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It Takes Two?: Exploring The Supportive Role Of Fathers During Pregnancy And Its Effect On Birth Outcomes Among Young Couples

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Abstract

Few studies have evaluated the relationship between prenatal paternal support and adverse birth outcomes among young couples. Traditionally, paternal support has been measured based on pregnancy wantedness and the presence of the father's name on the child's birth certificate. However, these indices may not capture key components of paternal support. The current study developed a paternal support index that expands the traditional view of parental support by incorporating other forms of support, including financial support, accompanying the mother to prenatal care visits, labor/birth classes, ultrasound appointments, and the father's presence at the child's birth. We examined its association with various birth outcomes controlling for known risk factors of adverse birth outcomes. We hypothesized that increased prenatal paternal support would reduce the risk of low birth weight birth, preterm birth, small for gestational age birth, and labor and delivery complications. The current study utilizes interview data collected from a longitudinal study on 296 young couples living in lower Connecticut. Multiple linear regression analysis was conducted to explore the relationship between the paternal support index and the outcome index, and separate logistic regression models were applied to understand the relationship between the paternal support index and preterm and low birth weight birth. Findings suggest that increased paternal support during pregnancy is significantly associated with higher risk of low birth weight birth, and more adverse birth outcomes. The risk of preterm birth was also associated with more prenatal paternal support, but was not significant. Results from the current study are not consistent with the existing literature on this topic. Further research should be conducted to better understand the mechanism through which paternal support during pregnancy works to impact birth outcomes, and how this mechanism might be different for young couples.

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Introduction

In the U.S., infant mortality is highest among non-Hispanic black infants, at 12.67 deaths per 1000 live births, more than twice that of non-Hispanic white infants (5.52) [1]. Despite efforts that have effectively reduced overall infant mortality, racial disparities remain [2]. Racial disparities are apparent across other adverse birth outcomes as well. Non-Hispanic black infants are more likely to be born low birth weight (13.33%) compared to only 7.09% of non-Hispanic white infants [1]. Similarly, 16.75% of non-Hispanic black infants are born preterm compared to 10.49% of non-Hispanic white infants [1]. Rates of low birth weight and preterm birth have declined slightly in past years, but remain substantially high compared to past decades [1].

Some studies have linked the lack of access to care, lower quality of care, and lower socioeconomic status to racial disparities in birth outcomes [2]. However, the role of the father during pregnancy has not been explored as a potential factor to explain the disparity. Some evidence suggests exploring this link is warranted. For example, it has demonstrated that increased paternal involvement during pregnancy may contribute to better birth outcomes by lowering the risk of low birth weight, preterm birth, and fetal growth restriction [2-6]. Although the mechanisms through which paternal prenatal involvement affects birth outcomes have not been clearly defined, researchers have proposed that the father's involvement during pregnancy can lead to improved maternal behaviors and reduced maternal stress by providing both emotional and financial support [5, 7, 8]. These findings suggest that facilitating the father's involvement during pregnancy may contribute to a reduction of adverse pregnancy outcomes.

Traditionally, fathers have not had a clear role in pregnancy and childbirth. Little research has been conducted regarding the role of expectant fathers during pregnancy [9]. The lack of attention on involving fathers during pregnancy is further perpetuated by the dearth of maternal and child programs designed to encourage fathers to help their partners sustain healthy pregnancies, and missing opportunities to engage with fathers during prenatal care visits [9, 10]. Thus, the community, at large, does not provide a setting that is conducive to fathers providing maximum support for their pregnant partners.

Pregnancies among young couples are unique because young couples may experience different barriers and have different social networks during pregnancy compared to older couples. For example, the need for paternal support may be buffered by the support that young mothers receive from their parents and family members [3]. Furthermore, paternal involvement during pregnancy may be impeded by a young father's lack of ability to provide financially [3]. Limited research has evaluated the relationship between paternal support during pregnancy and birth outcomes among young couples. The few studies that have explored this relationship determined paternal involvement based on the absence of the father's name on the birth certificate [11] or the mother reporting that her partner felt that it was the right time to have a baby [12]. However, these proxies do not include other essential supportive behaviors, such as financial support and prenatal care attendance.

