

Socioeconomic Position and Factors Associated With Use of a Nonsupine Infant Sleep Position: Findings From the Canadian Maternity Experiences Survey

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Optimizing infant sleep position in an effort to reduce the incidence of sudden infant death syndrome (SIDS) has been an important maternal child health promotion strategy since nonsupine sleep position was identified as an important modifiable risk factor for SIDS in the early 1990s.¹ Dramatic decreases in SIDS rates in many countries over the subsequent decade^{2–5} were largely credited to the success of public health campaigns that initially advised that infants be placed in nonprone positions for sleep and later restricted the recommendation to the supine sleep position only.^{5–10} In Canada and the United States, SIDS rates dropped by 70% and 60%, respectively, between 1985 and 2004.^{2,5,6,11} These reductions in SIDS rates were accompanied by reductions in postneonatal mortality rates, suggesting that they were real reductions rather than artifacts of changes in diagnostic criteria or coding practices.⁵

More recently, SIDS rates have stabilized in most countries. In some countries, such as the United States and New Zealand,⁵ and among socioeconomically disadvantaged, indigenous, and African American subpopulations,^{12,13} SIDS rates remain unacceptably high. These rates have been linked to the need for ongoing promotion of risk-reduction activities, such as supine sleep position, particularly in communities still experiencing a high SIDS burden.⁵ For example, despite efforts to promote parents' and caregivers' use of a supine position for infant sleep, longitudinal data from the National Infant Sleep Position Study in the United States have demonstrated that a sizable proportion of infants continue to be placed in nonsupine positions for usual sleep (27.9% in 2008).¹⁴ Moreover, following consistent increases in the proportion of infants being placed to sleep in supine positions throughout the 1990s, the rates have shown little change since approximately 2001.¹⁴

Objectives. With a focus on socioeconomic position, we examined the association between maternal education and nonsupine infant sleep position, and examined patterns of effect modification with additional sociodemographic, maternal, infant, and health services predictors.

Methods. Data were from the Maternity Experiences Survey, a national population-based sample of 76 178 new Canadian mothers (unweighted n = 6421) aged 15 years or older interviewed in 2006–2007. Using logistic regression, we developed multivariate models for 3 maternal education strata.

Results. Level of maternal education was significantly and inversely related to nonsupine infant sleep position. Stratified analyses revealed different predictive factors for nonsupine infant sleep position across strata of maternal education. Postpartum home visits were not associated with use of this sleep position among new mothers with less than high school completion. Adequacy of postpartum information regarding sudden infant death syndrome was not associated with nonsupine infant sleep position in any of the educational strata.

Conclusions. These findings suggest a need to revisit Back to Sleep health promotion strategies and to ensure that these interventions are tailored to match the information needs of all families, including mothers with lower levels of formal education. (*Am J Public Health.* 2014;104:539–547. doi:10.2105/AJPH.2012.301061)

Analysis of data from the US Pregnancy Risk Assessment Monitoring System survey has shown that socioeconomic position (SEP), measured by both education level and income, has been consistently, significantly, and positively associated with supine sleep position across states.¹⁵ Accordingly, nonsupine sleep position has been associated with socioeconomic deprivation in several other studies.^{16,17} For example, in a prospective cohort study of sleep position among inner-city mothers of infants aged 3 to 7 months in the United States, Brenner et al.¹⁶ found that mothers living below the poverty level were 1.81 times more likely to put their infant to sleep in a prone position than mothers living above the poverty level (95% confidence interval [CI] = 1.10, 2.99). Low SEP was not found to be significantly associated with nonsupine sleep position in an analysis of the National Infant Sleep Position Study; however, this data set

underrepresented women with fewer than 12 years of education by more than 50% compared with other national surveys.^{18,19}

The size and scope of the population surveyed by the Canadian Maternity Experiences Survey (MES) provided a unique opportunity to pursue our study objectives, which were to (1) clarify the significance of the association between SEP and nonsupine sleep position, and (2) examine patterns of effect modification by SEP on the associations between nonsupine infant sleep position and additional sociodemographic, maternal, infant, and health services predictors.

