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MATERNITY LEAVE IN THE NINTH MONTH OF PREGNANCY AND BIRTH OUTCOMES AMONG WORKING WOMEN

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Purpose. **The health effects of antenatal maternity leave have been scarcely evaluated. In California, women are eligible for paid benefits up to 4 weeks before delivery. We explored whether leave at ≥36 weeks gestation increases gestation and birthweight, and reduces primary cesarean deliveries among full-time working women.**

Methods. **Drawing from a 2002–2003 nested case-control study of preterm birth and low birthweight among working women in Southern California, we compared a cohort of women who took leave ($n = 62$) or worked until delivery ($n = 385$). Models weighted for probability of sampling were used to calculate hazards ratios for gestational age, odds ratios (OR) for primary cesarean delivery, and multilinear regression coefficients for birthweight.**

Main Findings. **Leave-takers were similar to non–leave-takers on demographic and health characteristics, except that more clerical workers took leave ($p = .02$). Compared with non–leave-takers, leave-takers had almost 4 times lower odds of cesarean delivery after adjusting for covariates (OR, 0.27; 95% confidence interval [CI], 0.08–0.94). Overall, there were no marked differences in length of gestation or mean birthweight. However, in a subgroup of women whose efforts outstripped their occupational rewards, gestation was prolonged (hazard ratio for delivery each day between 36 and 41 weeks, 0.56; 95% CI, 0.34–0.93).**

Conclusion. **Maternity leave in late pregnancy shows promise for reducing cesarean deliveries and prolonging gestation in occupationally strained women.**

Introduction and Background

In the United States, a large proportion of women work during pregnancy. Estimates indicate that 67% of mothers at first birth worked during pregnancy; of this group, 87% worked into their last trimester and the majority worked full time (Johnson, 2008). Although women often strain to balance work and pregnancy, few take antenatal leave, defined as time off before delivery with the expectation of returning to their job or employer after giving birth. A US Census report indicates that among employed women who had their first birth between 2001 and 2003, 28% took antenatal leave (17.6% paid and 10.6% unpaid; Johnson, 2008). An additional 22% quit their jobs; 1.6% were laid off, approximately 22% made other arrangements, and 26% took no leave.

Unlike most industrialized countries that support working women by providing job-protected paid maternity leave, the United States does not offer paid leave. The Family and Medical Leave Act (FMLA), enacted by Congress in 1993, allows parents to take up to 12 weeks of unpaid, job-protected leave around the birth of a child or to provide family care (FMLA, 1993). The law applies to employees working for a minimum of 1,250 hours in the previous 12 months in

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companies with ≥50 employees within a 75-mile radius. FMLA covers fewer than half of the employees in the private sector; part-time employees working on average <25 hours per week for 50 weeks, and those working in informal labor markets do not benefit. Many low- and middle-income workers do not take leave because they cannot afford to go without pay, are not covered, or are not aware of their eligibility (Overturf, Johnson, & Downs, 2005).

California is 1 of only 5 states in the nation to offer paid pregnancy leave through a temporary State Disability Insurance (SDI) system. SDI provides partial income replacement (55%–60% of average weekly wages currently up to a cap of $917 per week) to pregnant employees for up to 4 weeks of leave before birth and up to 6 weeks after giving birth by vaginal delivery. An additional 2 weeks of leave is granted for cesarean deliveries. Other conditions that severely compromise emotional or physical health such as postpartum depression, severe anemia, incontinence, and unresolved infections can extend leave. Because unused antenatal leave may not be used to supplement postpartum maternity leave, SDI provides no incentive to forego antenatal leave. California's Paid Family Leave Program offers additional benefits up to 6 weeks postpartum to bond with the baby and take care of a child, if sick. SDI is funded through employee payroll deductions and workers are required to get gestational-age verification from a doctor to receive payment. Despite the availability of these benefits, antenatal leave rates in California are only slightly higher than current national rates. A recent study of working women in Southern California, from which the current study is based, found that 32% took antenatal leave (Guendelman, Pearl, Graham, Angulo, & Kharrazi, 2006). The strongest predictors of leave taking were feeling stressed and tired, which in turn were associated with medical problems. Women were far less likely to use time off to prepare for the birth, or to give themselves rest and relaxation.

