Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

HHS Public Access

Author manuscript

J Perinatol. Author manuscript; available in PMC 2024 August 26.

Published in final edited form as:

J Perinatol. 2016 September ; 36(9): 787–793. doi:10.1038/jp.2016.80.

Supine sleep positioning in preterm and term infants after hospital discharge from 2000 to 2011

SS Hwang[1,2], **RA Smith**[3], **WD Barfield**[3], **VC Smith**[4,5], **MC McCormick**[4,5,6], **MA Williams**[6]

[1]Section of Neonatology, Department of Pediatrics, Children's Hospital Colorado, Aurora, CO, USA

[2]Department of Pediatrics, University of Colorado School of Medicine, Aurora, CO, USA

[3]Division of Reproductive Health, Centers for Disease Control and Prevention, Atlanta, GA, USA

[4]Department of Pediatrics, Harvard Medical School, Boston, MA, USA

[5]Department of Neonatology, Beth Israel Deaconess Medical Center, Boston, MA, USA

[6]Harvard School of Public Health, Boston, MA, USA.

Abstract

OBJECTIVE: Supine sleep positioning (SSP) has been shown to reduce the risk of sudden infant death syndrome (SIDS) and preterm infants are at higher risk for SIDS. Population-based estimates of SSP are lacking for the preterm population. The objectives of this study are: (1) compare the prevalence of SSP after hospital discharge for preterm and term infants in the United States; and (2) assess racial/ethnic disparities in SSP for preterm and term infants.

STUDY DESIGN: We analyzed the 2000 to 2011 data from the Pregnancy Risk Assessment Monitoring System of Centers for Disease Control and Prevention from 35 states. We measured prevalence of SSP by preterm and term gestational age (GA) categories. We calculated adjusted prevalence ratios (APR) to evaluate the likelihood of SSP for each GA category compared with term infants and the likelihood of SSP for non-Hispanic black (NHB) and Hispanic infants compared with non-Hispanic white (NHW) infants.

RESULTS: Prevalence of SSP varied by GA: ⩽ 27, 59.7%; 28 0/7 to 33 6/7, 63.7%; 34 0/7 to 36 6/7 (late preterm), 63.6%; and 37 0/7 to 42 6/7 (term) weeks, 66.8% ($P < 0.001$). In the adjusted analyses, late preterm infants were slightly less likely to be placed in SSP compared with term infants (APR: 0.96, confidence interval: 0.95 to 0.98). There were racial/ethnic disparities in SSP for all GA categories when NHB and Hispanic infants were compared with NHW infants.

CONCLUSIONS: All infants had suboptimal adherence to SSP indicating a continued need to better engage families about SSP. Parents of late preterm infants and families of NHB and Hispanic infants will also require greater attention given their decreased likelihood of SSP.

Correspondence: Dr SS Hwang, Department of Pediatrics, Section of Neonatology, Children's Hospital Colorado, 13121 E. 17th Street, Mailstop 8402, Aurora, CO 80045, USA. Sunah.hwang@childrenscolorado.org.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

Supplementary Information accompanies the paper on the Journal of Perinatology website (http://www.nature.com/jp)

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

INTRODUCTION

Sudden infant death syndrome (SIDS) is the third leading cause of infant mortality and the leading cause of postneonatal mortality in the United States.[1] One of the major risk factors for SIDS is preterm birth (gestational age (GA) <37 weeks). A prior population-based study of linked infant birth and death certificates demonstrated that infants born at 28 to 32 weeks GA have more than two times the risk of SIDS compared with term infants.[2] Supine sleep positioning (SSP) is associated with a decreased risk for SIDS as demonstrated by the nearly 50% decline in SIDS rates in the 1990 s after the introduction of the Back To Sleep Campaign.[3] However, since 2001, there has been no significant decline in the rate of SIDS.[4] In addition, results of the National Infant Sleep Position Study, an annual telephone survey that provided data on US trends in infant care practices related to SIDS, showed that there was no improvement in the prevalence of infant SSP from 2003 (73.2%) to 2007 (71.7%).[5] Although preterm infants are at higher risk for SIDS, with the association between prone sleep positioning and SIDS among low birth weight infants possibly even stronger than for term infants,[6] safe sleep practices are rarely integrated into the routine clinical care of these infants.[7] The American Academy of Pediatrics defines safe sleep as SSP in a safety-approved crib (as outlined by the US Consumer Product Safety Commission) without positioning devices and free of quilts, comforters and other soft surfaces. The American Academy of Pediatrics Task Force on SIDS recommends that preterm infants be placed in SSP by 32 weeks postmenstrual age if they are clinically stable.[4] Despite these recommendations, preterm infants are less likely than term infants to be placed supine in the hospital as well as after discharge to home.[7,8] SSP for the general population of infants, mainly term infants, has been well studied at the population level. However, recent data on sleep positioning of preterm infants after hospital discharge is minimal. Moreover, although the racial and ethnic disparities in SSP have also been demonstrated among term infants, with black infants much less likely to be placed on their back for sleep compared with white infants,[9] whether these disparities exist in the preterm population is unknown. Given that the rate of SIDS among non-Hispanic black (NHB) infants is nearly two times higher than the rate among non-Hispanic white (NHW) infants,[10] and that NHB infants are much less likely to be placed in SSP, understanding the racial/ethnic disparity in SSP for preterm infants is an important step in developing interventions to reduce infant mortality disparities. In light of the lack of improvement in SSP since 2001 and the persistence of racial/ethnic disparities in SSP, the objectives of this study are to: (1) compare the prevalence of SSP for preterm and term infants after hospital discharge on a multi-state population level; and (2) investigate racial/ethnic disparities in SSP in the preterm and term populations.