METHODS

We used 2006–2007 data from the Canadian MES,²⁰ which used a nationally representative stratified random sample of women who were aged 15 years or older and had

a singleton live birth in Canada 5 to 9 months before the interview. The MES was administered by trained interviewers using a computer-assisted telephone interview application, and interviews were conducted in English, French, and 13 additional languages. Of the 8542 women initially selected from the sampling frame, an estimated 8244 were eligible for the survey, and completed responses were obtained from 6421 women (78%), weighted to represent 76 178.²¹

We drew on data from the 6334 respondents who had complete information on the survey item for usual infant sleep position and maternal education level, weighted to represent an estimated 75 366 women.

The questionnaire included 309 items addressing such topics as preconception; pregnancy, birth, and postpartum care; infant feeding; maternal and infant health; smoking, alcohol, and drug use; stressful life events; postpartum depression; and social support. The full questionnaire is available at <http://www.publichealth.gc.ca/mes>.

Measures

The MES asked mothers of infants aged 5 to 9 months to identify their infant's usual sleep position during the first 4 months after birth. Mothers who said they usually put their baby down to sleep on his or her side or stomach or in another position (nonsupine) were compared with mothers who usually put their baby down to sleep on his or her back (supine).

Measures of socioeconomic status in the MES included total household income and level of maternal education (derived from a series of questions regarding elementary school, high school, and degree, certificate, or diploma completion). Additional independent variables in the MES that we included in our analyses on the basis of their identification in previous studies as known risk factors for SIDS included the following:

- demographic factors (maternal age, marital status, education, geographic size of maternal residence [i.e., rural, small urban, or large urban center], self-identified Aboriginal ethnicity, country of birth, and whether a woman had ever been a “landed immigrant” [Canadian term for permanent resident]),

- maternal factors (parity, type of delivery, number of stressful life events during the 12 months before birth, social support available after birth, postpartum depression as measured by the Edinburgh Postpartum Depression Scale, regular \geq once/week] maternal alcohol consumption in the 3 months preceding pregnancy, any maternal smoking during pregnancy, and whether a woman lived with a smoker),
- infant factors (gestational age at birth, birth weight, infant gender, and mother's rating of infant health), and
- health service factors (late initiation of prenatal care, < 5 prenatal care visits during pregnancy, attendance at prenatal classes, length of infant hospital stay after birth, contact at home by a health care provider after birth, and whether they had received enough information regarding SIDS).

Although the literature has demonstrated a strong and inverse association between breastfeeding and SIDS,¹⁶ we did not include it as a possible predictor of nonsupine sleep position in our analyses because we conceptualized breastfeeding as an outcome of the same predictive factors included in our study and not as a direct predictor of nonsupine sleep position.

Statistical Analysis

We began with descriptive statistics and bivariate associations with the outcome of the sociodemographic, maternal, infant, and health service variables of interest. Of the 2 socioeconomic variables of interest—household income and maternal level of education—we used the latter because the proportion of missing data was very low and we wanted to maximize our sample size for the analysis (1% missing education compared with 6% missing household income). To examine effect modification by maternal education, we conducted multivariate logistic regression on models stratified into 3 levels of maternal education. Support for the stratification approach was demonstrated by the presence of multiple significant interaction terms in bivariate analyses between maternal education and the risk factor variables.

We built multivariate models for each stratum of maternal education by sequentially adding blocks of risk factors in the following

order: demographic factors, maternal factors, infant factors, and health service factors. Individual factors that were not statistically significant after each block was added were removed from the model before proceeding with the addition of the next block of variables. All analyses were conducted using SAS version 9.1 (SAS Institute, Cary, NC) on a Unix platform. For prevalence data, we included sample weights, and 95% CIs for odds ratios were calculated using 1000 replicate bootstrap weights provided by Statistics Canada.²¹