In response, the current study develops a more comprehensive paternal support index that includes financial support, attending prenatal care visits, ultrasound appointments, and labor and birth classes, pregnancy wantedness, father's name on the birth certificate, and father's presence at birth, in order to evaluate its association with adverse birth outcomes adjusting for known risk factors of adverse birth outcomes. The objective of the current study is to evaluate whether greater paternal support during pregnancy is associated with fewer adverse birth outcomes, and reduced risk of preterm delivery and low birth weight.

Materials and Methods

Procedures

Data for this study were derived from a longitudinal study consisting of interviews conducted with 296 young couples expecting a baby. Study participants were recruited between July 2007 and February 2011. Young women receiving prenatal care from obstetrics and gynecology clinics and ultrasonography clinics in four university-affiliated hospitals located in urban areas of lower Connecticut were referred by their health care provider or were directly approached by study staff. Women who were interested in the study were screened, and if eligible, referred their partner who was subsequently recruited into the study by study staff. Research staff explained the study in detail to participants, and answered any questions. If the couple was interested, an appointment for a baseline interview was scheduled.

Participant inclusion criteria for couples included: (1) women aged 14-21 years and men aged 14 and above at time of interview; (2) women pregnant at greater than 23 weeks gestation; (3) both members of couples report being in a romantic relationship with each other; (4) both report being the biological parents of the child; (5) both agree to participate in the study; and (6) both are able to speak English or Spanish. An initial run-in period was also used to deem participants ineligible if they could not be re-contacted after screening and before the mother's estimated due date. Research staff screened 944 potential couples for study eligibility. Of these couples, 413 couples were deemed eligible, and 296 couples ultimately enrolled in the study (72.2% participation rate).

Data were collected at three time points: 24 or more weeks gestation (baseline/T1), 6 months postpartum (T2), and 12 months postpartum (T3). Data for financial support, number of prenatal care visits, number of labor birth classes, number of ultrasound appointments, and pregnancy wantedness were collected from baseline interviews. Data on the father's name on the child's birth certificate and father present at child's birth were collected at T2, but if participants missed their T2 assessment, the same questions were asked again at T3.

Participation in the study was both voluntary and confidential. At the baseline appointment, written informed consent from participants was obtained by a research staff member. Couples individually completed interviews using audio computer-assisted self-

interviews (ACASI). Each person was compensated $25 for participating in the study. The study was approved by the Yale University Human Investigation Committee and by the institutional review boards at study clinics.

Paternal support index

In prior studies on the effect of paternal support during pregnancy on birth outcomes among young couples, pregnancy wantedness and the father's name on the child's birth certificate were used as a proxy for paternal support. In the current study, we developed a support index which includes measures that are more reflective of actual supportive transactions. This index consisted of 7 items that included pregnancy wantedness and the father's name on the child's birth certificate as well as whether or not the father accompanied the mother to prenatal care visits, ultrasound appointments, and labor/child birth classes, whether or not the father was present at the child's birth, and whether or not the mother received financial support from the father. At baseline interviews, fathers were asked to report the number of prenatal care visits, ultrasound appointments, and labor/child birth classes they attended with their pregnant partner. If participants reported attending at least one of these three visit types, they were given a 1 for that visit type. To assess pregnancy wantedness, fathers were asked how much they wanted their partner to get pregnant in the current pregnancy, and responded on a scale of 0 ("Definitely No") to 4 ("Definitely Yes"). If the father responded 3 or 4, then pregnancy wantedness was coded yes (1). For father's name on the child's birth certificate and father present at birth, data were collected from the following sources, ranked in decreasing priority: (1) mothers' data at T2, (2) fathers' data at T2, (3) mothers' data at T3, and (4) fathers' data at T3. Baseline interviews also collected data regarding whether or not the father provided financial support. Each variable was coded yes/no, and the 7 items were summed to create a support index that ranged from 0 to 7. A higher support index total reflects greater paternal support.