METHODS

Data source

We analyzed retrospective cohort data from the Pregnancy Risk Assessment Monitoring System (PRAMS), an ongoing state-based surveillance system, funded by the Centers for Disease Control and Prevention. PRAMS is designed to monitor selected self-reported maternal behaviors and experiences among women who recently delivered a live-born infant in the prior 2 to 4 months, with a maximum allowable recall of 9 months postpartum. Using

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

standardized data collection methods, monthly stratified samples are selected from recent birth certificates. Surveys are obtained from mothers using a mixed-mode data collection method with mailed questionnaires and telephone follow-up for non-respondents. Survey data are linked to birth certificate data and weighted for sample design, nonresponse and noncoverage. Further details about the PRAMS methodology have been described elsewhere.[11] Institutional ethics approval was granted by the Centers for Disease Control and Prevention and participating PRAMS states. Institutional Review Board exemption was granted by Boston Children's Hospital.

Our study included 2000 to 2011 PRAMS data from states with a ⩾ 65% response rate. There was yearly variation in states' inclusion in PRAMS owing to nonparticipation as well as inability to meet threshold response rates in particular years. Among the 36 states with these high response rates, we analyzed data from women with live births in 2000 to 2011.

Variables

Using clinical estimate of GA from linked birth certificates, the following GA categories, which were defined by participating states, were analyzed: ⩽ 27, 28 to 33, 34 to 36, and 37 to 42 completed weeks. We excluded surveyed women whose infants were born ⩾ 43 weeks or whose GA was reported as unknown and who were delivered at home, in a clinic, en route to a hospital or in free-standing birth centers. We also excluded infants who died or were not living with their birth mother at the time of the survey or were of unknown race/ethnicity. The maternal selection flow chart is shown in Figure 1.

Maternal demographic characteristics included data obtained from birth certificates (maternal age, education, race/ethnicity and marital status). Maternal race/ethnicity was categorized as NHW, NHB, Hispanic and non-Hispanic other (which included Asian, Native American/Alaska Native and other). A history of previous live birth, insurance prior to pregnancy and maternal length of hospital stay were obtained from the survey. First trimester prenatal care use as well as the method of delivery (vaginal or cesarean section), infant sex and infant birth weight was obtained from birth certificates.

Data on supine sleep position were obtained from the PRAMS survey data. Mothers were asked: 'In which position do you usually put your infant to sleep (side, back and/or stomach)'. Responses were then categorized as supine (back) or non-supine (which included a combination of sleep positions).

Analysis

Using state-specific sampling weights, we calculated the population prevalence of SSP with 95% confidence intervals (95% CIs) for the entire sample and for each state. We then compared maternal demographic, delivery and infant birth characteristics of each GA category. Chi-square analyses and CIs were used to measure differences in maternal and infant characteristics, including GA, and SSP with a significance of $P < 0.001$. A chi-square P-value <0.001 was considered statistically significant, given the very large sample size.

We calculated unadjusted and adjusted prevalence ratios (APRs) for the likelihood of SSP among all preterm categories compared with term infants by using predicted marginals

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

from logistic regression models and then converting these estimates to prevalence ratios.[12] We adjusted for maternal age, education, race/Hispanic ethnicity, marital status, previous live birth, insurance status before pregnancy, method of delivery and plurality, based on documented associations in the literature and statistically significant bivariate results. Given the varying participation of states in PRAMS from 2000 to 2011, we assessed the effect of state participation as well as year of survey in the adjusted model and found that there was minimal change in our effect estimates. Thus state and year were not included in our adjusted model.

To assess racial/ethnic disparities in SSP, we first used chi-square analyses and 95% CIs to measure differences in SSP by race/ethnicity for each GA category, with a significance of chi-square *P*-value <0.001. We then calculated unadjusted and APRs to evaluate the likelihood of SSP for NHB and Hispanic infants compared with NHW infants for each GA category. We adjusted for maternal age, education, marital status, previous live birth, insurance status before pregnancy, method of delivery and plurality. To assess differences in the magnitude of the NHB and NHW and Hispanic and NHW disparity for each preterm GA group compared with the magnitude of disparity in the term group, we calculated relative prevalence ratios and 95% delta-method based CIs[13] by dividing the APR of each racial/ethnic group for each preterm GA category by the APR in the term group.

