The couple context of unintended pregnancy: the effect of parental disagreement on birth outcomes in the United States 2006-2010

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ABSTRACT

Intention to become pregnant associates strongly with prenatal behaviors and consequently health outcomes of the fetus, child, and mother. The role of couple agreement is largely ignored in the literature on pregnancy intentions, with marital status often serving as a proxy for couple context. However, marital status may be an outdated indicator of partnership agreement. Union formation and fertility are drastically changing in the American family, with more couples childbearing out of wedlock. This paper utilizes detailed couple pregnancy intentions from the 2006-2010 National Survey of Family Growth to evaluate consequences of differential parental pregnancy intent on the birth outcomes of pregnancy loss and low birth weight. Further, the relevance of marital status is assessed within this relationship. Preliminary results suggest that couple pregnancy intentions associate significantly with the probability of pregnancy loss, with the lack of maternal intent increasing the risk of pregnancy loss in cases of parental discordance and when neither parent intends. This association is stronger for married couples and null for unmarried couples. Stratification by marital status may still be relevant in understanding the couple context of pregnancy intentions. The effect of couple disagreement may be heterogeneous among unmarried couples as partnership stability may moderate the effect of couple intentions.

INTRODUCTION

A key aim of family demography is understanding the mechanisms and decision-making that lead to both pregnancy and birth. The collection of pregnancy intentions has been essential towards meeting this aim and elucidating higher patterns in fertility. Initiated in 1973, the National Survey of Family Growth (NSFG) was designed to be the national fertility survey in the United States and has tracked fertility intentions over time. Pregnancy intentions can be dichotomized into "unintended" or "intended" pregnancies, with unintended pregnancies being either mistimed (occurring outside of a desired time period) or unwanted (when pregnancy is not desired for any future time period). Between 2006-2010 in the United States, about 37% of births were unintended, approximately 27% mistimed and 10% unwanted (Mosher, Jones et al. 2012). Pregnancy intentions help academics and policymakers estimate the unmet need for contraceptives, evaluation of reproductive health programs, and the consequences of pregnancy intentions on the health of both mothers and children (Westoff and Ryder 1977, Brown and Eisenberg 1995, Westoff 2001, Santelli, Rochat et al. 2003, Santelli, Lindberg et al. 2009).

The cost of unintended pregnancy is high. Births resulting from unintended pregnancies, compared to intended pregnancies, experience elevated risks of adverse social, economic, and health outcomes for both the mother and child. Unintended births are associated with late maternal entry into prenatal care, maternal smoking during pregnancy, absence of breastfeeding, maternal stress, pregnancy loss, preterm birth, low birth weight, poor social and cognitive development during childhood, lesser quality mother-child relationships, and negative psychosocial development into adulthood (Cartwright 1988, Brown and Eisenberg 1995, Chandra 1995, Barber, Axinn et al. 1999, Orr, Miller et al. 2000, Taylor and Cabral 2002, Messer, Dole et al. 2005, David 2006, Mohllajee, Curtis et al. 2007, Gipson, Koenig et al. 2008,

David 2011, Shah, Balkhair et al. 2011, Mosher, Jones et al. 2012).

Traditionally only maternal pregnancy intentions are collected. However, pregnancy intentions should be conceptualized at the couple level. Recent evidence suggests the important role of partner intentions and partnership dynamics. Partner intentions may differ in quantum of intended fertility and independently affect achieved family size (Morgan 1985, Thomson, McDonald et al. 1990, Williams 1994, Iacovou and Tavares 2011). Intuitively one can imagine a scenario where the father does not intend a maternally intended pregnancy, however some pregnancies are intended by fathers rather than mothers (Morgan 1985, Thomson, McDonald et al. 1990, Williams 1994, Korenman, Kaestner et al. 2002). Couple dynamics may alter each partner's reported fertility intentions over time. Iacovou et al. demonstrated that both men and women adjust their fertility intentions over time towards convergence with their partner (Iacovou and Tavares 2011). Looking at a woman's different couplings over time, Zabin et al. further demonstrated that pregnancy intentions were highly relevant to the specific couple context rather than an individual's abstract lifetime, fertility preferences (Zabin, Huggins et al. 2000).

The risk of unintended pregnancy is higher for unmarried, less educated, non-Hispanic black, and younger women (Mosher, Jones et al. 2012). In 2006-2010, 77% of pregnancies to married women were intended compared to only 49% for cohabiting couples and 33% for single women. 83% of pregnancies were intended for women with a college degree or higher, compared to only 59% of pregnancies to women with less than a high school diploma. The age disparity is quite stark, with only 22% of pregnancies occurring to teenage mothers being intended. Conceptualization of couple rather than solely maternal intentions may aid in understanding such stark heterogeneity in the risk of unintended pregnancy across sub-groups. Indeed this sub-group heterogeneity holds in the likelihood of couple agreement (Williams 1994), suggesting a

stabilizing effect of partner concordance for maternal pregnancy intent. Further, couple intentions may explain the puzzling, persistently high levels of unintended pregnancy in the United States despite access to contraceptives and family planning services.

