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Re-evaluating the Relationship between Prenatal Employment and Birth Outcomes: A Policy-Relevant Application of Propensity Score Matching

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Abstract

BACKGROUND—Prior research shows an association between prenatal employment characteristics and adverse birth outcomes but suffers methodological challenges in disentangling women's employment choices from birth outcomes, and little U.S.-based prior research compares outcomes for employed women with those not employed. This study assessed the effect of prenatal employment status on birth outcomes.

METHODS—With data from the Listening to Mothers II survey, conducted among a nationally representative sample of women who delivered a singleton baby in a U.S. hospital in 2005 (N=1,573), we used propensity score matching to reduce potential selection bias. Primary outcomes were low birth weight (< 2,500 grams) and preterm birth (gestational age < 37 weeks).

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The authors have no conflicts of interest.

Dr. Kozhimannil had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Exposure was prenatal employment status (full-time, part-time, not employed). We conducted separate outcomes analyses for each matched cohort using multivariable regression models.

FINDINGS—Comparing full-time employees with women who were not employed, full-time employment was not causally associated with preterm birth (adjusted odds ratio AOR = 1.37, p = 0.47) or low birth weight (AOR = 0.73, p = 0.41). Results were similar comparing full- and part-time workers. Consistent with prior research, black women, regardless of employment status, had increased odds of low birth weight compared with white women (AOR = 5.07, p =0.002).

CONCLUSIONS—Prenatal employment does not independently contribute to preterm births or low birth weight after accounting for characteristics of women with different employment statuses. Efforts to improve birth outcomes should focus on the characteristics of pregnant women (employed or not) that render them vulnerable.

Introduction and Background

Employment during pregnancy and the postpartum period is increasingly common: 67% of first-time mothers report being employed during their pregnancies, and 87% of these women worked outside the home into their last trimester. In comparison, 44% of women were employed during pregnancy in the 1960s (T. D. Johnson, 2008). Postpartum employment shows similar historical trends: in 2010, 55% of all mothers of infants were employed, up from 38% in 1980 (Bureau., 2010).

Prevalence of preterm birth (before 37 weeks gestation) has increased 35% since 1981, from 9.4% to 12.7% in 2007. More than 40% of preterm infants are born at low birth weight (<2500 grams), and the prevalence of low birth weight has also increased 24% over this time period.(Martin et al., 2010) In recent years, rates have begun a slight decline, but reducing preterm birth and low birth weight remain a focus of policy and research (Bock & Miller, 2012; “Healthy People 2020 Topics and Objectives: Maternal, Infant and Child Health,” 2010; “Preterm Birth Projects,” 2012). While the etiology of preterm birth and low birth weight has not yet been fully characterized, associated factors include previous preterm birth, infection or inflammation, vascular disease, uterine overdistension, multiple pregnancies, periodontal disease, low maternal body mass index, indicated preterm births (e.g., for pre-eclampsia, eclampsia, and intrauterine growth restriction), and black race (Goldenberg, Culhane, Iams, & Romero, 2008). Additionally, iatrogenic prematurity is a real concern, as early elective deliveries are associated with health problems for both mothers and infants (Angood et al., 2010; Ashton, 2010; Tita et al., 2009). Given recent changes in the workforce participation of pregnant women and mothers, characterizing the influence of employment on childbirth-related health is relevant for families, employers, insurers, health care providers, and for the government and private-sector systems that support the care and well-being of mothers and children.

The theoretical model underlying this analysis (Figure 1) is a hybrid model of workforce participation and health adapted from Becker (1965) and Grossman (1972). The model has health, broadly defined, as the outcome, and assumes that health is determined by genetic endowment, other pre-existing factors, and personal choices. This theoretical model has successfully been applied to the study of women’s workforce participation and perinatal health (McGovern et al., 2006). In the model, birth outcomes are explained not only by maternal health status, medical factors, socio-economic circumstances, and demographics, but also by employment choices. The model allows for both a direct association between pre-pregnancy factors and birth outcomes (Pathway A) and an indirect association via pregnancy-related choices, including employment (Pathway B). Employment may influence birth outcomes either generally (whether women are employed or not) or in specific ways, depending on the amount of employment (part-time vs. full-time) or other factors, including employment conditions and exposures.