All analyses were conducted using SAS, Version 9.3 (Cary, NC, USA) and SUDAAN, version 11.0.0 (Research Triangle Park, NC, USA) to account for selection and response probabilities of the survey design.

RESULTS

Prevalence of SSP by state

For our entire cohort (weighted $N = 18\,055\,382$), the prevalence of SSP was 66.5% (95% CI: 66.3 to 66.7). Prevalence of SSP varied by state, ranging from 47.1% in Louisiana to 81.3% in Wisconsin. In general, the southern states had the lowest prevalence of SSP, whereas the northwestern and northeastern states had the highest prevalence (Table 1). Shown in Figure 2 are prevalence estimates of SSP by year for the five highest (Maine, Washington, Minnesota, Wyoming, Wisconsin) and five lowest (Arkansas, Florida, Mississippi, Alabama, Louisiana) performing states during our period of analysis, demonstrating that nearly all of these states had improved prevalence of SSP.

Preterm and term deliveries by maternal and infant characteristics

Compared with mothers who delivered at 37 to 42 weeks, mothers who delivered prematurely were more likely to be NHB, have lower levels of education, be unmarried, have no prenatal care, lack health insurance or have Medicaid prior to pregnancy, have no prior children, deliver by cesarean section, have longer hospital stays after delivery and have multiples (Supplementary Appendix Table S1).

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Supine sleep position by GA

Infants born at ⩽ 27 weeks had the lowest prevalence of SSP compared with all other GA groups (Table 3). In the unadjusted analysis, all preterm groups had a lower likelihood of SSP compared with the term group. In the adjusted analyses, there was no significant difference in SSP for infants born ⩽ 27 and 28 0/7 to 33 6/7 weeks compared with term infants. However, late preterm infants (34 0/7 to 36 6/7) were statistically less likely to be placed in SSP compared with term infants (Table 2), although the effect estimate was small. Given that state participation in PRAMS varied by year, we assessed the prevalence of SSP by GA category for the 10 states that participated in PRAMS continuously from 2000 to 2010 (Figure 3). All GA groups demonstrated improvement in SSP from 2000 to 2010.

Racial/ethnic disparities in safe sleep position

For all GA categories, NHB and Hispanic infants had significantly lower prevalence of SSP compared with NHW infants (Table 3). Less than half of all NHB infants were placed in SSP for all GA categories. In the adjusted analyses, NHB and Hispanic infants were significantly less likely to be placed in SSP compared with NHW infants for all the GA groups (Table 4). In general, there was minimal variation in the NHB and NHW and Hispanic and NHW disparity across the GA groups (table not shown). However, there was a statistically significant 5% decrease in the magnitude of the NHB and NHW disparity in the 28-to-33-week group compared with the term group. There was no difference in the NHB and NHW disparity in infants born ⩽ 27 weeks and 34 to 36 weeks compared with the term group. For Hispanic infants, the Hispanic and NHW disparity was increased by 5% in the 28-to-33-week group compared with term infants. There was no difference in the magnitude of disparity among the ⩽ 27-week and 34-to-36 week groups compared with the term group.

DISCUSSION

This population-based investigation demonstrated that from 2000 to 2011, preterm infants had a lower unadjusted prevalence of SSP after hospital discharge compared with term infants. In addition, there was a significant variation by state in SSP for all infants, with southern states having the lowest prevalence. Most states did demonstrate improvements in SSP from 2000 to 2011. A study of excess infant mortality in the US South from 2007 to 2009 found that one of the leading causes of excess infant death in the southern states was sudden unexpected infant death (SUID).[14] SUID is defined as ‘the death of an infant less than 1 year of age that occurs suddenly and unexpectedly, and whose cause is not immediately obvious prior to an investigation’.[4] After thorough investigation, SUIDs can be attributed to diagnoses such as SIDS, suffocation, asphyxia, infection, metabolic diseases and trauma. If no etiology is found and an autopsy, death scene investigation and review of the clinical history have been performed, then the death is called a SIDS death. If no etiology is found and there was no autopsy, death scene investigation and/or review of the clinical history, then the death is labeled ‘undetermined’. Given that 18% of SUID cases in 2011 were attributed to unsafe sleep practices leading to suffocation and asphyxia,[15] the wide variation by region in SSP requires local and national attention to improve safe sleep practices as echoed by organizations such as the American Academy of Pediatrics, the

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

National Institute of Child Health and Human Development and the Maternal Child Health Bureau.

Even for term infants, only about two-thirds were placed supine to sleep. After controlling for maternal socio-demographic characteristics that are associated with sleep positioning, late preterm infants were slightly less likely to be placed in SSP compared with term infants. However, the statistical significance of this estimate should be placed in the context of smaller sample sizes for the preterm groups at the lowest GAs, which resulted in less precise estimates and larger CIs that crossed one. The point estimates for the APRs for all of the preterm groups were very similar.