RESULTS

Overall, 22.6% of women reported putting their infant in a nonsupine sleep position during the first 4 months (Table 1). Nonstratified, unadjusted analysis of the full sample revealed strong, inverse, and graded associations between level of maternal education and choice of nonsupine infant sleep position and between household income and choice of nonsupine infant sleep position (Table 1). Women with less than a high school education were more than twice as likely to put their baby in a nonsupine sleep position than women who had completed postsecondary education (unadjusted odds ratio [OR] = 2.09; 95% CI = 1.71, 2.55). Specifically, 34.1% of women with less than a high school education placed their infants to sleep in a nonsupine position compared with 27.7% and 19.9% of women who had completed high school and postsecondary education, respectively. However, because the majority of women participating in the MES had completed postsecondary education, in absolute numbers the problem of nonsupine sleep position was most frequent among this group. Additional demographic factors significantly associated with nonsupine infant sleep position are detailed in Table 1.

The 3 maternal education strata-specific adjusted logistic regression models demonstrated considerable variation in retained predictive factors of nonsupine sleep position. For the less-than-high-school-education stratum, significant predictive factors of nonsupine sleep position included not being married or common law (OR = 2.05; 95% CI = 1.29, 3.25), living in a smaller urban locality (OR = 1.72; 95% CI = 1.07, 2.78) or rural (OR = 2.24; 95% CI = 1.32, 3.83) compared with living in

TABLE 1—Distribution of Usual Infant Sleep Position and Unadjusted Odds Ratios for Use of Nonsupine Infant Sleep Position by Sociodemographic, Maternal, Infant, and Health Service Factors: Canada, Maternity Experiences Survey, 2006–2007

Factors	Infant Sleep Position		Nonsupine Infant Sleep Position, Unadjusted OR (95% CI)
	Nonsupine (n = 17 186; 22.6%); %	Supine (n = 58 991; 77.4%); %	
Mother's highest level of completed education			
< high school	11.6	6.5	2.09 (1.71, 2.55)
High school graduate	23.9	18.1	1.54 (1.34, 1.78)
Postsecondary diploma or university graduate	64.5	75.4	1.00 (Ref)
Total household income, Can \$			
< 40 000	32.9	23.6	2.20 (1.80, 2.69)
40 000–59 999	19.4	19.1	1.60 (1.28, 2.00)
60 000–79 999	16.1	18.3	1.39 (1.11, 1.74)
80 000–99 999	8.6	13.7	1.00 (0.77, 1.30)
≥ 100 000	13.0	20.6	1.00 (Ref)
No income information	10.0	4.8	
Maternal age, y			
≥ 20	96.1	97.3	1.00 (Ref)
< 20	3.9	2.7	1.46 (1.12, 1.90)
Marital status			
Married or common law	87.3	92.9	1.00 (Ref)
Separated, widowed, divorced	2.9	1.6	1.89 (1.28, 2.79)
Single, never married	9.8	5.5	1.89 (1.54, 2.31)
Area size of residence			
Urban—population ≥ 100 000	54.0	57.6	1.00 (Ref)
Urban—population < 100 000	25.1	25.4	1.05 (0.91, 1.22)
Rural	20.9	17.0	1.32 (1.13, 1.54)
Mother self-identified as First Nations, Inuit, or Métis			
No	93.7	96.3	1.00 (Ref)
Yes	6.3	3.7	1.75 (1.37, 2.24)
Mother self-identified as First Nations			
No	97.7	98.2	1.00 (Ref)
Yes	2.3	1.8	1.30 (0.90, 1.88)
Mother self-identified as Inuit			
No	99.4	99.8	1.00 (Ref)
Yes	0.6	0.2	2.84 (1.74, 4.61)
Mother self-identified as Métis			
No	96.9	98.4	1.00 (Ref)
Yes	3.1	1.6	1.97 (1.35, 2.88)
Country of birth			
Canada	70.0	77.6	1.00 (Ref)
Other	30.0	22.4	1.49 (1.29, 1.71)
Mother was a landed immigrant at some time in her life			
No	73.1	79.4	1.00 (Ref)
Yes	26.9	20.6	1.42 (1.23, 1.65)
Parity			
Primiparous	37.7	47.0	1.00 (Ref)
Multiparous	62.3	53.0	1.47 (1.29, 1.67)