Prior research on the general impact of employment on birth outcomes has been limited, has conflicting results, and much of it is either decades old or was conducted in a non-U.S. context. Recent studies in European countries have found that employment during pregnancy had no impact on outcomes such as preterm birth and low birth weight (Jansen et al., 2012; Saurel-Cubizolles et al., 2004). Some U.S. studies, however, have found that women employed during pregnancy are more likely to experience adverse birth outcomes compared with women not employed during pregnancy (Mercer et al., 1996; Naeye & Peters, 1982). There is even less information on the differential impact of full-time vs. part-time employment on pregnancy outcomes. However, an analysis of participants of the Nurses' Health Study II found that part-time employment was associated with a lower risk of preterm birth, compared with full-time maternal employment (Lawson et al., 2009). While not the focus of the present paper, research suggests that specific employment and occupational characteristics are associated with low birth weight and preterm birth, such as high physical demands and long work hours (Bell, Zimmerman, & Diehr, 2008; Bonzini, Coggon, & Palmer, 2007; Peoples-Sheps et al., 1991; Teitelman, Welch, Hellenbrand, & Bracken, 1990).

While prior research on predictors of poor birth outcomes among employed women is extensive, much of it suffers a methodological challenge in identifying a causal relationship between prenatal employment and birth outcomes. This same challenge is present in the more limited extant literature comparing birth outcomes for employed women compared with those who are not employed, which generally relies on multivariable regression for this purpose. Researchers have noted the issue of selection bias and the consequent difficulty in obtaining unbiased estimates of the impacts of maternal choices and behaviors on health outcomes owing to differences in unmeasured characteristics associated with both the choice or behavior and the outcome of interest (Baker & Milligan, 2008). In other words, it is very difficult to disentangle a woman's employment choices from her birth outcomes given that both may be influenced by factors that are not easily measured or are unavailable in many data sets (for example, maternal or professional identity, financial or emotional stress, social support, and motivation).

Our analysis aims to contribute to the literature on the impact of workforce participation on birth outcomes and to address the methodological challenges of analyzing outcomes for groups of women with disparate characteristics. This study re-examines the relationship between prenatal employment and birth outcomes by isolating the potential causal impact of full-time, part-time or no employment during pregnancy, independent of other factors, on preterm birth and low birth weight. We minimize the role of selection bias by using propensity score matching methods.

Methods

Data and study population

Data came from the *Listening to Mothers* series of nationally-representative surveys, which collect information from women about their experiences during the perinatal period and report on many items that are not otherwise gathered at the national level. The data source for this analysis is the *Listening to Mothers II Survey,* a survey of English-speaking women, ages 18-45, who gave birth to a single baby in a U.S. hospital in 2005 (N = 1,573). The survey, commissioned by Childbirth Connection and implemented by Harris Interactive, was conducted via telephone and online using validated sampling methods (Taylor, Brenner, Overmeyer, Siegel, & Terhanian, 2001; Terhanian, Bremer, Smith, & Thomas, 2000). The

Listening to Mothers survey respondents were weighted using both demographic variables and a composite variable representing a women's propensity to be online in order to create a nationally representative sample. Detailed information on survey methodology has been previously reported(E. R. Declercq, Sakala, Corry, & Applebaum, 2006), and full reports from all surveys in the *Listening to Mothers* series, questionnaires, and related material are available online (www.childbirthconnection.org/listeningtomothers/). The survey contains detailed data on socio-demographic variables and childbirth as well as information on employment, which allowed us to examine the influence of prenatal employment on birth outcomes in groups of women matched on their propensity to work for an external employer, either full time or part time. Data from the *Listening to Mothers* surveys have previously been used in public health and maternal health services research (E. Declercq, Cunningham, Johnson, & Sakala, 2008; E. Declercq, Labbok, Sakala, & O'Hara, 2009; E. R. Declercq, Sakala, Corry, Applebaum, & Risher, 2006; Tatano Beck, Gable, Sakala, & Declercq, 2011; Young & Declercq, 2010), but have never before been used to study the dynamics of employment in a maternity context.

Measures

Outcomes of interest are low birth weight and preterm birth. We constructed both a dichotomous indicator for low birth weight (less than 2500 g at birth) and a continuous measure of the baby's birth weight in grams calculated from women's survey responses of their infant's birth weight in pounds and ounces. We constructed a gestational age variable based on the difference between a respondent's reported due date and the date of their baby's birth. We coded any baby born at less than 37 completed weeks of gestation as preterm. The exposure of interest was employment status during pregnancy. Survey respondents were asked: "Were you employed when you were pregnant?" We coded responses as those who reported full-time employment (30 hours a week or more on average, $n = 632$), part-time employment (less than 30 hours a week on average, $n = 250$), or not being employed ($n = 616$) during pregnancy. We excluded women who reported being self-employed ($n = 75$), due to small sample size not allowing for separate analysis of this group.

