnancy, a subsample of nonsmokers during the first pregnancy was applied. Based on reports of partner's smoking status during the first and the second pregnancies, a variable was computed reflecting nonsmoking partners, partners who quit smoking by the second pregnancy, and partners who maintained smoking. In both analyses, participants' age was analyzed as assessed in the first pregnancy, and to adjust for unequal birth intervals among the participants, a continuous variable reflecting the number of years between pregnancies was included. Educational attainment was analyzed as assessed in the second pregnancy. The scores for psychological distress were standardized, and a variable reflecting the baseline level of psychological distress from the first pregnancy was included in the analyses, in addition to a variable reflecting the relative change in symptoms of psychological distress from the first to the second pregnancy. Moreover, as Norway passed a comprehensive

Table 1. Sample Characteristics of 45,369 Primiparous Participants in the Norwegian Mother and Child Cohort Study and Assessment of Representativeness of Women Participating With One and Two Pregnancies in the Study

	One pregnancy (<i>n</i> = 34,479)	Two pregnancies (<i>n</i> = 10,890)	
	1st pregnancy	1st pregnancy	2nd pregnancy
Smoking ^a			
No	85.4%	89.0%	92.9%
Occasionally	3.4%	3.0%	1.9%
Daily	11.2%	8.0%	5.2%
Smoking prior to pregnancy ^b			
No	68.0%	71.3%	82.8%
Yes	32.0%	28.7%	17.2%
Age ^c	28.5 (4.53)	28.2 (3.88)	30.8 (3.86)
Educational attainment ^d			
Secondary level	34.7%	29.9%	24.2%
College/university level	65.3%	70.1%	75.8%
Partner's smoking status ^e			
No	72.6%	75.5%	80.9%
Yes	27.4%	24.5%	19.1%
Psychological distress ^f	1.29 (0.37)	1.23 (0.32)	1.19 (0.31)
Years between pregnancies			
1 year	n/a	n/a	9.3%
2 years	n/a	n/a	43.7%
3 years	n/a	n/a	33.0%
4 years	n/a	n/a	9.5%
≥5 years	n/a	n/a	4.5%

^aFirst pregnancy significantly different from one pregnancy only ($\chi^2 = 100.15$).

^bFirst pregnancy significantly different from one pregnancy only ($\chi^2 = 42.86$).

^cFirst pregnancy significantly different from one pregnancy only ($t = 5.97$).

^dFirst pregnancy significantly different from one pregnancy only ($\chi^2 = 86.79$).

^eFirst pregnancy significantly different from one pregnancy only ($\chi^2 = 35.92$).

^fFirst pregnancy significantly different from one pregnancy only ($t = 14.13$).

legislation banning smoking in restaurants, bars, and other public places in June 2004 (Braverman, Aarø, Bontempo, & Hetland, 2010), a variable was included grouping the year of the second pregnancy prior to and after the introduction of the smoking ban. Analyses were conducted using logistic regression in *Mplus* (Muthén & Muthén, 1998–2010). Missing data were handled by full-information maximum likelihood estimation.

Results

Responses from primiparous women participating with one and two pregnancies in MoBa was compared to assess the representativeness of women participating with two pregnancies in the study (Table 1). The findings showed that among women participating once, 14.6% reported smoking during their first pregnancy in contrast to 11% for women participating twice. In their second pregnancy, the proportion of smokers had decreased to 7.1%. In their first pregnancy, women participating twice in MoBa had a significantly higher proportion of nonsmokers and quitters, were somewhat younger, were better educated, reported fewer symptoms of psychological distress, and had a smoking partner less often as compared with women participating with one pregnancy only.

Among the women taking part twice in the study and among their partners, the proportion of smokers decreased across pregnancies. The vast majority of women did not smoke in either of the pregnancies (86.9%), and more women quit smoking (5.9%) than relapsed to smoking in their second pregnancy (2.1%), whereas a relatively small group smoked in both pregnancies (5.1%). Among those women who did not smoke in their first but who smoked in their second pregnancy, the distribution of occasional (44.9%) and daily smokers (55.1%) were fairly equal, whereas among those smoking in both pregnancies, the majority were daily smokers (80.9%). Also, the proportion of smoking partners was considerably higher among women smoking in their second pregnancy (55.7%) as compared with women quitting smoking by their second pregnancy (30.4%). The largest proportion of partners quitting smoking between pregnancies was found in the group of women who themselves quit smoking from their first to their second pregnancy.