Continued

TABLE 1—Continued

Type of delivery			
Vaginal	76.7	72.7	1.00 (Ref)
Cesarean	23.3	27.3	0.81 (0.70, 0.94)
Total no. of stressful life events during the 12 mo before birth			
0	33.2	40.9	1.00 (Ref)
1-2	45.5	43.3	1.29 (1.12, 1.49)
≥ 3	21.3	15.8	1.66 (1.40, 1.96)
Since the birth, amount of support available when needed			
Most or all of the time	81.1	84.9	1.00 (Ref)
None, a little or some of the time	18.9	15.1	1.31 (1.11, 1.55)
Edinburgh Postnatal Depression Scale score			
0-9	80.9	84.9	1.00 (Ref)
10-12	9.2	8.4	1.15 (0.91, 1.44)
≥ 13	9.9	6.7	1.54 (1.23, 1.93)
Regular (≥ once/wk) alcohol consumption during 3 mo before pregnancy			
No	80.3	72.7	1.00 (Ref)
Yes	19.7	27.3	0.65 (0.56, 0.75)
Any smoking during pregnancy			
No	86.8	90.3	1.00 (Ref)
Yes	13.2	9.7	1.42 (1.18, 1.70)
Lived with a smoker at some time during pregnancy			
No	73.0	77.7	1.00 (Ref)
Yes	27.0	22.3	1.28 (1.11, 1.48)
Gestational age at birth, completed wk			
< 37	7.0	6.0	1.17 (0.90, 1.52)
≥ 37	93.0	94.0	1.00 (Ref)
Birth weight, g			
< 2500	6.1	4.8	1.31 (0.99, 1.75)
2500-3999	80.2	82.9	1.00 (Ref)
≥ 4000	13.7	12.3	1.15 (0.96, 1.39)
Infant gender			
Female	45.7	49.1	1.00 (Ref)
Male	54.3	50.9	1.15 (1.01, 1.30)
Mother's rating of infant health			
Excellent or very good	90.6	93.3	1.00 (Ref)
Good	8.0	6.0	1.38 (1.09, 1.76)
Fair or poor	1.4	0.7	2.04 (1.11, 3.73)
Late initiation of prenatal care (>13 wk gestation)			
No	93.1	95.4	1.00 (Ref)
Yes	6.9	4.6	1.55 (1.20, 1.99)
Inadequate prenatal care (<5 prenatal care visits)			
No	98.6	99.1	1.00 (Ref)
Yes	1.4	0.9	1.54 (0.91, 2.61)
Attended prenatal classes			
Yes	24.1	35.3	1.00 (Ref)
No	75.9	64.7	1.72 (1.49, 1.98)
Length of infant hospital stay after birth			
≥ 2 d	72.0	76.9	1.00 (Ref)
< 2 d	28.0	23.1	1.30 (1.12, 1.50)

Continued

TABLE 1—Continued

Mother contacted at home by a health care provider after birth			
Yes	90.3	94.1	1.00 (Ref)
No	9.7	5.9	1.73 (1.38, 2.16)
Enough postpartum information on SIDS			
Yes	87.4	91.0	1.00 (Ref)
No	12.6	9.0	1.46 (1.20, 1.78)

Note. CI = confidence interval; OR = odds ratio; SIDS = sudden infant death syndrome. The weighted sample size for respondents who completed information on infant sleep position and maternal education was $n = 75\,366$. Percentages may not add to 100% because of rounding.

a larger urban locality, and late initiation of prenatal care (OR = 1.98; 95% CI = 1.13, 3.49). For the stratum of women with completed high school education, significant predictive factors of nonsupine sleep position included multiparity (OR = 1.52; 95% CI = 1.14, 2.03), stressful life events (OR = 1.45; 95% CI = 1.05, 1.99, for 1–2 events compared with none), living with a smoker during pregnancy (OR = 0.62; 95% CI = 0.46, 0.82), and no contact from a health care provider after birth (OR = 2.20; 95% CI = 1.33, 3.64).