Analysis

The goal of the analysis was to create an explicit causal contrast for which we constructed exchangeable groups of exposed and unexposed women, based on employment status (Maldonado & Greenland, 2002). We created two primary comparisons: 1) women who were employed full-time during pregnancy (exposed) compared with women who were not employed during pregnancy (unexposed); and 2) women who were employed full-time during pregnancy (exposed) compared with women who were employed part-time during pregnancy (unexposed). As a secondary analysis, we compared women who were employed part-time during pregnancy (exposed) compared with women who were not employed during pregnancy (unexposed). For each, we estimated the probability of exposure (propensity score) using logistic regression. After testing a range of specifications, our final models matched exposed women (with replacement) to unexposed women on estimated propensity scores within a 0.025 caliper. We conducted sensitivity analyses around the propensity score model specification, caliper size (range 0.01-0.05), and matching methodology (with and without replacement) (D'Agostino, 1998; Oakes & Johnson, 2006; Rubin, 1997). We also tested various weighting strategies, alone and in combination with matching in order to assess the optimal strategy for achieving covariate balance (Hirano & Imbens, 2001). We included covariates in the propensity score estimation model that we expected to differ by exposure level and which preceded the exposure of interest (employment status). We assessed quality of the propensity score matching process by comparing the balance of measured covariates before and after matching. Our final model for calculating the propensity score included the following covariates: age, education, race, region, marital status, unintended pregnancy, mistimed pregnancy, fertility treatment, prior cesarean delivery, interaction between race and parity, interaction between parity and region, and interaction between age and marital status.

Using matched groups for analysis, we assessed the relationship between employment status during pregnancy and the odds of having a low birth weight baby or preterm birth using logistic regression. We used ordinary least squares (OLS) linear regression to examine the effects of employment status on the continuous variables of gestational age and birth weight. In both the logistic and linear models, we used clustered standard errors to account for correlation within matched pairs (Austin, 2008; Oakes & Johnson, 2006), and all reported *P*-values are two-sided. The regression models were specified using the following covariates: age, age squared, race-ethnicity, and income category. Although race-ethnicity and age were also included in the propensity score matching model, we included them after matching because they are known to be strong predictors of the study outcomes (Bell et al., 2008; P. J. Johnson, Oakes, & Anderton, 2008). In addition, 110 respondents did not provide information on their family income. We used hot deck imputation methods (using age, race-ethnicity, region and marital status) to assign values for income among those for whom this information was not reported (Andridge & Little, 2010; Mander & Clayton, 1999; Reilly, 1993). Income category and insurance status were not included in the matching model because they were endogenous to the outcome (i.e., a result of employment, rather than a predictor of employment), and insurance status was not included in the final model because of collinearity with income (i.e. Medicaid eligibility is income-based for pregnant women).

Results

In the overall sample before matching ($N = 1{,}498$), 632 women reported full-time employment during pregnancy, 250 reported part-time employment, and 616 reported no employment (Table 1). There were 84 (5.6 percent) low birth weight babies and 118 (7.9 percent) preterm births. Average birth weight was 3395 grams (7 pounds, 8 ounces), and average gestational age at birth was 38.7 weeks. About 20 percent of women in the sample were age 20–24, 34.4 percent were age 25–29, and 28.5 percent were 30–34. The sample was nearly 70 percent white, 12.5 percent African American, 13.5 percent Hispanic/Latino, and about 6 percent other or multiple races. Nearly 80 percent had at least some education beyond high school, and education varied considerably by employment status ($p<0.001$). Three-quarters of women were married. About 15 percent had a previous cesarean delivery. Slightly more than one-half reported a household income of less than $50,000 in 2005. The vast majority (97.9 percent) reported some insurance coverage for maternity care, with 39.5 percent reporting public coverage (i.e. Medicaid), and 59.4 percent reporting private coverage.

Prior to matching, there were significant differences in many characteristics between women who were employed or were not employed during pregnancy (Appendix 1 presents full information on comparisons between groups, before and after matching). Comparing women employed full-time with women who were not employed, the largest differences were in education, age, parity, and previous cesarean delivery. As expected, women who were employed full-time had higher levels of education; for example, 24.8 percent of full-time employees had a bachelor’s degree compared with 16.7 percent of women who were not employed ($p < 0.001$).

Full-time employees were generally older than those who were not working. Specifically, only 15.2 percent of employed women were age 20–24 compared with 22.9 percent of women who were not employed ($p < 0.001$). Full-time employees had an average of 1.8

children compared with 2.4 for women who were not employed ($p < 0.001$), and 12.8 percent of employed women had a previous delivery by cesarean section compared with 19.8 percent of those who were not employed ($p < 0.001$). The characteristics of women employed part-time during pregnancy were comparable to those for women who were not employed in terms of education, age, and parity.