Studies have shown that women with elevated anxiety scores and those perceiving stress are prone to deliver preterm (Copper et al., 1996; Dole et al., 2003; Hedegaard, Henriksen, Secher, Hatch, & Sabroe, 1996; Nordentoft et al., 1996; Wadhwa, Sandman, Porto, Dunkel-Schetter, & Garite, 1993). Additionally, women who get little night sleep are more likely to have cesarean deliveries (Lee & Gay, 2004). By providing rest and reducing stress, job-protected antenatal leave may prolong gestation, and reduce the occurrence of maternal complications and the need for costly procedures such as cesarean deliveries. A cesarean first birth is associated with increased risk of placenta previa and placental abruption in subsequent pregnancies, both of which are risk factors for perinatal mortality (Getahun, Oyelese, Salchu, & Ananth, 2006). Evidence also suggests that the risk of placenta accreta, hysterectomy, and bowel, ureteral, and other injuries increase with increasing number of cesarean deliveries (Silver et al., 2006). Although planned primary cesarean births (not necessarily by maternal request) are associated with increased risk for maternal rehospitalization and with longer hospital days (Declercq et al., 2007), elective caesareans before 39 weeks gestation are not recommended. Deliveries within 1 month before full term are associated with several difficulties including feeding problems, infant maturation problems, respiratory distress and bonding difficulties (National Institutes of Health, 2006).

Few studies have evaluated the effects of antenatal leave on birth outcomes; notably, all have been conducted outside the United States (Alegre, Rodriguez-Escudero, Cruz, & Prada, 1984; Mamelle, Bernicat & Munoz, 1989; Tanaka, 2005; Sydsjo, Brynhildsen, Ekholm Selling, Josefsson, & Sydsjo, 2006; Cerón-Mireles, Harlow, & Sanchez-Carrillo, 1996; Xu, Ségun, & Goulet, 2002). The bulk of the evidence suggests that antenatal leave may protect against poor birth outcomes such as obstetric complications during labor and delivery (Xu et al., 2002); low birthweight (Tanaka, 2005), prematurity (Mamelle et al., 1989), and small-for-gestational age births (Ceron-Mirelles et al., 1996).

Evidence is needed to determine whether policies that encourage antenatal leave in the United States can improve birth outcomes among working women. We conducted a study in California to assess whether antenatal leave prolongs gestation, increases birthweight, and reduces the rate of cesarean deliveries. Because California's antenatal leave benefits begin at 36 weeks, this paper focuses on leave taken and birth outcomes after 35 weeks gestation.

Methods

A cohort was selected from participants in a nested case-control study, *Juggling Work and Life During Pregnancy*, designed to examine the relationship between stress, corticotrophin-releasing hormone, antenatal leave, and pregnancy outcomes. Women were eligible for the study if they were ≥18 years old, participated in the California Department of Health Services' expanded alpha-fetoprotein Prenatal Screening Program in the 3 Southern California counties (Orange, Imperial, and San Diego) selected for the study, delivered live births between July 2002 and December 2003, had a singleton birth without congenital anomalies, and a US mailing address (Guendelman et al., 2006). Among eligible participants we sampled all women who delivered preterm or low birthweight infants (n = 3,361) according to last menstrual period and birthweight from birth records registered between July 2002 and August 2003, and a random sample of controls delivering normal weight at term (≥2,500 g and ≥37 weeks gestation; n = 3,366) frequency-matched on

race and month of birth. In addition, 504 unmatched low birthweight cases registered between September and December 2003 were included to increase sample size. Details of the prescreening for work eligibility and the 45-minute telephone interview have been described elsewhere (Guendelman et al., 2006). The response rate among eligible women contacted for the study was 73%. An additional 38 women were excluded owing to the identification of births with congenital anomalies during the interview. Overall, 1,176 women who worked ≥20 hours/week through the date of prenatal screening completed interviews. The study protocol was approved by the Committees for the Protection of Human Subjects at the University of California, Berkeley (No. 2003-115) and at the California Health and Human Services Agency (No. 02-10-18).