Table 2 shows the adjusted odds ratios for quitting smoking prior to the second pregnancy among 1,193 women smoking during their first pregnancy. Among these smokers, 30.9% had quit smoking prior to their second pregnancy and stayed abstinent during the pregnancy. Younger women were somewhat less likely to quit smoking while educational attainment had no

Table 2. Adjusted Odds Ratios for Quitting Smoking Prior to the Second Pregnancy Among 1,193 Smokers During the First Pregnancy

	% Quitters	Quitting smoking	
		OR	95% CI
Quitting smoking prior to 2nd pregnancy	30.9%		
Age ^a			
<25 years	23.0%	0.70*	0.49, 0.98
25–29 years	34.6%	1.00	Reference
>30 years	34.1%	0.88	0.65, 1.20
Educational attainment ^b			
Secondary level	24.6%	0.79	0.59, 1.06
College/university level	37.3%	1.00	Reference
Partner's smoking status			
Nonsmoker	40.0%	2.54**	1.91, 3.38
Quitter pre-2nd pregnancy	56.0%	5.50**	3.65, 8.28
Smoker pre-2nd pregnancy	19.1%	1.00	Reference
Psychological distress			
Baseline 1st pregnancy	n/a	0.78**	0.65, 0.92
Relative increase 1st to 2nd pregnancy	n/a	0.79**	0.66, 0.94
Years between pregnancies	n/a	0.83**	0.73, 0.95
Smoking during 1st pregnancy			
Occasionally	39.3%	1.42*	1.06, 1.89
Daily	27.9%	1.00	Reference
Year of birth ^b			
1999–2004	27.6%	1.00	Reference
2005–2008	31.6%	1.34	0.92, 1.96

^aFirst pregnancy.^bSecond pregnancy.* $p < 0.05$, ** $p < 0.01$, otherwise not significant.

significant influence on quitting. Compared with women living with a partner who smoked prior to the second pregnancy, women living with a nonsmoking partner (*OR*, 2.54; 95% *CI*, 1.91, 3.38) or a partner who quit prior to the second pregnancy (*OR*, 5.50; 95% *CI*, 3.65, 8.28) had both an increased likelihood of themselves quitting by the second pregnancy. Moreover, women who smoked occasionally in their first pregnancy were somewhat more likely to quit smoking prior to their second pregnancy as compared with daily smokers. Women reporting increasing levels of psychological distress across pregnancies had a lower likelihood of quitting smoking prior to their second pregnancy (*OR*, 0.79; 95% *CI*, 0.66, 0.94). Increasing number of years between pregnancies was negatively associated with quitting smoking, whereas year of birth before or after introduction of the smoking ban did not significantly influence quitting smoking.

Table 3 shows the adjusted odds ratios for smoking during the second pregnancy among 9,697 women who did not smoke during their first pregnancy. Among these women, 2.3% did smoke during their second pregnancy. Age had no significant influence on smoking, whereas women holding education at a secondary level had an increased likelihood of smoking in their

second pregnancy (*OR*, 2.29; 95% *CI*, 1.70, 3.08). Women living with a nonsmoking partner (*OR*, 0.22; 95% *CI*, 0.16, 0.29) or a partner who quit smoking (*OR*, 0.36; 95% *CI*, 0.22, 0.60) had a lower likelihood of smoking as compared with women living with a partner who still smoked during the second pregnancy. Women reporting higher levels of psychological distress had a somewhat higher likelihood of smoking during their second pregnancy. Greater number of years between pregnancies was associated with smoking (*OR*, 1.29; 95% *CI*, 1.13, 1.48), whereas year of birth before or after introduction of the smoking ban did not significantly influence smoking during the second pregnancy.

Discussion

The main finding of this study is that women's smoking behavior prior to and during their second pregnancy may be explained by changes taking place between pregnancies. The most important risk factor inhibiting smoking cessation and for smoking during the second pregnancy was continued smoking on the part of the woman's partner. In contrast, women whose partners quit smoking between pregnancies had an increased likelihood of themselves quitting smoking and had a lower likelihood of smoking in their second pregnancy. As for educational attainment, women holding college or university-level education were at substantial lower risk for smoking during their second pregnancy. These findings replicate and expand findings from previous cross-sectional studies showing that partner smoking and educational attainment are important factors associated with maternal smoking, also across pregnancies (Colman & Joyce, 2003; Kahn et al., 2002; Martin et al., 2008).