After matching on the propensity score, these differences were eliminated, achieving covariate balance for these critical factors across employment status groups. Figure 2 presents the distribution of propensity scores before and after matching for our two primary comparisons: women who were not employed during pregnancy compared with those who were employed full-time, and women employed part-time compared with women employed full-time. It indicates the extent of the differences prior to matching and the success of the propensity score matching strategy in achieving balance between the groups on measured covariates. Prior to matching, differences were also apparent between full-time and part-time employees. In the matched groups for these contrasts, the differences were likewise reduced or eliminated.

In multivariable logistic regression analyses, using matched groups, we found no significant differences in low birth weight or preterm birth on the basis of employment status, but known risk markers (such as race) remained highly predictive of adverse outcomes. We also found no significant, independent effect of employment status on continuous measures of birth weight or gestational age at birth using OLS regression. Table 2 presents the findings from our analysis of birth outcomes, comparing full-time employment during pregnancy to no employment during pregnancy. Although full-time employment was not associated with preterm birth or low birth weight (adjusted odds ratio (AOR) for low birth weight = 0.73, $p = 0.41$; AOR for preterm birth = 1.37, $p = 0.47$), black race was an independent predictor of adverse birth outcomes. Black women had a more than fourfold increase in the odds of having a low birth weight baby compared with white women (AOR = 5.07, $p = .002$). Black women gave birth to infants who weighed an average of 329 grams less than infants born to white women ($p < .001$), and they gave birth about 4 days earlier than their white counterparts (coefficient −0.61, p =0 .02). Results were broadly similar when comparing full-time and part-time employees (Table 3). Full-time employment was not independently associated with adverse birth outcomes compared to part-time employment, and the only significant predictor was black race. Results for part-time employment compared with no employment during pregnancy indicate similar results and are available upon request.

Conclusion and Discussion

Our analysis finds that full-time employment status (compared with not being employed or with part-time employment) does not independently lead to adverse birth outcomes after accounting for selection into employment patterns. Whether a woman is employed full-time does not significantly affect her birth outcomes. Prior to propensity score matching, women's characteristics differed markedly based on employments status, indicating that different types of women make different employment choices during pregnancy, either of necessity or preference or some combination thereof. These characteristics, especially those that are known risk markers for preterm birth and low birth weight, should be the focus of intervention efforts. Although employment is itself not causally linked with adverse birth outcomes, workplace policy ought to be a target of policy efforts, as many known risk markers occur with greater frequency among employed women. Our findings should catalyze policy efforts to improve preconception and prenatal health (Behrman & Butler, 2007), and to protect the health of pregnant women through workplace accommodations and other relevant policies.

Implications for Policy and Practice

The Pregnant Workers Fairness Act (H.R. 5647) currently under consideration by Congress highlights the ongoing debate and continuing need for statutory policies to support the health and well-being of women employed during pregnancy. Current federal laws that may apply to women requesting pregnancy-related workplace accommodations include the Family Medical Leave Act (FMLA) and the Americans with Disabilities Act (ADA), if the woman works for a covered employer, per Chapter 29 C.F.R. § 825.113(b). Under the FMLA, eligible employees have a right to medical leave during a period of incapacity owing to pregnancy or for prenatal care, which could include leave related to the need for bed rest or medically prescribed ultrasounds. The ADA requires employers to provide reasonable accommodations to disabled employees (including employees with medical complications arising from pregnancies). To the extent that medical complications arising from pregnancies substantially limit a major life activity, a woman has a right to seek reasonable workplace accommodations from a covered employer. While employment leave under both regulations is unpaid leave, leave could be paid if an employer's policies provide benefits such as sick leave, personal time off, or temporary disability insurance. Adopting new laws or more rigorously applying existing policies that protect a pregnant woman's rights to reasonable accommodations may have benefits beyond a healthy pregnancy or improved birth outcomes. Employers often bear a portion of the financial burden for high-cost obstetric or neonatal care required by their employees via health insurance premiums (Chollet, Newman Jr, & Sumner, 1996). Low birth weight and preterm births account for 47 percent of all infant hospitalization costs and 27 percent of all pediatric hospitalization costs (Russell et al., 2007). For an employer who is self-insured or who pays any portion of health insurance premiums for their employees, taking steps to reduce the risk of these adverse outcomes could have both financial and health benefits.

There are considerable and troubling racial disparities in adverse birth outcomes (Behrman & Butler, 2007). Our results are consistent with prior research documenting higher rates of preterm birth and low birth weight among black women. In addition, our analysis shows that this race effect is independent of employment status. Continued policy and research efforts are warranted to explore and eliminate the causes of this disparity.