This paper focuses on a subset of women who, by virtue of working full time, may have had reduced flexibility in juggling work and life demands, and who were eligible for the state's antenatal leave benefits after 35 weeks gestation. Therefore, we excluded women who were employed <35 hours per week ($n = 357$); took leave before 36 weeks ($n = 244$) or after 39 weeks gestation ($n = 1$); delivered before 36 weeks gestation ($n = 112$); and who quit ($n = 7$), cut back on their hours ($n = 6$), or were fired during pregnancy ($n = 2$). The final analytic sample yielded 447 full-time workers who had not yet delivered or taken leave as of 35 weeks and 6 days gestation and thereafter either took antenatal leave ($n = 62$) or worked throughout the pregnancy ($n = 385$). Telephone interviews were conducted on average 4.5 months after delivery for both groups.

Variables

Outcomes studied included gestational age, birthweight, and delivery by primary cesarean. Gestational age was ascertained using estimates from the prenatal screening program to improve accuracy over birth records (Dietz et al., 2007; Pearl, Wier, & Kharrazi, 2007); in 62% of records, early ultrasound dating was employed. Birthweight was recorded on birth records, and cesarean delivery was self-reported and verified from birth records.

The key exposure, antenatal leave, was collected from postpartum telephone interviews with women and is defined as maternity leave while pregnant with the expectation of returning to their job or employer sometime after giving birth. Those who did not take leave worked through pregnancy to delivery.

Potential sociodemographic confounders, drawn from the interview, include maternal age, parity, annual household income, highest educational attainment at the time of delivery, and race/ethnicity, type of prenatal care insurance and infant gender as reported on birth records. Occupational characteristics drawn from the interview include type of occupation; Siegrist's standardized measure on perceived imbalance between work effort or demands and rewards in terms of money, esteem, and career opportunities (Siegrist, 1996; Siegrist & Marmot, 2004); and whether sick or vacation days off were taken during pregnancy. Health measures were also obtained from the interview and include perceived maternal stress assessed with a standard question that asks women how often they felt stressed during the second trimester of pregnancy, categorized as never, seldom, often, or always (Sable & Wilkinson, 2000), the average number of hours of night sleep during the second and third trimesters; maternal height and prepregnancy body mass index (BMI), the presence of medical problems including hypertension, diabetes, heart disease, sexually transmitted and urinary tract infections, and whether any bed rest was required during pregnancy for medical reasons.

Statistical analysis

A cohort analysis was performed weighting all point estimates by the inverse probability of sampling to account for oversampling of cases and frequency matching. The analytic weights reflect the known sampling probabilities before exclusion of nonworkers and nonrespondents. Using SAS 9.1, standard errors and test statistics were obtained using appropriate survey augmentation to account for survey, where available (SAS, 2004). Leave-takers and non–leave-takers were compared with respect to demographic, occupational, and health characteristics using weighted frequencies and χ^2 tests.

The association of leave with duration of gestation was analyzed by Cox proportional hazards methods using Stata version 9.2. (Cox, 1972; STATA, 2006). Because women with longer gestations have more opportunity to take leave, and earlier delivery truncates the opportunity for taking leave (i.e., opportunity bias), leave was treated as a time-varying covariate, such that the estimated relative hazard of delivery associated with leave-taking was calculated among those who had not yet delivered at each day of gestation. Bootstrapped standard errors performing 1,000 replicates with replacement are presented, as no survey procedures exist for hazard models with time varying covariates. Postterm deliveries (after 41 weeks gestation; $n = 3$) were excluded to restrict hazard estimates for gestational age to a medically desirable range.

Mean birthweight and odds of cesarean delivery (excluding 37 mothers with previous cesareans) were modeled using linear and logistic regression models, respectively, utilizing SAS 9.1 survey procedures specific to complex survey designs. To avoid opportunity bias in models of birthweight and cesarean deliveries owing to their association with gestational age, gestational age was included as both linear and quadratic

terms. Hazards ratios for gestational age, odds ratios (ORs) for cesarean delivery, and multiple linear regression coefficients for birthweight were adjusted for potential confounding covariates, selected if their inclusion changed the leave association measure by >5%, or if deemed important in the literature. Covariates were dropped in the final cesarean delivery model if their removal had no effect on the OR for antenatal leave versus work through pregnancy.