Outcomes of interest

Low birth weight and preterm were both dichotomous variables (yes/no). The outcome index was the sum of four dichotomous birth outcomes (yes/no): (1) preterm (born before 37 weeks gestational age), (2) low birth weight (less than 2500 g), (3) small for gestational age (weight below 10^{th} percentile for the gestational age), and (4) labor and delivery complications. The checklist for labor and delivery complications included: (a) breathing problems, (b) cord around neck, (c) color, (d) jaundice, and (e) other complication. If the father reported at least one of these complications, the labor and delivery complications variable was coded yes.

Covariates

Eight covariates were adjusted for in the regression analysis: the mother's age, race (black, latino, white and other), body mass index (BMI), personal income per year, cigarette smoking since pregnancy (yes/no), alcohol use since pregnancy (yes/no), perceived stress, and social support. These covariates were chosen based on previous research that has identified potential linkages to birth outcomes.

Maternal stress level was assessed using the 10-item Perceived Stress Scale (PSS) [13]. Participants were asked to rate their perceived stress level in the past month using a 5-point likert scale ranging from 0 (“never”) to 4 (“very often”). Perceived stress total could range from 0-40, where higher scores indicated more perceived stress. In the current study, the 10-item PSS produced a cronbach’s alpha of 0.79 among mothers, and 0.73 among fathers, demonstrating adequate reliability.

The social support total score was determined by 9 items adapted from the 20-item Medical Study Social Support (MOSS) scale developed by Sherbourne and Steward [14]. The scale aims to assess the availability of emotional, informational, and tangible support, and positive social interaction and affection. Participants were asked to report the level of social support using a 5-point likert scale, ranging from 1 (“none of the time”) to 5 (“all of the time”). The social support total score ranged from 0-45, where higher scores demonstrated more social support. The current study found a high cronbach’s alpha of 0.95 among participating mothers, and 0.95 among fathers, reflecting excellent reliability.

Data Analysis

Results of descriptive analyses and means are provided in Table 1. A multiple linear regression analysis was conducted to explore the relationship between the paternal support index and the outcome index. Bivariate and multivariate regression parameters are presented in Table 4. Logistic regression models were used to investigate the associations for preterm birth and low birthweight birth independently. Unadjusted and adjusted odds ratios (ORs) and their 95% confidence intervals (CIs) are provided in Table 4.

Results

In the study sample, the majority of mothers were African American (39.5%) and Latino (39.5%), while 20.9% were White or Other racial/ethnic group. Fathers were primarily African American (48.7%) and Latino (36.5%), and only 14.9% of fathers were White or of another race/ethnicity. Average age of mothers was 18.71 years old (SD= 1.63), whereas the average age of fathers was 21.33 years old (SD= 4.06). Fathers (mean= 10869.5, SD= 11857.6) reported a higher personal income compared to mothers (mean= 5835.03, SD= 7447.71). The distribution of BMI scores among fathers (mean= 25.08, SD= 5.48) was similar to that of mothers (mean = 25.87, SD= 6.74).

When examining substance use, we found that among mothers, alcohol use during pregnancy was low (4.7%); however, smoking cigarettes during pregnancy was more common (16.2%). In contrast, almost half of the fathers reported having smoked (46.1%) or drank alcohol (53.6%) during their partner’s pregnancy. In terms of stress level, the mean perceived stress scale score was 16.73 (SD= 6.24) among mothers and 15.45 (SD= 6.31) among fathers, reflecting a low-moderate level of perceived stress. Out of a maximum score of 45, the average social support score was 28.20 (SD=7.56) among mothers, and 24.67 (SD= 9.38) among fathers. The

child in the study was the first pregnancy for the majority of mothers (79.0%), and most fathers (75.7%). Descriptive characteristics of the study sample are presented in Table 1.