The prevalence of sub-optimal sleep practices for all infants, and particularly for preterm infants, indicates there is much room for improvement in engaging families to adopt safe sleep practices. Recent quality improvement initiatives have demonstrated that integrating safe sleep practices into the routine care of preterm infants increased the adherence to safe sleep practices during their infants' hospital stays as well as after discharge home.[16,17] A recently published review of the literature on discharge readiness as related to Neonatal Intensive Care Unit infants emphasized the importance of including safe sleep teaching in the discharge education of all families leaving the Neonatal Intensive Care Unit.[18] In working toward improving infant safe sleep practices, racial and ethnic disparities in adherence to recommendations should be addressed. For example, barriers to engaging black mothers include lack of maternal trust in providers; lack of appropriate advice from providers, friends and family; and concerns about safety and comfort, such as the risk for choking in the supine position.[19]

In the adjusted analysis, only late preterm infants were less likely to be placed in supine sleep position compared with term infants. Although research in the drivers of this phenomenon is lacking, we hypothesize that, because late preterm infants have a shorter hospital stay than very preterm infants, mothers of late preterm infants have fewer opportunities to engage with hospital staff about safe infant care practices, including SSP.

We found that, although significant racial/ethnic disparities in SSP were present across all GAs, the magnitude of the NHB and NHW disparity in the 28-to-33-week group was slightly decreased compared with the disparity in the term population. This finding perhaps highlights the potential opportunities available during a preterm infant's prolonged hospital stay to reduce racial/ethnic disparities in infant sleep practices. However, given that there was no reduction in the racial/ethnic disparity of SSP across other GA groups for NHB infants and Hispanic preterm infants, much more attention needs to be given toward the development of better strategies to engage black and Hispanic families during their infants' hospital stay as well as after discharge home to reduce the risk of morbidity and mortality in these high-risk infants.

There are several limitations to the study. First, owing to our exclusion criteria, approximately 64 000 (14%) of our initial unweighted sample of women were excluded from our analysis. The majority of excluded women had selected 'don't know' or had left blank questions regarding their race/ethnicity, location of delivery and education. We

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

compared the excluded population of mothers with those included in our analysis and found that excluded mothers were more likely to be non-white, unmarried, have lower education levels and less likely to place their infants in the supine sleep position. Given this comparison, our study findings are likely biased toward the null and underestimate the prevalence of unsafe infant sleep positioning. Second, we did not include the age of the infant at the time of maternal survey completion in our adjusted models. Although in our bivariate analysis we found that, as the age of the infant increased, the prevalence of SSP decreased, inclusion of infant age into our adjusted models did not change our point estimates and thus was not included. Finally, as with all retrospective survey studies, there is the potential for recall bias.

Despite these limitations, our study is the first to present the prevalence of SSP by GA on a population-based multi-state level and highlights the need to better engage all mothers, in particular non-white mothers and those of late preterm infants as well as those living in the southern US states.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGEMENTS

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

REFERENCES

1. Murphy SL, Xu J, Kochanek KD. Deaths: final data for 2010. Natl Vital Stat Rep 2013; 61: 12–13.
2. Malloy MH. Prematurity and sudden infant death syndrome: United States 2005–2007. J Perinatol 2013; 33(6): 470–475. [PubMed: 23288251]
3. Willinger M, Hoffman HJ, Wu KT, Hou JR, Kessler RC, Ward SL et al. Factors associated with the transition to nonprone sleep positions of infants in the United States: the National Infant Sleep Position Study. JAMA 1998; 280(4): 329–335. [PubMed: 9686549]
4. Task Force on Sudden Infant Death Syndrome, Moon RY. SIDS and other sleep-related infant deaths: expansion of recommendations for a safe infant sleeping environment. Pediatrics 2011; 128(5): 1030–1039. [PubMed: 22007004]
5. Colson ER, Rybin D, Smith LA, Colton T, Lister G, Corwin MJ. Trends and factors associated with infant sleeping position: the national infant sleep position study, 1993–2007. Arch Pediatr Adolesc Med 2009; 163(12): 1122–1128. [PubMed: 19996049]
6. Oyen N, Markestad T, Skaerven R, Irgens LM, Helweg-Larsen K, Alm B et al. Combined effects of sleeping position and prenatal risk factors in sudden infant death syndrome: the Nordic Epidemiological SIDS Study. Pediatrics 1997; 100(4): 613–621. [PubMed: 9310514]
7. Grazel R, Phalen AG, Polomano RC. Implementation of the American Academy of Pediatrics recommendations to reduce sudden infant death syndrome risk in neonatal intensive care units: an evaluation of nursing knowledge and practice. Adv Neonatal Care 2010; 10(6): 332–342. [PubMed: 21102179]
8. Vernacchio L, Corwin MJ, Lesko SM, Vezina RM, Hunt CE, Hoffman HJ et al. Sleep position of low birth weight infants. Pediatrics 2003; 111(3): 633–640. [PubMed: 12612248]
9. Colson ER, Willinger M, Rybin D, Heeren T, Smith LA, Lister G et al. Trends and factors associated with infant bed sharing, 1993–2010: the National Infant Sleep Position Study. JAMA Pediatr 2013; 167(11): 1032–1037. [PubMed: 24080961]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