Retained predictive factors of nonsupine sleep position for the postsecondary maternal education stratum included rural residence (OR = 1.32; 95% CI = 1.08, 1.63), maternal country of birth other than Canada (OR = 1.48; 95% CI = 1.22, 1.80), stressful life events (OR = 1.24; 95% CI = 1.03, 1.49, for 1–2 events compared with none and OR = 1.64; 95% CI = 1.30, 2.07, for 3 or more events compared with none), regular alcohol consumption in the 3 months before pregnancy (OR = 0.82; 95% CI = 0.68, 0.99), living with a smoker during pregnancy (OR = 1.30; 95% CI = 1.05, 1.61), not attending prenatal classes (OR = 1.76; 95% CI = 1.47, 2.12), and not being contacted by a health care provider after birth (OR = 1.40; 95% CI = 1.03, 1.90).

DISCUSSION

The size, national representation, and high response rate of the 2006–2007 Canadian MES sample support our study's demonstration of a significant and graded inverse association between SEP (indicated by maternal education level) and nonsupine infant sleep position. This result sheds light on the variation in findings regarding the association between SEP and infant sleep position found in the US Pregnancy

Risk Assessment Monitoring System survey¹⁵ and the National Infant Sleep Position Study,¹⁸ and suggests that the absence of a statistically significant association in the latter study may have resulted from the underrepresentation of women with lower levels of educational achievement.

Our findings also address a pressing need to better understand patterns of effect modification on the association of additional sociodemographic, maternal, infant, and health service predictors of nonsupine sleep position across levels of maternal education and SEP. The disproportionately high burden of SIDS experienced by those who are socioeconomically disadvantaged has been linked to limitations in the effectiveness of mainstream Back to Sleep campaigns among these populations.^{15–17} Using maternal education level as our primary indicator of SEP, our results confirm that a socioeconomic gradient may exist in the effectiveness of existing health service interventions with respect to reducing nonsupine sleep position. The only significant health service factor that was associated with nonsupine sleep position for the most socioeconomically disadvantaged mothers in our study (those with less than a high school education) was the late initiation of prenatal care. These results contrast with the findings for high school and postsecondary or university graduates, for whom we found a significant inverse association between postpartum contact by a health care provider and nonsupine sleep position, but not for the late initiation of prenatal care.

Self-reported sufficiency of postpartum information on SIDS was not significantly associated with nonsupine sleep positioning across all 3 strata of maternal education. It is important to note that the CIs for postpartum contact by a health care provider and self-

sufficiency of postpartum information on SIDS approach significance for the less-than-high-school stratum.

With respect to public health practice, these findings imply that access to early prenatal care is important, especially for those with less than a high school education. In addition, we have uncovered a need for further evaluation of the impact of pre- and postpartum health care provider services regarding infant care practices such as sleep position for mothers with less than a high school education. Finally, we have also identified a need for further investigation into the efficacy of existing postpartum Back to Sleep health promotion efforts for women across all levels of education—keeping in mind that although the relative risk of nonsupine sleep position is greatest for women with less than a high school education, in absolute numbers the large majority of mothers using nonsupine sleep positioning in the MES had completed postsecondary education.

Rural residence (compared with large urban residence) was also significantly and strongly associated with nonsupine sleep position for mothers with less than a high school education, signaling an additional need to better understand effective health-promoting strategies among this population.

Aboriginal (First Nations, Inuit, or Métis), Inuit-only, and Métis-only MES participants had elevated rates of nonsupine sleep position (nonstratified unadjusted OR = 1.75, 2.84, and 1.97, respectively; Table 1). Unfortunately, there were too few Aboriginal participants in the MES to verify whether the association between Aboriginal ethnicity and nonsupine sleep position persisted in the adjusted models stratified by level of maternal education. Maori,²⁴ select Native American,²⁵ and African American^{15,18,19,26} populations have also been

TABLE 2—Odds Ratios of Nonsupine Infant Sleep Position for Additional Sociodemographic, Maternal, Infant, and Health Service Factors by Level of Maternal Education for Canadian Women: Maternity Experiences Survey, 2006–2007