Table 1. Sample characteristics, lifestyle habits, perceived stress, and social support of young expecting couples (N=296)[a]

	Mothers	**Fathers**
Characteristic	**N (%)[b]**	**N (%)[b]**
Age (years)	18.71 ± 1.63	21.33 ± 4.06
Race/ethnicity		
Black	117 (39.5)	144 (48.7)
Latino	117 (39.5)	108 (36.5)
White/Other	62 (20.9)	44 (14.9)
Personal income per year	5835.03 ± 7447.71	10869.5 ± 11857.6
Body mass index (kg/m^2)	25.87 ± 6.74	25.08 ± 5.48
Cigarette smoking since pregnancy		
Yes	48 (16.2)	134 (46.1)
No	248 (83.8)	157 (54.0)
Alcohol use since pregnancy		
Yes	14 (4.7)	156 (53.6)
No	282 (95.3)	135 (46.4)
Total Perceived Stress Scale	16.73 ± 6.24	15.45 ± 6.31
Social support total score	28.20 ± 7.56	24.67 ± 9.38

[a] Table values are mean ± SD for continuous variables and n (column %) for categorical variables.
[b] Numbers may not sum to total due to missing data, and percentages may not sum to 100% due to rounding.

The distribution of the paternal support index, which ranges from 0 to 7, revealed that fathers in this sample were quite supportive of their partners during pregnancy. The mean support index score was 4.64 (SD= 1.28). A breakdown of the 7 measures of paternal support included in the index is provided in Table 2. The majority of fathers reported to have accompanied their partner to prenatal care visits (91.1%), ultrasound appointments (93.5%), and labor/child birth classes (70.0%). Interestingly, on average, fathers reported having attended more ultrasound appointments and labor/child birth classes than mothers, potentially suggesting difficulty in recall or social desirability. Most fathers were also present at the child's birth (86.4%), and have their name listed on the child's birth certificate (88.5%). A little more than half of fathers reported that he wanted his partner to get pregnant in the current pregnancy (53.1%), and 61.8% of mothers reported receiving financial support from their partner.

Table 2. Breakdown of paternal support index predictor

Characteristic	**N (%)[a, b]**
Paternal support index (0-7)	4.64 ± 1.28
# of prenatal care visits mother attended	8.49 ± 5.29
# of prenatal care visits father attended	5.83 ± 4.45
Prenatal care visits	
Yes	266 (91.1)
No	26 (8.9)

# of ultrasounds mother attended	2.77 ± 3.51
# of ultrasounds father attended	2.80 ± 2.54
Ultrasound appointments	
Yes	273 (93.5)
No	18 (6.5)
# of labor/birth classes mother attended	0.23 ± 1.27
# of labor/birth classes father attended	0.31 ± 1.49
Labor/Birth classes	
Yes	203 (70.0)
No	67 (23.1)
Pregnancy wantedness (0-4)	2.41 ± 1.30
Pregnancy wantedness	
Yes (3-4)	155 (53.1)
No (0-2)	137 (46.9)
Father's name on birth certificate	
Yes	238 (88.5)
No	31 (11.5)
Father present at birth	
Yes	234 (86.4)
No	37 (13.7)
Financial support	
Yes	183 (61.8)
No	113 (38.2)

[a] Table values are mean ± SD for continuous variables and n (column %) for categorical variables.
[b] Numbers may not sum to total due to missing data, and percentages may not sum to 100% due to rounding.

Despite research suggesting African American and Latino racial/ethnic groups having higher risk of adverse birth outcomes, preterm and low birth weight births were low in this sample. Only 8.9% of children born to the 296 couples were born preterm, and even fewer children were born low birth weight (5.8%). Based on the outcome index, the cumulative sum of low birth weight, preterm, small for gestational age, and labor and delivery complications, the majority of the sample experienced no complications at birth (70%).

Table 3. Description of outcomes of interest (preterm, LBW, outcome index)

Characteristic	**N (%)[a]**
Preterm	
Yes	25 (8.9)
No	256 (91.1)
LBW	
Yes	16 (5.8)
No	262 (94.2)
Outcome index (0-4)	
0	203 (70.0)
1	67 (23.1)
2	18 (6.2)
3	2 (0.7)

4	0 (0)

[a] Numbers may not sum to total due to missing data, and percentages may not sum to 100% due to rounding.