10. Murphy SL, Xu J, Kochanek KD. Deaths: final data for 2010. Natl Vital Stat Rep 2013; 61(4): 1–117.
11. Shulman HB, Gilbert BC, Msphbrenda CG, Lansky A. The Pregnancy Risk Assessment Monitoring System (PRAMS): current methods and evaluation of 2001 response rates. Public Health Rep 2006; 121(1): 74–83. [PubMed: 16416701]
12. Bieler GS, Brown GG, Williams RL, Brogan DJ. Estimating model-adjusted risks, risk differences, and risk ratios from complex survey data. Am J Epidemiol 2010; 171 (5): 618–623. [PubMed: 20133516]
13. Oehlert GW. A note on the delta method. Am Stat 1992; 46: 27–29.
14. Hirai AH, Sappenfield WM, Kogan MD, Barfield WD, Goodman DA, Ghandour RM et al. Contributors to excess infant mortality in the U.S. South. Am J Prev Med 2014; 46(3): 219–227. [PubMed: 24512860]
15. Centers for Disease Control and Prevention. Sudden unexpected infant death and sudden infant death syndrome. Available at: http://www.cdc.gov/sids/data.htm (accessed 20 January 2015).
16. Gelfer P, Cameron R, Masters K, Kennedy KA. Integrating “Back to Sleep” recommendations into neonatal ICU practice. Pediatrics 2013; 131(4): e1264–e1270. [PubMed: 23460685]
17. Hwang SS, O’Sullivan A, Fitzgerald E, Melvin P, Gorman T, Fiascone JM. Implementation of safe sleep practices in the neonatal intensive care unit. J Perinatol 2015; 35(10):862–866. [PubMed: 26156063]
18. Smith VC, Hwang SS, Dukhovny D, Young S, Pursley DM. Neonatal intensive care unit discharge preparation, family readiness and infant outcomes: connecting the dots. J Perinatol 2013; 33(6): 415–421. [PubMed: 23492936]
19. Colson ER, Levenson S, Rybin D, Calianos C, Margolis A, Colton T et al. Barriers to following the supine sleep recommendation among mothers at four centers for the Women, Infants, and Children Program. Pediatrics 2006; 118(2): e243–e250. [PubMed: 16882769]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