Factors	< High School (n = 5784 ^a)		High School Graduate (n = 14 597 ^a)		Postsecondary Diploma or University Graduate (n = 54 986 ^a)	
	Unadjusted OR (95% CI)	AOR ^b (95% CI)	Unadjusted OR (95% CI)	AOR ^b (95% CI)	Unadjusted OR (95% CI)	AOR ^b (95% CI)
Sociodemographic factors						
Marital status						
Married or common law (Ref)	1.00	1.00	1.00	...	1.00	...
Other (separated, single, etc.)	2.00 (1.34, 3.00)	2.05 (1.29, 3.25)	1.25 (0.89, 1.76)	...	1.70 (1.26, 2.30)	...
Area size of residence						
Urban—population ≥ 100 000 (Ref)	1.00	1.00	1.00	...	1.00	1.00
Urban—population < 100 000	1.59 (1.01, 2.52)	1.72 (1.07, 2.78)	0.97 (0.72, 1.32)	...	0.94 (0.78, 1.14)	0.98 (0.80, 1.20)
Rural	2.08 (1.26, 3.41)	2.24 (1.32, 3.83)	1.09 (0.78, 1.51)	...	1.24 (1.02, 1.51)	1.32 (1.08, 1.63)
Mother self-identified as First Nations, Inuit, or Métis						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	1.34 (0.82, 2.16)	...	1.48 (0.96, 2.27)	...	1.49 (0.98, 2.27)	...
Mother self-identified as First Nations						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	0.99 (0.49, 2.00)	...	1.27 (0.65, 2.50)	...	0.86 (0.44, 1.68)	...
Mother self-identified as Inuit						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	2.32 (1.19, 4.54)	...	1.36 (0.54, 3.43)	...	1.99 (0.86, 4.60)	...
Mother self-identified as Métis						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	1.65 (0.60, 4.55)	...	1.48 (0.80, 2.74)	...	2.05 (1.18, 3.58)	...
Country of birth						
Canada (Ref)	1.00	...	1.00	...	1.00	1.00
Other	1.11 (0.68, 1.81)	...	1.66 (1.18, 2.33)	...	1.57 (1.32, 1.86)	1.48 (1.22, 1.80)
Mother was a landed immigrant at some time in her life						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	1.19 (0.71, 1.99)	...	1.70 (1.20, 2.41)	...	1.45 (1.21, 1.73)	...
Maternal factors						
Parity						
Primiparous (Ref)	1.00	...	1.00	1.00	1.00	...
Multiparous	1.03 (0.70, 1.52)	...	1.32 (1.02, 1.71)	1.52 (1.14, 2.03)	1.57 (1.33, 1.85)	...
Type of delivery						
Vaginal (Ref)	1.00	...	1.00	...	1.00	...
Cesarean	0.67 (0.43, 1.05)	...	0.79 (0.57, 1.10)	...	0.86 (0.72, 1.03)	...
Total no. of stressful life events during the 12 mo before birth						
0 (Ref)	1.00	...	1.00	1.00	1.00	1.00
1–2	1.10 (0.67, 1.81)	...	1.39 (1.01, 1.91)	1.45 (1.05, 1.99)	1.24 (1.04, 1.49)	1.24 (1.03, 1.49)
≥ 3	1.16 (0.70, 1.94)	...	1.12 (0.78, 1.61)	1.17 (0.80, 1.71)	1.75 (1.41, 2.17)	1.64 (1.30, 2.07)
Since the birth, amount of support available when needed						
Most or all of the time (Ref)	1.00	...	1.00	...	1.00	...
None, a little, or some of the time	1.30 (0.83, 2.03)	...	1.17 (0.84, 1.63)	...	1.28 (1.04, 1.59)	...