A multiple linear regression analysis was conducted to model the relationship between the paternal support index and the adverse birth outcome index. Contrary to the existing literature on this topic, increased paternal support was significantly associated with a greater number of adverse birth outcomes (B=0.073, SE= 0.029, t=2.48, p= 0.012). Even after adjusting for the mother's age, race/ethnicity, personal income, BMI, smoking and alcohol use during pregnancy, perceived stress level, and social support, the association between the paternal support index and the outcome index remained significant. No significant associations were found between the covariates adjusted for in the model and the birth outcome index (see Table 4).

In the adjusted model, the odds of the child being born preterm is multiplied by 1.30 (OR= 1.30; 95% CI: 0.90-1.91) for every unit increase in the paternal support index. However, this association was not significant. No significant associations existed between covariates adjusted for in the model and preterm birth (see Table 4).

A logistic regression model adjusting for the mother's age, race/ethnicity, personal income, BMI, smoking and alcohol use during pregnancy, perceived stress, and social support, revealed a significant association between the paternal support index and the risk of low birth weight birth. For every unit increase in the paternal support index, the odds that the child is born low birth weight doubled (OR= 2.07; 95% CI: 1.14-3.77).

Table 4. Results of multiple linear regression model predicting birth outcome index, and logistic regression models predicting preterm and low birth weight

Characteristic	Birth Outcome Index				Preterm		LBW	
	Bivariate		Multivariate		Unadjusted	Adjusted	Unadjusted	Adjusted
	B (SE)	p	B (SE)	p	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Paternal support index (0-7)	0.077 (0.029)	0.008*	0.073 (0.029)	0.012*	1.31 (0.90 – 1.90)	1.30 (0.89 – 1.91)	1.93 (1.12 – 3.36)*	2.07 (1.14 – 3.77)*
Age (years)	0.006 (0.023)	0.805	0.011 (0.024)	0.643	0.94 (0.73 – 1.21)	0.96 (0.74 – 1.24)	1.10 (0.80 – 1.52)	1.17 (0.83 – 1.64)
Race/ethnicity								
Black	Reference	--	Reference	---	1.00	1.00	1.00	1.00
Latino	0.188 (0.083)	0.025*	0.157 (0.086)	0.067	1.35 (0.57 – 3.23)	1.25 (0.50 – 3.10)	1.87 (0.61 – 5.78)	1.83 (0.54 – 6.17)
White/Other	0.018 (0.010)	0.861	0.016 (0.103)	0.875	0.36 (0.08 – 1.72)	0.34 (0.07 – 1.68)	0.75 (0.14 – 3.99)	0.66 (0.12 – 3.76)
Personal income per year	0.032 (0.050)	0.519	0.032 (0.051)	0.535	1.11 (0.67 – 1.82)	1.20 (0.71 – 2.01)	1.15 (0.64 – 2.08)	1.20 (0.64 – 2.24)
Body mass index (kg/m^2)	0.002 (0.006)	0.740	0.0006 (0.006)	0.910	1.03 (0.98 – 1.09)	1.03 (0.97 – 1.09)	0.93 (0.84 – 1.03)	0.93 (0.85 – 1.02)
Cigarette smoking since pregnancy								
Yes	-0.137 (0.102)	0.180	-0.071 (0.110)	0.517	0.70 (0.20 – 2.43)	1.15 (0.30 – 4.51)	0.75 (0.16 – 3.42)	1.21 (0.20 – 6.14)
No	Reference	--	Reference	---	1.00	1.00	1.00	1.00
Alcohol use since pregnancy								
Yes	-0.170 (0.174)	0.329	-0.192 (0.176)	0.276	0.85 (0.11 – 6.80)	0.89 (0.11 – 7.51)	N/R[a]	N/R[a]
No	Reference	--	Reference	---	1.00	1.00	1.00	1.00
Total Perceived Stress Scale	-0.0002 (0.006)	0.970	-0.0002(0.006)	0.977	1.01 (0.94 – 1.07)	1.00 (0.93 – 1.07)	1.01 (0.93 – 1.09)	1.01 (0.92 – 1.12)
Social support total score	-0.00007 (0.005)	0.989	-0.003 (0.005)	0.608	0.98 (0.93 – 1.04)	0.98 (0.92 – 1.04)	0.99 (0.92 – 1.06)	0.97 (0.90 – 1.04)