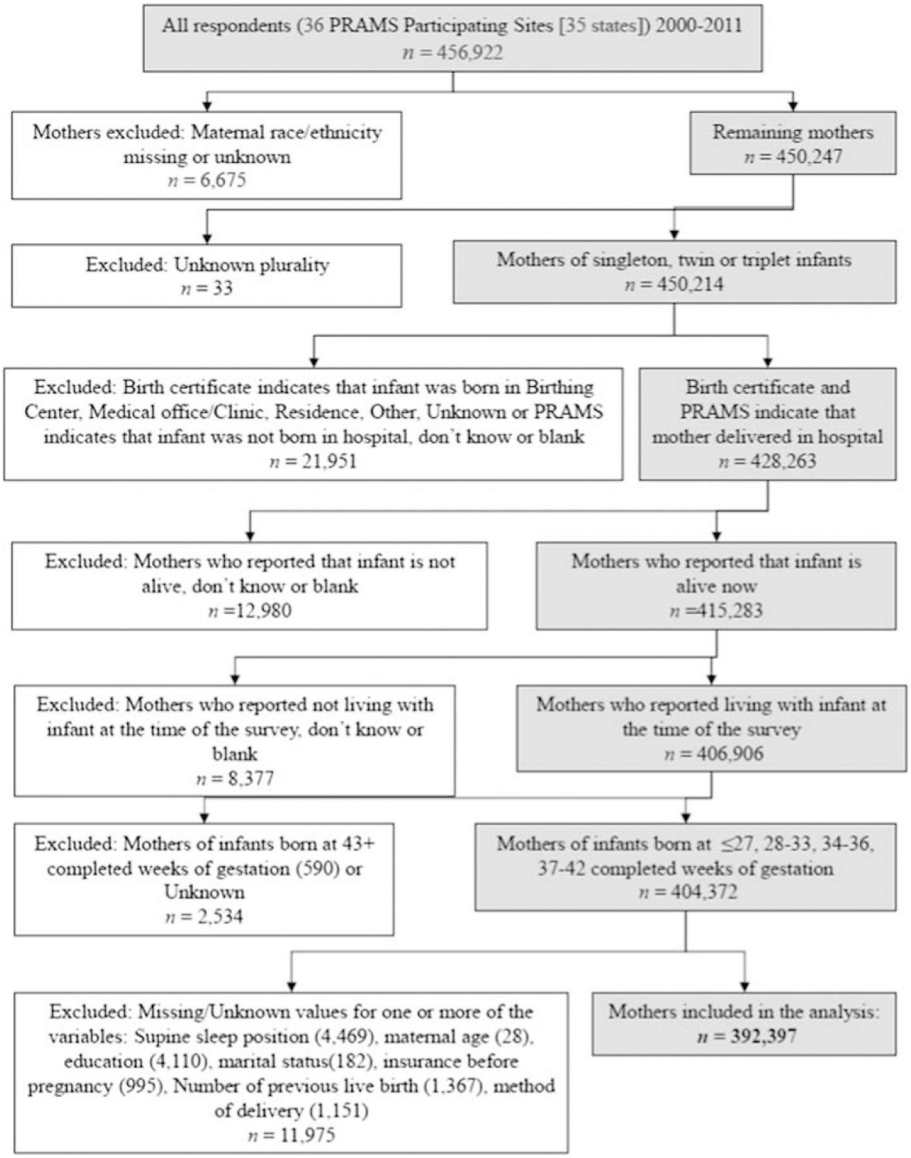

Figure 1.

Flow chart of mother selection for the study. PRAMS, Pregnancy Risk Assessment Monitoring System.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

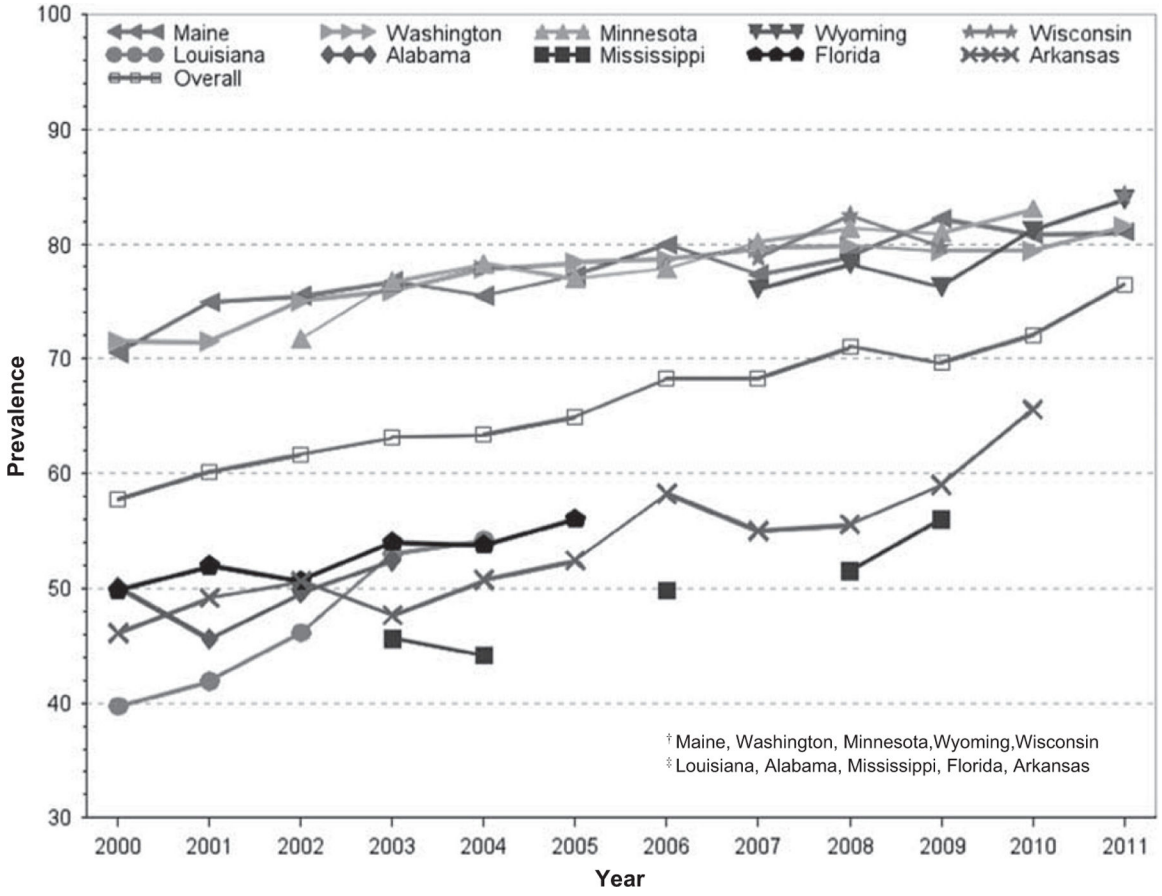

Figure 2.