Strengths and Limitations

The *Listening to Mothers* surveys comprehensively explore the experience of childbirth and the quality of maternity care in the United States (E. R. Declercq, Sakala, Corry, Applebaum, et al., 2006). Although valuable for examining the relationship between employment and birth outcomes, secondary analysis of survey data entails limitations in measures and methods. First, our analyses relied on self-report measures of both exposure status (employment) and outcomes (preterm birth and low birth weight). Self-reports are prone to reporting bias, and the dataset does not contain diagnostic codes or clinical assessments of medical conditions. It is noteworthy that the prevalence of low birth weight and preterm birth in this sample are lower than national averages reported on U.S. birth certificates (6.4% and 11.0%, respectively, for singleton births in 2005)(Martin et al., 2007). This may be due, in part, to self-reported outcomes, but could also be because the survey is limited to English-speaking women, ages 18 to 45, who had singleton live births and chose to participate in the survey. Second, some important covariates were not measured in this survey, and respondents chose not to provide information on others. The survey did not ask about occupation or job characteristics, which limited our ability to examine these important facets of employment as independent predictors of adverse birth outcomes. As with many surveys, some respondents chose not to provide income data. However, we retained cases by imputing values using validated hot-deck imputation methods and sensitivity analyses to ensure the stability of results (Reilly, 1993). Third, although based on a national survey, our sample was somewhat small, thus we only had the ability to detect an approximately 30% or greater difference in birth outcomes between employment status groups. We would have preferred stratified analysis by racial and ethnic groups (instead of controlling for race-ethnicity). However, subgroup sample size precluded us from doing so.

We employed propensity score matching methods specifically to address the issue of selection bias, a noted limitation of previous observational studies. However, these methods are not a panacea for limitations of observational data. While it is a useful tool for achieving covariate balance across exposure groups, propensity score matching only ensures balance on observed covariates between exposed and unexposed women. Unobserved characteristics may still differ after matching. Additionally, while propensity score matching methods can be useful for examining rare events (Braitman & Rosenbaum, 2002), propensity score estimation is most efficient with large samples and when making use of a rich set of covariates(D'Agostino, 1998; Rubin, 1997; Stuart & Rubin, 2008).

In spite of limitations, this study makes several important contributions. Our primary contributions are the use of explicit comparisons across different employment categories (full-time, part-time, and no employment) and our control for selection bias through propensity score matching. This national dataset allowed for inclusion of a range of relevant covariates in its propensity score estimation models. The detection of other important, known associations of statistical significance (i.e. association between black race and study outcomes) lends credence to the strength of the methodology and sufficiency of sample size.

Conclusion

Future efforts to address the persistent problems of low birth weight and preterm births should focus on the characteristics of women (including characteristics related to their jobs) that put them at risk of adverse birth outcomes. Prospective cohort studies with larger sample sizes may provide opportunities to validate these findings, and to further explore alternative mechanisms by which employed women may experience greater risk of adverse birth outcomes. One important focus of future research is the etiology of preterm birth, including the role of policy and other social determinants (Behrman & Butler, 2007). Another important area for future investigation concerns iatrogenic prematurity and the potential interplay between employment and increases in early elective delivery. Researchers may consider the utility of propensity score matching methods for reducing potential selection bias and ensuring comparability across groups that are exposed to different employment situations or associated policies. Such research may inform employer, insurer, and clinical policies as well as programmatic efforts to improve the health and well-being of employed mothers and their infants and to reduce persistent racial and ethnic disparities in birth outcomes.

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Appendix 1

Sample characteristics for each employment comparison group, before and after matching