* significant

[a] not reportable (N/R) because small occurrence of alcohol use

Discussion

Contrary to past literature on the relationship between prenatal paternal support and pregnancy outcomes among young couples, the current study demonstrates that increased paternal support during pregnancy, in forms of financial support, attending prenatal care visits, ultrasounds appointments, and labor/birth classes, pregnancy wantedness, the father's name on the birth certificate, and the father's presence at birth, was significantly associated with more adverse birth outcomes and low birth weight birth. Similarly, greater levels of paternal support were associated with higher risk of preterm birth, although this association was not statistically significant. While the findings from this study are inconsistent with prior literature on paternal support and adverse birth outcomes, it may reflect the complexity of the pathway between support and birth outcomes, particularly because there may be inherent differences between young couples and older couples.

Although these findings may be counterintuitive at first glance, one potential explanation that might account for these results is that problem pregnancies tend to rally more support. The recommended number of prenatal care visits among mothers is typically 10-15 visits [15], but more prenatal care visits are recommended for regular surveillance if the pregnancy is identified as high risk. In the current sample, 17% of mothers reported to have attended more than 15 visits, suggesting these pregnancies might be at high risk of adverse birth outcomes. It is possible that if a couple expects pregnancy complications, the father may be more motivated to support his partner throughout her pregnancy to prevent such complications. Despite increased efforts from the father to protect his partner and unborn child from any complications, these efforts may not be enough to protect against genetic and environmental factors that put these families at risk for adverse birth outcomes.

In addition, paternal support may only be effective to the extent to which the couple is knowledgeable of how to facilitate a healthy pregnancy. The current study uses a sample of young parents, and for the majority of participants in the study, this was their first pregnancy (mothers: 79.0%; fathers: 75.7%). As such, these young parents may be equally unaware of how to support a healthy pregnancy, and risk factors during pregnancy. Thus, although the father might have the best intention to be supportive of his pregnant partner, the effect of his support may be very limited due to this overall lack of knowledge about pregnancy.

An alternative explanation for these results is that the father's lifestyle habits could potentially contribute to adverse birth outcomes. The average paternal support index score was 4.64 (SD= 1.28), indicating that most fathers were generally supportive of their partners. High support index scores could also suggest that fathers are spending a lot of time with their pregnant partner. However, almost 50% of fathers reported to have smoked during pregnancy. A systematic review and meta-analysis from 2010 reported that mothers who were exposed to higher levels of environmental tobacco exposure (ETS) were more at risk for low birth weight

births (RR= 1.16, 95% CI: 0.99-1.36), although the association between ETS and preterm delivery was not significant (RR= 1.07, 95% CI: 0.93-1.22) [16]. Thus, spending more time with the father may increase second hand smoke exposure to the pregnant mother, posing a potential adverse impact on the health of the developing fetus.

Limitations of the current study include the relatively small sample size of 296 couples. Despite the study sample being a group at high-risk for adverse birth outcomes, the occurrence of adverse pregnancy outcomes was low in the sample. As such, the results from this study may not be reflective of the true relationship between prenatal paternal support and pregnancy outcomes. It is also possible that the regression model did not fully adjust for all of the covariates that need to be considered to understand the relationship between prenatal paternal support and pregnancy outcomes, thus causing residual confounding. For instance, the current study does not adjust for the mother's pregnancy history, such as previous preterm deliveries. Mercer reports that mothers with previous preterm deliveries have 2.5 times the risk of delivering a preterm baby in their next pregnancy [17]. Another potential limitation is the misclassification of paternal support. The paternal support index was calculated such that fathers who report having attended at least one prenatal care visit, ultrasound appointment, and labor/child birth class are classified as 'yes' for each measure respectively. However, the range of appointments or classes attended is large, ranging from 0-20 for ultrasound appointments, and 0-15 for labor/child birth classes. Forcing dichotomous categorization of these items may be giving too much credit to fathers who have attended only a few appointments. As such, the threshold of being considered "supportive" is low. Lastly, the data are subject to recall bias as participants are asked about events that occurred in the past. This could be a result of difficulty in recalling how many appointments were attended, or social desirability, through which fathers tend to over report the number of classes and prenatal appointments they attended because they want to be viewed as a supportive partner and parent.