Results

In this study population, 15% of full-time workers took maternity leave after 35 weeks gestation (Table 1). Almost half (49%) did so during the 36th week of gestation; 85% were paid by the state and 15% by their employer (data not shown). Leave-takers were similar to non–leave-takers with respect to sociodemographic and health characteristics, except for a higher frequency of clerical workers ($p = .02$) among leave-takers (Table 1). In this study population, all women were insured for their prenatal care. The mean gestational age at delivery was 277 days, the mean birthweight was 3,475 g (data not shown), and 24% had a primary cesarean delivery.

Antenatal leave was associated with a large reduction in cesarean deliveries (Table 2). After adjusting for gestational age, infant gender, maternal race, parity, prepregnancy BMI, height, and occupation, women who took antenatal leave had almost 4 times lower odds of a primary cesarean delivery as women who continued working (OR, 0.27; 95% confidence interval [CI], 0.08–0.94). In the overall study population, antenatal leave was associated with a small and statistically insignificant decrease in the risk of delivery at any given day of gestational age compared with non–leave-taking (hazard ratio [HR], 0.84; 95% CI, 0.62–1.15). However, leave-taking was associated with prolonged gestation among women whose efforts outstripped their rewards at work (HR, 0.56; 95% CI, 0.34–0.93). Maternity leave in the 9th month of pregnancy was not associated with mean birthweight after adjusting for gestational age, maternal race/ethnicity, height, or BMI (β, −9.7 g; 95% CI, −171.8 to 152.5 g).

Discussion and Conclusions

This is the first study to examine the association of maternity leave during pregnancy and birth outcomes in US working women. Despite a state policy that makes this paid benefit available, we found that only 15% of pregnant, full-time workers in Southern California took maternity leave at 36 weeks or later. About half of the leave-takers did so at 36 weeks gestation, which is the period when paid benefits normally begin.

Our findings suggest that maternity leave in the 9th month of pregnancy is associated with reduced primary cesarean delivery. Leave-takers had almost 4 times lower odds of cesarean delivery compared with non−leave-takers, after adjusting for several covariates. Leave-takers did not have longer gestations compared with non–leave-takers, although the study was underpowered to detect small differences in gestational age. It is worth noting that among women whose efforts exceeded their occupational rewards, gestation was markedly prolonged. Previous studies have shown that occupational strain is associated with preeclampsia (Klonoff-Cohen, Cross & Pieper, 1996) and that this obstetric complication can lead to cesarean delivery (Lee, O'Connell & Baskett, 2004). Our findings showed that women who experienced occupational strain from low rewards at work had higher rates of self-reported hypertension, preeclampsia, or retained water and/or swelling of hands and legs. Antenatal leave was especially protective against cesarean deliveries for this subgroup. In a study of approximately 1,200 women who worked during pregnancy in 1993, Hung, Morrison, Whittington, and Beck Fein (2002) found that women who planned to work through pregnancy were not at higher risk of a cesarean delivery compared with women who planned to stop during the first 2 months of pregnancy, after controlling for covariates. Unlike our study, which focused on actual leave, this study focused on intended duration of work as a proxy for antenatal leave, and this could have resulted in misclassification of leave-takers. Furthermore, these authors excluded women who had any adverse pregnancy outcome, including preterm deliveries.

Many factors influence clinical decision making surrounding cesarean deliveries, including women's choice of delivery mode, endurance, and energy levels. Women who are more fatigued might be more likely to choose or be advised by a health professional to have a cesarean delivery (Chien & Ko, 2003). Less than 6 hours of sleep at night and poor sleep quality have also been shown to markedly increase the risk of cesarean deliveries (Lee & Gay, 2004). However, in the current study, adjusting for sleep duration in the second or third trimester did not change the results, and leave was associated with decreased cesarean deliveries even among women with adequate sleep in both trimesters (OR, 0.38). A behavioral or biological pathway that explains the higher cesarean delivery rate among non–leave-takers requires investigation. Possible factors include failure to progress in labor, uteroplacental stress, and elective inductions. Although a positive association between cesarean delivery rates and socioeconomic status has been shown (National Institutes of Health, 2006), adjusting for occupation, income, and education did not change the association of leave with cesarean delivery in our study. Given the high rate of cesarean deliveries in the United States (29.1%) and associated high financial and human costs owing to increased hospitalizations, length of hospital