Prevalence estimates of supine sleep position by state and year: five best and five worst performing states for supine sleep position.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

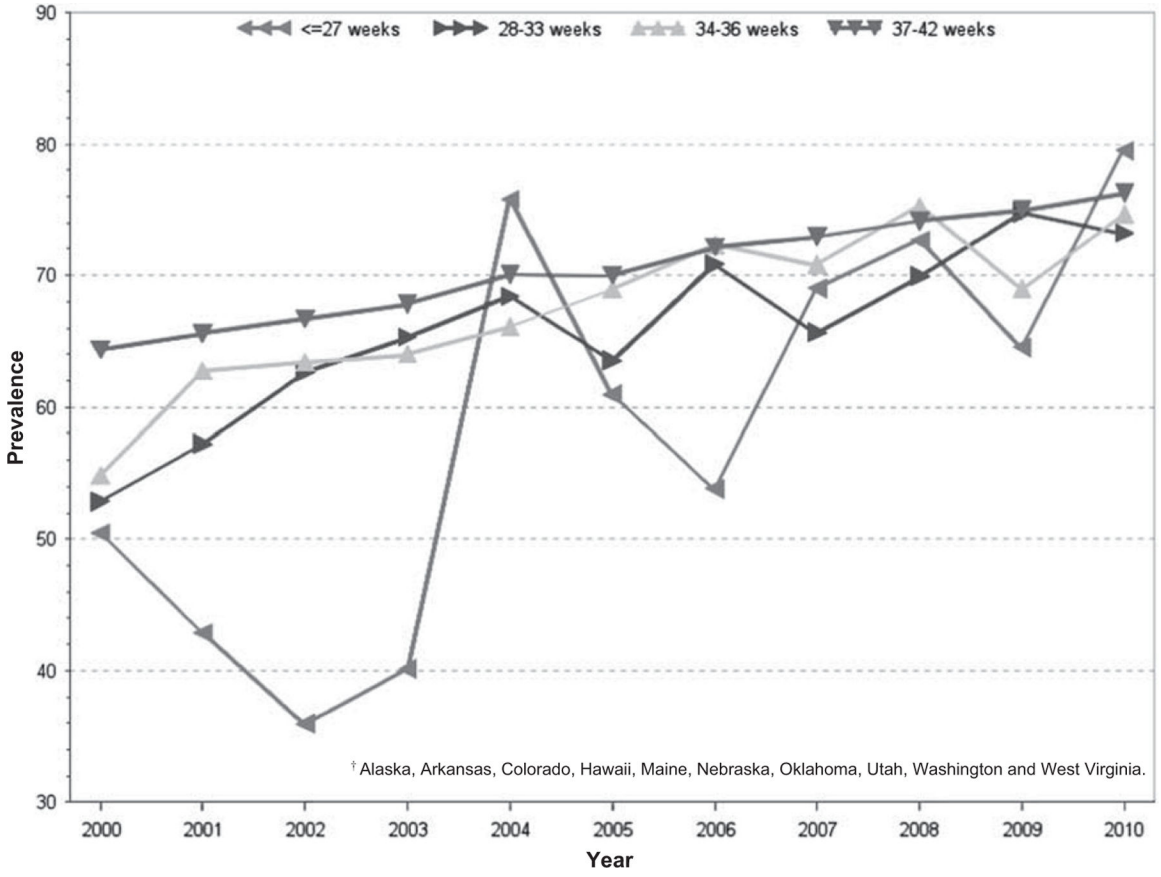

Figure 3.

Unadjusted supine sleep prevalence estimates by gestational age and by year—for the 10 states that participated in every year of Pregnancy Risk Assessment Monitoring System from 2000 to 2010.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 1.

Supine sleep position by PRAMS participant site

PRAMS participant site	*Supine sleep position*			n[a]
	Weighted %	Lower 95% CL	Upper 95% CL	
Overall	66.5	66.3	66.7	392 397
Alaska	69.9	68.8	70.9	10 640
Alabama	49.4	47.8	51.0	5489
Arkansas	53.7	52.7	54.7	18 268
Colorado	76.0	75.2	76.8	21 900
Delaware	70.1	68.6	71.6	3637
Florida	52.8	51.4	54.1	10 756
Georgia	57.8	56.0	59.5	7515
Hawaii	70.1	69.3	70.8	19 589
Illinois	66.7	65.9	67.5	16 203
Louisiana	47.1	45.9	48.4	7858
Massachusetts	76.8	75.3	78.2	5218
Maryland	68.5	67.3	69.6	15 125
Maine	77.5	76.7	78.3	12 305
Michigan	71.2	70.2	72.1	11 934
Minnesota	78.8	78.0	79.7	11 947
Missouri	73.2	71.7	74.7	4884
Mississippi	49.4	47.9	51.0	5788
North Carolina	61.1	59.9	62.2	10 917
Nebraska	74.2	73.5	74.9	20 199
New Jersey	63.4	62.6	64.2	15 806
New Mexico	65.8	64.8	66.8	9058
New York	68.5	67.4	69.7	10 369
New York City	59.2	57.7	60.6	6512
Ohio	68.3	67.2	69.3	12 549
Oklahoma	59.7	58.6	60.8	19 348
Oregon	77.3	76.2	78.4	13 131
Pennsylvania	75.8	74.3	77.3	4287
Rhode Island	70.7	69.7	71.7	10 315
South Carolina	56.2	54.6	57.7	9098
Tennessee	64.0	60.5	67.2	1340
Texas	63.3	61.1	65.5	2898
Utah	76.4	75.7	77.1	17 866
Washington	77.6	76.7	78.4	15 110
Wisconsin	81.3	79.8	82.7	4076
West Virginia	65.5	64.5	66.4	16 641
Wyoming	79.0	77.5	80.4	3821