Continued

TABLE 2—Continued

Edinburgh Postnatal Depression Scale score						
0-9 (Ref)	1.00	...	1.00	...	1.00	...
10-12	1.39 (0.76, 2.53)		0.88 (0.56, 1.38)		1.15 (0.86, 1.54)	
≥ 3	1.32 (0.76, 2.32)		1.07 (0.67, 1.70)		1.65 (1.24, 2.21)	
Regular (≥ once/wk) alcohol consumption during 3 mo before pregnancy						
No (Ref)	1.00	...	1.00	...	1.00	1.00
Yes	0.89 (0.50, 1.58)		0.62 (0.44, 0.87)		0.70 (0.59, 0.84)	0.82 (0.68, 0.99)
Any smoking during pregnancy						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	1.36 (0.92, 2.00)		0.70 (0.49, 0.99)		1.51 (1.14, 1.99)	
Lived with a smoker at some time during pregnancy						
No (Ref)	1.00	...	1.00	1.00	1.00	1.00
Yes	1.09 (0.75, 1.59)		0.64 (0.49, 0.84)	0.62 (0.46, 0.82)	1.49 (1.22, 1.81)	1.30 (1.05, 1.61)
Infant factors						
Gestational age, completed wk						
< 37	1.92 (0.97, 3.82)	...	0.75 (0.38, 1.47)	...	1.14 (0.82, 1.58)	...
≥ 37 (Ref)	1.00		1.00		1.00	
Birth weight, g						
< 2500	1.32 (0.59, 2.96)	...	0.78 (0.40, 1.51)	...	1.49 (1.05, 2.12)	...
2500-3999 (Ref)	1.00		1.00		1.00	
≥ 4000	0.56 (0.32, 1.00)		1.38 (0.97, 1.98)		1.14 (0.90, 1.43)	
Infant sex						
Female (Ref)	1.00	...	1.00	...	1.00	...
Male	1.13 (0.77, 1.67)		1.39 (1.06, 1.82)		1.06 (0.91, 1.23)	
Mother's rating of infant health						
Excellent or very good (Ref)	1.00	...	1.00	...	1.00	...
Good/fair or poor	1.19 (0.67, 2.10)		1.35 (0.83, 2.20)		1.45 (1.08, 1.95)	
Health service factors						
Late initiation of prenatal care (> 13 wk gestation)						
No (Ref)	1.00	1.00	1.00	...	1.00	...
Yes	2.17 (1.27, 3.72)	1.98 (1.13, 3.49)	0.80 (0.48, 1.34)		1.41 (0.96, 2.05)	
Inadequate prenatal care (< 5 prenatal care visits)						
No (Ref)	1.00	...	1.00	...	1.00	...
Yes	1.13 (0.38, 3.35)		1.16 (0.44, 3.07)		1.60 (0.67, 3.83)	
Attended prenatal classes						
Yes (Ref)	1.00	...	1.00	...	1.00	1.00
No	1.02 (0.68, 1.55)		1.26 (0.93, 1.72)		1.85 (1.56, 2.20)	1.76 (1.47, 2.12)
Length of infant hospital stay after birth						
≥ 2 d (Ref)	1.00	...	1.00	...	1.00	...
< 2 d	1.16 (0.73, 1.84)		1.40 (1.04, 1.88)		1.28 (1.07, 1.53)	
Mother contacted at home by a health care provider after birth						
Yes (Ref)	1.00	...	1.00	1.00	1.00	1.00
No	1.90 (0.92, 3.95)		2.06 (1.27, 3.34)	2.20 (1.33, 3.64)	1.60 (1.20, 2.13)	1.40 (1.03, 1.90)

Continued

TABLE 2—Continued

Enough postpartum information on SIDS							
Yes (Ref)	1.00	...	1.00	...	1.00
No	1.54 (0.91, 2.61)		1.20 (0.82, 1.76)		1.38 (1.06, 1.80)		

Note. AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio; SIDS = sudden infant death syndrome.

^aWeighted sample size.

^bAll variables adjusted for the other factors shown in each model and for maternal age at birth.

shown to have higher rates of nonsupine infant sleep positioning than nonindigenous and non-African American comparison groups. The relationship between poverty and indigenous or African American ethnicity as predictors of nonsupine infant sleep position merits further exploration given the known and substantial relative impoverishment of both indigenous and African American populations.