In contrast to previous findings showing that the majority of women who smoke in their first pregnancy also smoke in their second (Dietz et al., 1997), our findings show that among those who smoked in their first pregnancy, more women quit smoking than continued to smoke in their second pregnancy. It is often argued that women who have previously delivered a healthy child may engage in more reckless behavior and be less motivated to quit smoking in later pregnancies (Wakschlag et al., 2003). However, as opposed to previous findings (Colman & Joyce, 2003; Kahn et al., 2002; Martin et al., 2008), we found no evidence for increased parity being a salient risk factor for smoking. On the contrary, the proportion of smokers decreased across pregnancies, and more women quit smoking than relapsed to smoking from their first to their second pregnancy. Consistent with the general trend in the Norwegian population (Helleve et al., 2010), the proportion of smokers seems to be declining, also among multiparous women.

This is the most comprehensive longitudinal study of smoking behavior among pregnant women to date, and as such, the study has several strengths. Very few studies have investigated risk factors for smoking across pregnancies and examined the role of possible changes in risk factors from one to a later pregnancy (Dietz et al., 1997). Demonstrating associations with changes taking place between pregnancies permits stronger causal inferences. Also, applying the longitudinal study design to examine the influence of increased parity for subsequent smoking behavior in a substantial sample of primiparous women is a

Table 3. Adjusted Odds Ratios for Smoking During the Second Pregnancy Among 9,697 Nonsmokers During the First Pregnancy

	% Smokers	Smoking	
		OR	95% CI
Smoking during 2nd pregnancy	2.3%		
Age ^a			
<25 years	4.0%	0.93	0.65, 1.33
25–29 years	2.3%	1.00	Reference
>30 years	1.7%	0.80	0.58, 1.11
Educational attainment ^b			
Secondary level	4.9%	2.29*	1.70, 3.08
College/university level	1.7%	1.00	Reference
Partner's smoking status			
Nonsmoker	1.4%	0.22*	0.16, 0.29
Quitter 2nd pregnancy	2.5%	0.36*	0.22, 0.60
Smoker 2nd pregnancy	7.0%	1.00	Reference
Psychological distress			
Baseline, 1st pregnancy	n/a	1.20*	1.06, 1.36
Relative increase, 1st to 2nd pregnancy	n/a	1.03	0.90, 1.17
Years between pregnancies	n/a	1.29*	1.13, 1.48
Year of birth ^b			
1999–2004	2.2%	1.00	Reference
2005–2008	2.4%	1.12	0.73, 1.72

^aFirst pregnancy.^bSecond pregnancy.* $p < 0.01$, otherwise not significant.

significant strength. Moreover, in addition to adjusting for the most important risk factors for maternal smoking, the possibility to take into account prior smoking behavior when investigating risk factors for smoking in a later pregnancy strengthens the findings. Because both women who quit and women who do not quit smoking share a history of smoking, their situation may deviate substantially from that of nonsmokers (Wakschlag et al., 2003). As postpartum relapse rates are substantial (Colman & Joyce, 2003; Hajek et al., 2001; Kahn et al., 2002), many pregnancy quitters may have suspended smoking rather than actually quit, and as such, their situation may influence the associations being investigated.

Still, some limitations need to be considered. One possible limitation of the study is that smoking was assessed by self-report. Social desirability and the stigma attached to smoking during pregnancy may result in biased estimates, and validation of self-report by cotinine measurements typically demonstrates an under-reporting of actual smoking during pregnancy (Dietz et al., 2011; Pickett, Rathouz, Kasza, Wakschlag, & Wright, 2005). However, in a substudy of the MoBa cohort, it was found that self-reported smoking status during pregnancy had a sensitivity of 82% and a specificity of 99% in contrasted to plasma cotinine concentrations, indicating that self-reported smoking is a valid marker for smoking behavior in the MoBa cohort (Kvalvik et al., 2012). Another limitation of the study

sample is selection bias from the larger population from which the women were sampled and a selected sample of women participating with two pregnancies. A comparison of women taking part in MoBa with all women giving birth in Norway identified under-representations such as women younger than 25 years and single women (Nilsen et al., 2009). However, although differences in prevalence estimates were observed, no relative differences in relevant exposure-outcome associations were identified. Nevertheless, the associations obtained in this study should be replicated in more representative and culturally diverse samples.