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Abbreviations: CL, confidence limit; PRAMS, Pregnancy Risk Assessment Monitoring System, 2000–2011. Alaska and Arkansas included data for 2000–2010. Alabama included data for 2000–2003. Delaware and Massachusetts included data for 2007–2010. Florida included data for 2000–2005. Georgia included data for 2004–2010. Illinois included data for 2000–2009. Louisiana included data for 2000–2004. Maryland included data for 2001–2011. Michigan included data for 2001–2010. Minnesota included data for 2002–2010. Missouri included data for 2007 and 2009–2011. Mississippi included data for 2003–2004, 2006 and 2008–2009. North Carolina included data for 2000–2005 and 2007–2008. New Jersey and Rhode Island included data for 2002–2011. New Mexico included data for 2000–2005 and 2011. New York included data for 2000–2008 and 2010–2011. New York City included data for 2004–2007 and 2010–2011. Ohio included data for 2000–2003 and 2005–2010. Oregon included data for 2003–2011. Pennsylvania and Wyoming included data for 2007–2011. South Carolina included data for 2000–2007. Tennessee included data for 2008–2009. Texas included data for 2009–2010. Wisconsin included data for 2007–2009 and 2011. Colorado, Hawaii, Maine, Nebraska, Oklahoma, Utah, Washington and West Virginia included data for 2000–2011.

[a] Unweighted *n*.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 2.

Supine sleep position by gestational age unadjusted and adjusted prevalences (%), prevalence ratios (PR) and 95% confidence intervals (CI)

Gestational age	Unadjusted				Adjusted[a]			
	Prevalence	95% CI	PR	95% CI	Prevalence	95% CI	PR	95% CI
⩽ 27 weeks	59.7	57.1–62.2	0.89	0.86–0.93	0.65	0.62–0.67	0.97	0.93–1.01
28–33 weeks	63.7	62.7–64.7	0.95	0.94–0.97	0.66	0.65–0.67	0.98	0.97–1.00
34–36 weeks	63.6	62.7–64.4	0.95	0.94–0.97	0.64	0.63–0.65	0.96	0.95–0.98
37–42 weeks	66.8	66.5–67.0	1.00	1.00	0.67	0.66–0.67	1.00	1.00

[a]Adjusted for the following: maternal age, education, race/Hispanic ethnicity, marital status, previous live birth, insurance status before pregnancy, method of delivery and plurality.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3.

Supine sleep position by race/ethnicity and gestational age

Race/ethnicity	Gestational age							
	⩽ 27 weeks		28–33 weeks		34–36 weeks		37–42 weeks	
	Weighted prevalence	95% CI	Weighted prevalence	95% CI	Weighted prevalence	95% CI	Weighted prevalence	95% CI
Non-Hispanic white	70.1	66.7–73.4	71.7	70.4–72.9	70.4	69.3–71.4	72.5	72.2–72.8
Non-Hispanic black	49.3	45.6–53.0	47.9	46.1–49.7	44.5	42.8–46.3	46.0	45.3–46.7
Hispanic	52.0	44.0–59.9	57.7	54.5–60.9	57.2	54.4–59.8	61.3	60.5–62.0
Non-Hispanic other	69.9	58.2–79.5	75.0	72.0–77.7	72.7	69.7–75.4	72.1	71.2–72.9

Abbreviation: CI, confidence interval.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 4.

Prevalence of supine sleep position by race/ethnicity and gestational age unadjusted (UPR) and adjusted prevalence ratios (APR) and 95% confidence intervals (CIs)

Race/ethnicity	Gestational age							
	⩽ 27 weeks		28–33 weeks		34–36 weeks		37–42 weeks	
	UPR 95% CI	APR[a] 95% CI	UPR 95% CI	APR[a] 95% CI	UPR 95% CI	APR[a] 95% CI	UPR 95% CI	APR[a] 95% CI
Non-Hispanic white	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Non-Hispanic black	0.70 (0.64–0.77)	0.75 (0.69–0.82)	0.67 (0.64–0.70)	0.73 (0.70–0.76)	0.63 (0.61–0.66)	0.70 (0.67–0.73)	0.63 (0.62–0.64)	0.69 (0.68–0.70)
Hispanic	0.74 (0.63–0.87)	0.81 (0.70–0.94)	0.81 (0.76–0.85)	0.87 (0.82–0.92)	0.81 (0.77–0.85)	0.88 (0.84–0.93)	0.85 (0.83–0.86)	0.92 (0.91–0.93)

[a]Adjusted for maternal age, marital status, previous live birth, insurance status before pregnancy, method of delivery and plurality.