The significant and negative associations between living with a smoker during pregnancy and nonsupine sleep position for women with completed high school and completed postsecondary education and the significant and negative associations between regular alcohol consumption in the 3 months before pregnancy and nonsupine sleep position for women with completed postsecondary education raise some additional questions, because smoke exposure and maternal alcohol use are themselves known risk factors for SIDS. One possibility is that women with higher levels of education are aware of the additional SIDS risk linked to smoke exposure and alcohol use and are therefore more careful to put their babies on their back to sleep as a form of harm reduction.

A limitation of the MES question regarding infant sleep position is that it asked about the usual sleep position during the first 4 months of the baby's life. Infants usually placed in the supine sleep position may still on occasion have been placed in the nonsupine sleep position, contributing to possible underestimation of the risk factors that we examined in our study. Although this was a national sample, some of the cell sizes for comparison were small, especially when the outcome was rare, and limited statistical power may have precluded our finding a statistically significant association. This is of particular concern for the model adjusted for less-than-high-school maternal education (Table 2). Although the unweighted

number of mothers for this less-than-high-school-education stratum was larger than that obtained in many other studies to date ($n = 563$), it may have been inadequate to demonstrate statistically significant association for some indicators in the adjusted multivariate strata-specific logistic regression model. In addition, the relatively small size of the Aboriginal sample and a survey tool that asked about ethnic or cultural identity but not about race or racism limited our ability to explore the racialized impacts of poverty on infant sleep position. Finally, although we wanted to examine co-sleeping as a predictor in our analyses because it has been associated with SIDS in the literature,²⁷ the MES did not ask about this behavior.

Our data analysis suggests that Back to Sleep SIDS prevention messaging using mainstream media and postpartum health care provider follow-up may have reached a threshold with respect to influencing maternal choice of sleep position, particularly for socioeconomically disadvantaged families. This result is consistent with findings in the United States that despite ongoing health promotion efforts, rates of nonsupine sleep position have shown little change since 2001.¹⁴ Further reductions in nonsupine sleep position may require an enhancement of existing health promotion strategies. Tailoring of postpartum health care provider follow-up strategies to better meet the specific needs of socioeconomically disadvantaged populations is an approach that might help address the differential impact of this strategy in the reduction of nonsupine sleep position across socioeconomic strata. Although we were unable to find examples in the literature of this type of tailoring with a focus addressing socioeconomic disadvantage only, we did find literature regarding the culturally specific tailoring of Back to Sleep health promotion efforts for indigenous populations that we include here because of our interest in

racialized socioeconomic deprivation and indigenous and nonindigenous SIDS disparities. In New Zealand, initial Back to Sleep health promotion efforts in the early 1990s were temporally associated with a decline in non-Maori SIDS rates and no change in Maori SIDS rates. This universal health promotion effort was critiqued for messaging and dissemination strategies that were culturally inappropriate for and ineffective with the Maori population.^{24,28} A subsequent Maori-specific SIDS prevention program that was designed and delivered by a Maori SIDS prevention team has been temporally linked to reductions in Maori SIDS rates.²⁸

Our findings validate the importance of SEP (as measured by maternal education level) as a key predictor of health-promoting behaviors such as infant sleep position and the need to address effect modification using stratification to understand the complex relationships between SEP and other factors that are associated with infant sleep position. ■

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Contributors

J. Smylie, D. B. Fell, and P. O'Campo were responsible for the study design, data analysis, interpretation, and reporting. B. Chalmers, C. Royle, and R. Sauve contributed to the conceptualization of the study, the interpretation of the data, and reporting. B. Allan contributed to the interpretation of the data and reporting.

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Human Participant Protection

The Maternity Experiences Survey project was presented to Health Canada's Science Advisory Board, Health Canada's Research Ethics Board, and the Federal Privacy Commissioner. The study was approved by Statistics Canada's Policy Committee. In keeping with current ethical policies regarding reporting of data specific to Aboriginal populations in Canada, the Native Women's Association of Canada reviewed and approved the Aboriginal-specific analyses in this article.

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