Table 1. Characteristics of Leave-Takers Versus Non–Leave-Takers ($n = 447$)

Covariates	Leave-Takers		Non–Leave-Takers		χ^2	p-Value
	n	w%*	n	w%*		
Total	62	15	385	85	n/a	n/a
Mother's age (yrs)						
<30	25	43	167	44	0.02	.90
≥30	37	57	218	56		
Parity						
0	35	57	215	58	3.20	.20
1	14	20	111	29		
≥2	13	23	59	13		
Race/ethnicity						
White Non-Latina	24	46	155	49	1.78	.41
Latina	24	41	139	32		
Other	14	13	91	19		
Maternal education						
Did not graduate high school	2	5	46	9	2.02	.57
High school graduate	10	22	62	14		
At least some college	38	54	191	55		
Postgraduate	12	20	86	21		
Annual household income ($)						
≤25,000	8	11	59	14	1.67	.64
>25,000 to 50,000	12	22	71	15		
>50,000 to 75,000	15	19	78	22		
>75,000	27	48	176	49		
Missing	0	0	1	0		
Prenatal care insurance						
Private	55	86	325	87	0.02	.88
Public	7	14	60	13		
Occupation						
Managerial	32	42	191	53	8.20	.02
Clerical	25	51	123	30		
Service or manufacturing	5	7	71	17		
Effort/reward (imbalance)						
Low effort/high reward	14	24	131	31	3.52	.32
High effort/high reward	12	18	78	24		
Low effort/low reward	9	14	59	15		
High effort/low reward	27	44	113	29		
Missing	0	0	1	1		
Infant's gender						
Male	29	53	196	48	0.31	.58
Female	33	47	189	52		
Chronic medical problems						
No	52	84	287	78	0.74	.39
Yes	10	16	97	22		
Missing	0	0	1	0		
Sleep (hours per night)						
≤6	21	30	119	30	0.00	.98
>6	41	70	266	70		
Perceived prenatal stress						
Low	35	58	268	71	2.77	.10
High	27	42	117	29		
BMI						
Normal or underweight	39	66	261	68	0.12	.73
Overweight	22	33	116	30		
Missing	1	1	8	2		
Height (feet)						
≤5	52	91	332	91	0.01	.92
>5	9	7	45	8		
Missing	1	1	8	2		
Bed rest						
No	51	82	332	89	1.89	.17
Yes	11	19	53	11		

(*Continued*)

Table 1. (*Continued*)

Covariates	Leave-Takers		Non–Leave-Takers		χ^2	*p*-Value
	n	w%*	*n*	w%*		
Took sick days off						
No	31	48	263	63	3.54	.06
Yes	31	52	121	37		
Missing	0	0	1	0		
Took vacation days off						
No	44	70	313	78	1.37	.24
Yes	18	30	72	22		
Delivery type						
Primary cesarean	11	11	92	24	6.08	.13
Repeat cesarean	5	7	31	8		
Vaginal	46	82	262	68		

* Percentages are weighted to reflect probabilities, and therefore may differ from percentages calculated.

stay, wound complications, and serious maternal morbidities, it is important to determine whether antenatal leave can be an effective protective intervention against this procedure, particularly for women who do not request a cesarean delivery (National Institutes of Health, 2006). Because deliveries before full term (at <39 weeks gestation) are associated with infant feeding and maturation problems, heightened maternal anxiety and bonding difficulties, prolonging gestation to 39 weeks could give mother and child a healthier start (National Institutes of Health, 2006).