Whereas many previous cross-sectional studies have identified important yet relatively stable demographic and contextual risk factors for maternal smoking, this study offers an important distinction in identifying also more modifiable factors associated with smoking behavior prior to and during pregnancy. Pregnancy and early parenthood are critical periods during which substantial social changes take place, changes that involve both the woman herself and her partner (Hildingsson, Tingvall, & Rubertsson, 2008). As the most important factor inhibiting smoking cessation and for smoking during the second pregnancy was continued smoking on the part of the woman's partner, focusing on smoking cessation also for partners will probably be one of the most important steps to further reduce the prevalence of smoking during pregnancy (DiClemente et al., 2000). Support for this view is provided by the finding that the largest proportion of women quitting smoking from their first to their second pregnancy is found among those who have a partner who also quit between pregnancies. Moreover, the finding that women, who experience relative increases in symptoms of psychological distress during pregnancy, are at higher risk for maintaining smoking highlights the importance of taking seriously such symptoms during this critical period. Although the relationship may be bi-directional, nicotine from cigarette smoking may be a woman's most readily accessible means of controlling and relieving symptoms of anxiety and depression; thus, psychological distress may be an important inhibiting factor for smoking cessation in pregnancy (Khantzian, 1997; Lawrence, Mitrou, & Zubrick, 2011). Since smoking not only affects the woman herself but also her unborn child, it is important for midwives and others in antenatal care to identify these women at an early stage to provide support for altering their harmful behavior, regardless of the true causal nature of the relationship. Alongside the finding that women's partners' smoking behavior to a large extent influences their own smoking habits, these findings speak for implementing broader intervention efforts with regard to smoking cessation that involve also the pregnant women's partners (Hajek et al., 2001; Schneider et al., 2010). It has been shown that dissatisfaction with partner support is associated with the woman's emotional well-being, and based on the knowledge that both of these factors are related to smoking, a stronger focus on their inter-relationship will hopefully help reduce smoking among pregnant women (McBride et al., 1998).

Funding

The Norwegian Mother and Child Cohort Study is supported by the Norwegian Ministry of Health and the Ministry of Education and Research, NIH/NIEHS (grant no N01-ES-85433), NIH/NINDS (grant no.1 U01 NS 047537-01), and the Norwegian Research Council/FUGE (grant no. 151918/S10).

Declaration of Interests

None declared.