	Full time employment vs. no eployment						Full time employment vs. part time employment						Part time employm		
	Unmatched			Matched			Unmatched			Matched			Unmatched		
	Full time	No work	P-value	Full time	No work	P-value	Full time	Part Time	P-value	Full Time	Part Time	P-value	Part Time	No work	P-value
Education															
No H.S. diploma	0.01	0.06	0.000	0.01	0.02	0.488	0.01	0.03	0.113	0.01	0.02	0.464	0.03	0.06	0.036
H.S. diploma	0.12	0.21	0.000	0.12	0.13	0.608	0.12	0.17	0.052	0.12	0.13	0.551	0.17	0.21	0.137
Some college	0.32	0.38	0.035	0.32	0.33	0.904	0.32	0.42	0.005	0.32	0.33	0.718	0.42	0.38	0.236
Associate's degree	0.13	0.10	0.072	0.13	0.10	0.094	0.13	0.09	0.083	0.13	0.11	0.291	0.09	0.10	0.669
Bachelor's degree	0.25	0.17	0.000	0.25	0.25	0.896	0.25	0.19	0.055	0.25	0.23	0.32	0.19	0.17	0.464
Some grad school	0.06	0.03	0.012	0.06	0.06	0.808	0.06	0.03	0.107	0.06	0.05	0.806	0.03	0.03	0.828
Graduate degree	0.11	0.05	0.000	0.11	0.12	0.723	0.11	0.08	0.108	0.11	0.13	0.265	0.08	0.05	0.208
Race															
White	0.67	0.69	0.437	0.67	0.67	0.857	0.67	0.71	0.204	0.67	0.69	0.466	0.71	0.69	0.493
Black	0.14	0.11	0.124	0.13	0.16	0.202	0.14	0.12	0.551	0.14	0.10	0.057	0.12	0.11	0.569
Hispanic	0.13	0.14	0.554	0.13	0.13	0.933	0.13	0.12	0.77	0.13	0.12	0.932	0.12	0.14	0.466
Other/multi-race	0.06	0.06	0.808	0.06	0.04	0.129	0.06	0.04	0.205	0.06	0.08	0.222	0.04	0.06	0.273
Age															
18-19	0.00	0.03	0.000	0.00	0.00	0.317	0.00	0.04	0.000	0.00	0.01	0.413	0.04	0.03	0.889
20-24	0.15	0.23	0.001	0.15	0.19	0.114	0.15	0.27	0.000	0.15	0.16	0.587	0.27	0.23	0.223
25-29	0.38	0.31	0.011	0.38	0.36	0.448	0.38	0.34	0.290	0.38	0.41	0.273	0.34	0.31	0.392
30-34	0.31	0.27	0.205	0.30	0.27	0.170	0.31	0.26	0.134	0.31	0.26	0.091	0.26	0.27	0.582
35+	0.16	0.15	0.784	0.16	0.18	0.228	0.16	0.10	0.025	0.16	0.16	0.938	0.10	0.15	0.042
Region															
Northeast	0.17	0.15	0.204	0.17	0.17	0.940	0.17	0.14	0.304	0.17	0.19	0.273	0.14	0.15	0.937
Midwest	0.27	0.25	0.569	0.27	0.27	1.000	0.27	0.31	0.226	0.27	0.25	0.367	0.31	0.25	0.1
South	0.37	0.37	0.957	0.37	0.38	0.683	0.37	0.31	0.113	0.37	0.33	0.173	0.31	0.37	0.105
West	0.19	0.23	0.091	0.19	0.18	0.665	0.19	0.24	0.139	0.19	0.23	0.127	0.24	0.23	0.863
Married	0.75	0.76	0.734	0.76	0.75	0.743	0.75	0.72	0.235	0.76	0.73	0.218	0.72	0.76	0.149
Foreign born	0.05	0.07	0.132	0.05	0.03	0.015	0.05	0.06	0.897	0.05	0.03	0.052	0.06	0.07	0.327
Parity	1.79	2.39	0.000	1.79	1.79	0.976	1.79	1.96	0.017	1.79	1.71	0.131	1.96	2.39	0
Unintended	0.39	0.43	0.158	0.38	0.42	0.167	0.39	0.46	0.044	0.38	0.35	0.218	0.46	0.43	0.352
Mistimed	0.31	0.34	0.299	0.31	0.34	0.185	0.31	0.37	0.07	0.31	0.25	0.027	0.37	0.34	0.314
Previous cesarean	0.13	0.20	0.001	0.13	0.12	0.799	0.13	0.16	0.216	0.13	0.14	0.619	0.16	0.20	0.194
Fertility treatment	0.06	0.03	0.033	0.05	0.04	0.172	0.06	0.02	0.046	0.06	0.06	0.718	0.02	0.03	0.586

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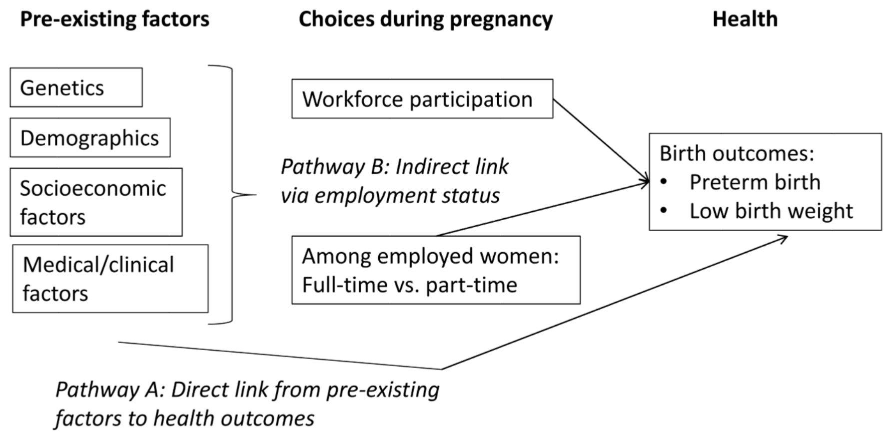

Figure 1.