A negative association between prenatal paternal support and adverse birth outcomes does not necessarily suggest that paternal support is harmful for the mother and child. Instead, this could indicate that problem pregnancies tend to rally more support, but paternal support, by itself, may not be a strong enough buffer to protect against the adverse birth outcomes that these families are at high risk for. The findings from this study call for follow-up research that can better illuminate on the mechanism through which increased paternal support may work to support or, in this case, not support better birth outcomes. Further research should also help to identify which aspects of prenatal paternal support, including support measures not included in the current study, can be the most effective in sustaining healthy pregnancies. In turn, this research can better inform interventions that aim to protect the health of mothers and infants, and can help to tailor these interventions for young couples.

References

1. Hamilton, B.E., et al., *Annual summary of vital statistics: 2010-2011.* Pediatrics, 2013. **131**(3): p. 548-58.
2. Alio, A.P., et al., *Assessing the impact of paternal involvement on racial/ethnic disparities in infant mortality rates.* J Community Health, 2011. **36**(1): p. 63-8.
3. Alio, A.P., et al., *Feto-infant health and survival: does paternal involvement matter?* Matern Child Health J, 2010. **14**(6): p. 931-7.
4. Alio, A.P., et al., *The impact of paternal involvement on feto-infant morbidity among Whites, Blacks and Hispanics.* Matern Child Health J, 2010. **14**(5): p. 735-41.
5. Ghosh, J.K., et al., *Paternal support and preterm birth, and the moderation of effects of chronic stress: a study in Los Angeles county mothers.* Arch Womens Ment Health, 2010. **13**(4): p. 327-38.
6. Ngui, E., A. Cortright, and K. Blair, *An investigation of paternity status and other factors associated with racial and ethnic disparities in birth outcomes in Milwaukee, Wisconsin.* Matern Child Health J, 2009. **13**(4): p. 467-78.
7. Martin, L.T., et al., *The effects of father involvement during pregnancy on receipt of prenatal care and maternal smoking.* Matern Child Health J, 2007. **11**(6): p. 595-602.
8. Padilla, Y.C. and N.E. Reichman, *Low birthweight: Do unwed fathers help?* Children and Youth Services Review, 2001. **23**(4): p. 427-452.
9. Bond, M.J., *The missing link in MCH: paternal involvement in pregnancy outcomes.* Am J Mens Health, 2010. **4**(4): p. 285-6.
10. Alio, A.P., et al., *Addressing policy barriers to paternal involvement during pregnancy.* Maternal and child health journal, 2011. **15**(4): p. 425-430.
11. Alio, A.P., et al., *Teenage pregnancy and the influence of paternal involvement on fetal outcomes.* J Pediatr Adolesc Gynecol, 2011. **24**(6): p. 404-9.
12. Shah, M.K., R.E. Gee, and K.P. Theall, *Partner support and impact on birth outcomes among teen pregnancies in the United States.* J Pediatr Adolesc Gynecol, 2014. **27**(1): p. 14-9.
13. Cohen, S., T. Kamarck, and R. Mermelstein, *A global measure of perceived stress.* Journal of health and social behavior, 1983: p. 385-396.
14. Sherbourne, C.D. and A.L. Stewart, *The MOS social support survey.* Social science & medicine, 1991. **32**(6): p. 705-714.
15. U.S. Department of Health and Human Services, O.o.W.s.H. *Prenatal Care Fact Sheet*. 2012 April 10, 2015]; Available from: https://www.womenshealth.gov/publications/our-publications/fact-sheet/prenatal-care.html#f.
16. Salmasi, G., et al., *Environmental tobacco smoke exposure and perinatal outcomes: a systematic review and meta-analyses.* Acta obstetricia et gynecologica Scandinavica, 2010. **89**(4): p. 423-441.
17. Mercer, B.M., et al., *The preterm prediction study: effect of gestational age and cause of preterm birth on subsequent obstetric outcome.* American journal of obstetrics and gynecology, 1999. **181**(5): p. 1216-1221.