References

- Braverman, M. T., Aarø, L. E., Bontempo, D. E., & Hetland, J. (2010). Bar and restaurant workers' attitudes towards Norway's comprehensive smoking ban: A growth curve analysis. *Tobacco Control*, 19, 240–247. doi:10.1136/tc.2009.033845
- Cnattingius, S. (2004). The epidemiology of smoking during pregnancy: Smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research*, 6, S125–S140. doi:10.1080/14622200410001669187
- Colman, G. J., & Joyce, T. (2003). Trends in smoking before, during, and after pregnancy in ten states. *American Journal of Preventive Medicine*, 24, 29–35. doi:10.1016/S0749-3797(02)00574-3
- DiClemente, C. C., Dolan-Mullen, P., & Windsor, R. A. (2000). The process of pregnancy smoking cessation: Implications for interventions. *Tobacco Control*, 9, iii16–iii21. doi:10.1136/tc.9.suppl_3.iii16
- Dietz, P. M., Adams, M. M., Rochat, R. W., & Mathis, M. P. (1997). Prenatal smoking in two consecutive pregnancies: Georgia, 1989–1992. *Maternal and Child Health Journal*, 1, 43–51. doi:10.1023/A:1026276419551
- Dietz, P. M., Homa, D., England, L. J., Burley, K., Tong, V. T., et al. (2011). Estimates of nondisclosure of cigarette smoking among pregnant and nonpregnant women of reproductive age in the United States. *American Journal of Epidemiology*, 173, 355–359. doi:10.1093/aje/kwq381
- Hajek, P., West, R., Lee, A., Foulds, J., Owen, L., et al. (2001). Randomized controlled trial of a midwife-delivered brief smoking cessation intervention in pregnancy. *Addiction*, 96, 485–494. doi:10.1080/0965214002005446
- Helleve, A., Weisæth, A. H., & Lindbak, R. L. (2010). *Tal om tobakk 1973–2009 [Tobacco use 1973–2009]*. Oslo, Norway: Norwegian Directorate of Health. Retrieved from <http://www.helsedirektoratet.no/publikasjoner/tal-om-tobakk-1973-2009/Publikasjoner/tall-om-tobakk-1973-2009-nynorsk.pdf>
- Hildingsson, I., Tingvall, M., & Rubertsson, C. (2008). Partner support in the childbearing period—A follow up study. *Women and Birth*, 21, 141–148. doi:10.1016/j.wombi.2008.07.003
- Irgens, L. M. (2000). The Medical Birth Registry of Norway. Epidemiological research and surveillance throughout 30 years. *Acta Obstetrica et Gynecologica Scandinavica*, 79, 435–439. doi:10.1034/j.1600-0412.2000.079006435.x
- Kahn, R. S., Certain, L., & Whitaker, R. C. (2002). A reexamination of smoking before, during, and after pregnancy. *American Journal of Public Health*, 92, 1801–1808. doi:10.2105/AJPH.92.11.1801
- Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: A reconsideration and recent applications. *Harvard Review of Psychiatry*, 4, 231–244. doi:10.3109/10673229709030550
- Kvalvik, L. G., Nilsen, R. M., Skjærven, R., Vollset, S. E., Midttun, Ø., et al. (2012). Self-reported smoking status and plasma cotinine concentrations among pregnant women in the Norwegian Mother and Child Cohort Study. *Pediatric Research*, 71, 101–107. doi:10.1038/pr.2012.36
- Lawrence, D., Mitrou, F., & Zubrick, S. R. (2011). Non-specific psychological distress, smoking status and smoking cessation: United States National Health Interview Survey 2005. *BMC Public Health*, 11, 256. doi:10.1186/1471-2458-11-256
- Ludman, E. J., McBride, C. M., Nelson, J. C., Curry, S. J., Grothaus, L. C., et al. (2000). Stress, depressive symptoms, and smoking cessation among pregnant women. *Health Psychology*, 19, 21–27. doi:10.1037/0278-6133.19.1.21
- Magnus, P., Irgens, L. M., Haug, K., Nystad, W., Skjaerven, R., et al. (2006). Cohort profile: The Norwegian Mother and Child Cohort Study (MoBa). *International Journal of Epidemiology*, 35, 1146–1150. doi:10.1093/ije/dyl170
- Martin, L. T., McNamara, M., Milot, A., Bloch, M., Hair, E. C., et al. (2008). Correlates of smoking before, during, and after pregnancy. *American Journal of Health Behavior*, 32, 272–282. doi:10.5555/ajhb.2008.32.3.272
- McBride, C. M., Curry, S. J., Grothaus, L. C., Nelson, J. C., Lando, H., et al. (1998). Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychology*, 17, 63–69. doi:10.1037/0278-6133.17.1.63
- Mullen, P. D. (2004). How can more smoking suspension during pregnancy become lifelong abstinence? Lessons learned about predictors, interventions, and gaps in our accumulated knowledge. *Nicotine & Tobacco Research*, 6, S217–S238. doi:10.1080/14622200410001669150
- Muthén, L. K., & Muthén, B. O. (1998–2010). *Mplus User's Guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.
- Nilsen, R. M., Vollset, S. E., Gjessing, H. K., Skjaerven, R., Melve, K. K., et al. (2009). Self-selection and bias in a large prospective pregnancy cohort in Norway. *Paediatric and Perinatal Epidemiology*, 23, 597–608. doi:10.1111/j.1365-3016.2009.01062.x
- Pickett, K. E., Rathouz, P. J., Kasza, K., Wakschlag, L. S., & Wright, R. (2005). Self-reported smoking, cotinine levels, and patterns of smoking in pregnancy. *Paediatric and Perinatal Epidemiology*, 19, 368–376. doi:10.1111/j.1365-3016.2005.00660.x
- Schneider, S., Huy, C., Schütz, J., & Diehl, K. (2010). Smoking cessation during pregnancy: A systematic literature review. *Drug and Alcohol Review*, 29, 81–90. doi:10.1111/j.1465-3362.2009.00098.x
- Schneider, S., & Schütz, J. (2008). Who smokes during pregnancy? A systematic literature review of population-based surveys conducted in developed countries between 1997 and 2006. *The European Journal of Contraception and Reproductive Health Care*, 13, 138–147. doi:10.1080/13625180802027993

- Shea, A. K., & Steiner, M. (2008). Cigarette smoking during pregnancy. *Nicotine & Tobacco Research*, 10, 267–278. doi:10.1080/14622200701825908
- Solomon, L., & Quinn, V. (2004). Spontaneous quitting: Self-initiated smoking cessation in early pregnancy. *Nicotine & Tobacco Research*, 6, S203–S216. doi:10.1080/14622200410001669132
- Strand, B. H., Dalgard, O. S., Tambs, K., & Rognerud, M. (2003). Measuring the mental health status of the Norwegian population: A comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nordic Journal of Psychiatry*, 57, 113–118. doi:10.1080/08039480310000932
- Wakschlag, L. S., Pickett, K. E., Middlecamp, M. K., Walton, L. L., Tenzer, P., *et al.* (2003). Pregnant smokers who quit, pregnant smokers who don't: Does history of problem behavior make a difference? *Social Science & Medicine*, 56, 2449–2460. doi:10.1016/S0277-9536(02)00248-4