Despite 1 negative finding, several studies conducted abroad indicate that antenatal leave may protect against poor birth outcomes. In a study of 363 working women who had delivered a full-term infant at 1 hospital in Montreal, Xu et al. (2002) found that the adjusted risk of a difficult delivery decreased with the duration of antenatal leave (OR, 0.96; 95% CI, 0.93–0.99). The average duration of leave was 8 weeks. Among female factory workers in France, preterm delivery was lower if women took antenatal leave (3.1%) than if they did not (8.1%; Mamelle et al, 1989). A study in Spain found that women who had taken 6 weeks of antenatal leave delivered infants with higher mean birthweights than women who took no antenatal leave (Alegre et al., 1984), and another conducted in several industrialized countries found that paid leave, but not unpaid leave, significantly decreased low birthweight (Tanaka, 2005). In the developing world, a study of 2,663 women who worked ≥3 months during pregnancy and delivered singletons at 3 major hospitals in Mexico City found an elevated odds of prematurity and small-for-gestational-age birth associated with lack of antenatal leave benefits and with duration of leave among leave-takers, after adjusting for confounders (Cerón-Mireles et al., 1996). In contrast with these studies, Sydsjo et al. (2006), in a population-based study in Sweden, evaluated the effects of special paid prebirth leave benefits on birthweight and found no relationship. Whether an early delivery precluded women from taking leave was not considered in these studies.

In the United States, the health effects of antenatal leave are more difficult to assess given that most women work through pregnancy and many prefer to take leave after childbirth. A strong work attachment

Table 2. Relationships Between Maternity Leave in the 9th Month and Primary Cesarean Delivery, Gestational Age and Birth Weight

	Primary cesarean delivery		Gestational age (days) total population		Gestational age (days) high job strain subpopulation		Mean birth weight (g)	
n	410		444		140		447	
Model	Odds ratio‡	95% CI	Hazard ratio†	95% CI	Hazard ratio†	95% CI	β‡	95% CI
Not adjusted for potential confounders	0.34^	0.12–0.95	0.88	0.65–1.19	0.68	0.44–1.05	8.0^	−151.9 to 167.9
Adjusted for potential confounders	0.27*	0.08–0.94	0.84**	0.62–1.15	0.56**	0.34–0.94	−9.7 ***	−171.8 to 152.5

^ Adjusted for gestational age only.
* Adjusted for gestational age, infant gender, parity, maternal race, occupation, prepregnancy BMI, and height.
** Adjusted for race, parity, and baby's gender.
*** Adjusted for gestational age, race, prepregnancy BMI, and height.
‡ Odds ratios from weighted logistic regression models and β parameters from weighted linear regression models incorporating design effects.
† Weighted proportional hazard models include antenatal leave as a time-varying covariate; hazard ratio represents the relative probability of delivery at each day of gestation; confidence intervals derive from bootstrapped standard errors.

and fear of sacrificing career advancement opportunities deter women from taking leave. For others, immediate financial need and a lack of paid benefits to cover leave before 36 weeks gestation requires them to continue working (Guendelman et al., 2006).

The findings from this study require cautious interpretation. The *Juggling Life and Work During Pregnancy* study used a retrospective design. We were unable to confirm the reported employment and leave patterns, or the employment benefits. The sample may not be demographically representative of the general obstetric population of working women. We sampled an almost equal number of Latina and white non-Latina women; very few Black women were included. In addition, our study sample was restricted to deliveries after 35 weeks, to match California's benefit timing and minimize medically necessitated leave. If leave were taken for rest and relaxation before 36 weeks, it would be unusual in our workplace culture and, as presently designed in California, unlikely to be covered by maternity insurance. As a result, we were unable to study the potential impact of elective antenatal leave on early preterm deliveries. Furthermore, we excluded part-time workers and those who quit or cut back on their hours while pregnant because such women have more flexible lifestyles and may experience less fatigue and stress in juggling life, work, and pregnancy.

Despite these limitations, we conclude that among full-time working, predominantly white Latinas and non-Latinas, maternity leave taken after 35 weeks of gestation is associated with a reduction in cesarean deliveries. Studies with much larger samples of women taking leave after 35 weeks gestation are needed to determine whether antenatal leave—and particularly paid leave—protects women against the birth outcomes explored in this study, as well as unexamined outcomes such as infant feeding and postpartum depression. Furthermore, subgroups of women, such as those at high risk for job strain, may particularly benefit from antenatal leave, an area of exploration for additional studies. Future studies that aim to recruit women who take leave before 36 weeks for non-medical reasons may also be valuable, as are studies that focus specifically on Black women and other ethnic groups not represented in this study. Such evidence is essential to guide maternity leave policies and to ensure that antenatal leave becomes a preventive rather than a curative health measure.

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