Conceptual model of the relationship between pre-existing factors, workforce participation during pregnancy, and birth outcomes

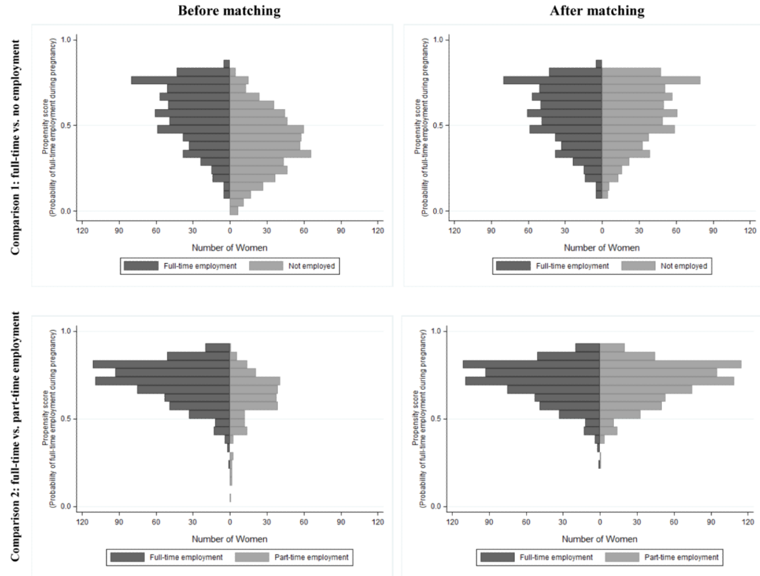

Figure 2.

Distribution of propensity scores before (left) and after (right) matching for two primary comparisons: 1) comparing women who were employed full time during pregnancy and those not employed during pregnancy before matching (top), and 2) comparing women who were employed full time and those employed part time (bottom).

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Table 1

Maternal Characteristics by Pregnancy Employment Status Among U.S. Women Who Gave Birth to a Singleton Baby in 2005, Before Matching (N = 1,498)

	Not employed		Part-time work		Full-time work		Total		
	N	% or mean (SD)	N	% or mean (SD)	N	% or mean (SD)	N	% or mean (SD)	*P*
Age									
18-19	21	3.4	9	3.6	3	0.5	33	2.2	
20-24	141	22.9	67	26.8	96	15.2	304	20.3	
25-29	191	31.0	85	34.0	239	37.8	515	34.4	
30-34	169	27.4	64	25.6	194	30.7	427	28.5	
Over 35	94	15.3	25	10.0	100	15.8	219	14.6	<0.001
Race/ethnicity									
White	424	68.8	178	71.2	422	66.8	1024	68.4	
Black/African American	68	11.0	31	12.4	88	13.9	187	12.5	
Hispanic	88	14.3	31	12.4	83	13.1	202	13.5	
Other/Multiple race	36	5.8	10	4.0	39	6.2	85	5.7	0.578
Education Attainment									
No high school degree	39	6.3	7	2.8	8	1.3	54	3.6	
High school degree/GED	131	21.3	42	16.8	75	11.9	248	16.6	
Some college, no degree	232	37.7	105	42.0	202	32.0	539	36.0	
Associate's degree	60	9.7	22	8.8	82	13.0	164	11.0	
College (e.g. B.A., B.S.)	103	16.7	47	18.8	157	24.8	307	20.5	
Some grad school	18	2.9	8	3.2	37	5.9	63	4.2	
Graduate degree	33	5.4	19	7.6	71	11.2	123	8.2	<0.001
Married	470	76.3	179	71.6	477	75.5	1126	75.2	0.340
Income									
Less than $50,000	409	66.4	154	61.6	293	46.4	856	57.1	
$50,000 to 99,999	180	29.2	80	32.0	276	43.7	536	35.8	
100,000 or more	27	4.4	16	6.4	63	10.0	106	7.1	<0.001
Census Region									

	Not employed		Part-time work		Full-time work		Total		
	N	**% or mean (SD)**	**N**	**% or mean (SD)**	**N**	**% or mean (SD)**	**N**	**% or mean (SD)**	***P***
Northeast	90	14.6	36	14.4	109	17.3	235	15.7	
Midwest	156	25.3	77	30.8	169	26.7	402	26.8	
South	228	37.0	78	31.2	233	36.9	537	35.9	
West	142	23.1	59	23.6	121	19.2	322	21.5	0.208
Previous cesarean delivery	122	19.8	40	16.0	81	12.8	243	16.2	0.004
Reported insurance type									
Public coverage	301	48.9	122	48.8	154	24.4	577	38.5	
Private coverage	301	48.9	124	49.6	465	73.6	890	59.4	
No reported coverage	14	2.3	4	1.6	13	2.1	31	2.1	<0.001
Number of children (parity)	616	2.4 (1.27)	250	2.0 (1.02)	632	1.8 (.98)	1498	2.1 (1.15)	<0.001

Note: Reported p-values are from χ^2 tests for categorical variables, F-tests for continuous variables.

Table 2

Multivariate Logistic and Linear Regression Results for Low Birth Weight and Preterm Birth in a Propensity Score Matched Group of Women Who Gave Birth in 2005 and Were Employed Full Time During Pregnancy, Compared With Women Who Were Not Employed During Pregnancy

	Low birth weight		Birth weight in grams		Preterm birth		Gestational age (weeks)	
	OR	**95% CI**	**Coeff.**	**95% CI**	**OR**	**95% CI**	**Coeff.**	**95% CI**
Full time work during pregnancy (Ref=no work)	0.73	0.35, 1.54	−14.56	−127.26, 98.14	1.37	0.58, 3.25	−0.16	−0.48, 0.16
Age	1.29	0.78, 2.13	−13.24	−92.91, 66.43	1.45	0.80, 2.62	−0.42 ***	−0.67, −0.17
Age squared	1.00	0.99, 1.00	0.18	−1.13, 1.49	0.99	0.98, 1.00	0.01 ***	0.00, 0.01
Black/African American (Ref=white)	5.07 ***	1.85, 13.90	−328.80 ***	−510.38, −147.23	1.32	0.60, 2.93	−0.61 **	−1.11, −0.10
Hispanic (Ref=white)	0.60	0.18, 1.96	−74.82	−224.91, 75.27	2.17	0.65, 7.25	−0.45	−1.04, 0.14
Other/Multiple race (Ref=white)	0.75	0.16, 3.65	16.51	−175.84, 208.87	0.80	0.21, 3.05	−0.05	−0.55, 0.45
Income less than $50,000 (Ref= $100k or more)	2.13	0.52, 8.67	114.79	−85.12, 314.71	1.19	0.48, 2.95	−0.01	0.56, 0.54
Income $50,000 to 99,999 (Ref= $100k or more)	2.46	0.54, 11.25	82.61	−119.68, 284.90	0.93	0.33, 2.59	0.15	−0.34, 0.64

Note:

Models use clustered standard errors to account for correlation within matched pairs.

*** p<0.01,

** p<0.05,

* p<0.1

Table 3

Multivariate Logistic and Linear Regression Results for Low Birth Weight and Preterm Birth in a Propensity Score Matched Group of Women Who Gave Birth in 2005 and Were Employed Full Time During Pregnancy, Compared With Women Who Were Employed Part Time During Pregnancy

	Low birth weight		Birth weight in grams		Preterm birth		Gestational age (weeks)	
	OR	95% CI	Coeff.	95% CI	OR	95% CI	Coeff.	95% CI
Full time work during pregnancy (Ref=part time work)	0.58	0.22, 1.54	79.93	−65.80, 225.66	0.79	0.34, 1.87	0.20	−0.39, 0.79
Age	2.10	0.75, 5.87	−35.98	−157.73, 85.78	1.89	0.78, 4.59	−0.36 *	−0.76. 0.03
Age squared	0.99	0.97, 1.00	0.70	−1.37, 2.76	0.99	0.97, 1.00	0.01 *	0.00, 0.01
Black/African American (Ref=white)	3 49 ***	1.44, 8.45	−204.24 **	−393.78, −14.70	2.10 *	0.96, 4.62	-0.56	−1.32, 0.20
Hispanic (Ref=white)	0.77	0.18, 3.33	11.93	−154.09, 177.94	0.69	0.20, 2.45	−0.07	−0.68, 0.54
Other/Multiple race (Ref=white)	0.43	0.08, 2.30	164.12	−102.00, 430.24	0.47	0.12, 1.77	0.12	−0.61, 0.85
Income less than $50,000 (Ref= $100k or more)	2.39	0.56, 10.14	100.70	−63.85, 256.26	0.45	0.09, 2.16	0.26	−0.73, 1.25
Income $50,000 to 99,999 (Ref= $100k or more)	3.18	0.70, 14.46	81.80	−95.97, 259.57	0.45	0.09, 2.31	0.11	−0.91, 1.13

Note:

Models use clustered standard errors to account for correlation within matched pairs.

*** p<0.01,

** p<0.05,

* p<0.1