Even with this clear need for couple data, relatively few studies have explored the role of partner pregnancy intentions beyond the level of agreement or achieved fertility. In other words, a large body of research suggests the importance of couple intentions in terms of fertility preference or completed family size but neglect exploring partner effects on birth outcomes, pregnancy behavior, or child outcomes (Montgomery 1996, Korenman, Kaestner et al. 2002). Other studies merely control for marital or cohabitation status as a proxy for information on the couple context (Hohmann-Marriott 2009). This study utilizes rich couple pregnancy intentions in the 2006-2010 NSFG, which collects maternal and paternal pregnancy intention per pregnancy. I then investigate the effect of parental disagreement on birth outcomes shown to associate with maternal pregnancy intention; low birth weight and pregnancy loss.

BACKGROUND

Consequences of unintended pregnancy

Unintended pregnancy results in poor health for the mother and child. In the United States, research examining the consequences of unintended birth has focused primarily on birth outcomes (low birth weight, preterm birth, or pregnancy loss) and maternal behaviors (entry into prenatal care, smoking during pregnancy, breastfeeding, etc.). Aggregate data from the 1988 National Survey of Family Growth and the 1988 National Maternal and Infant Health Survey showed that the proportion of infants receiving well-baby care and the proportion ever breastfed are highest among intended pregnancies. Furthermore, unwanted pregnancies increased the odds of poor infant health, determined by an infant's weight and gestational age, by 30% (before

controlling for maternal prenatal behavior) and decreased the odds of breastfeeding by 40% (after controlling for maternal prenatal behavior) (Kost, Landry et al. 1998).

The mechanisms through which unintended pregnancy may lead to adverse birth outcomes include maternal psychosocial wellbeing and prenatal behaviors. Women reporting unintended pregnancies show increased odds of perceived stress and depressive symptoms during pregnancy (Messer, Dole et al. 2005). In comparison to women with intended pregnancies, women with unintended pregnancies are more likely to smoke or drink alcohol during pregnancy, less likely to use daily vitamins, and less likely to alter prenatal behaviors in accordance with medical advice, such as the decreased use of caffeinated beverages or increased use of vitamins (Hellerstedt, Pirie et al. 1998, Gipson, Koenig et al. 2008). Women with unintended pregnancies also entered prenatal care later or not at all (Orr, Miller et al. 2000, Gipson, Koenig et al. 2008, Shah, Balkhair et al. 2011) and were less likely to breastfeed (Taylor and Cabral 2002) compared to women with intended pregnancies. Once born, children resulting from unintended pregnancy may receive a reduced share of family resources, attributing to poor longer-term developmental outcomes (David 1992, Korenman, Kaestner et al. 2002).

Acting through the aforementioned mechanisms, pregnancy intention affects the prenatal environment and consequently birth outcomes. A recent meta-analysis of maternal pregnancy intention and birth outcomes found a significant increase in the odds of low birth weight among unintended pregnancies [OR: 1.36] compared to intended pregnancies ending in live birth (Shah, Balkhair et al. 2011). The authors also found a significant increase in the odds of preterm birth among unintended pregnancy [OR: 1.31] compared to intended pregnancies ending in live birth. While Shah et al. did not examine the risk of pregnancy loss, an independent meta-analysis found an increased risk of spontaneous abortion among unintended pregnancies (Gipson, Koenig

et al. 2008). Furthermore, the extensive literature of the increased risk of preterm birth for unintended pregnancies is examined only in instances of live birth (Gipson, Koenig et al. 2008, Shah, Balkhair et al. 2011). The prenatal factors leading to preterm birth can be extended to consider the risk of un-induced pregnancy loss. Therefore the primary outcomes of pregnancy loss and low birth weight in this paper capture dynamics of the prenatal environment inclusive of all unintended pregnancies, not only those reaching live birth. Again, the couple context of intentions is rarely included in this literature and not at all in the large meta-analyses describing the consequences of maternal pregnancy intention.

Consequences of partner disagreement in unintended births

Research unilaterally has shown that pregnancies intended by both partners lead to infants with the least health disadvantage relative to unintended pregnancies, defined as mistimed or unwanted pregnancies (Kost, Landry et al. 1998, Gipson, Koenig et al. 2008). Infants whose conception was intended by their mother but not their father are at elevated risk of adverse health events (Korenman, Kaestner et al. 2002). Schoen et al. showed that including spousal intentions greatly improved the predictive power in modeling the probability of live birth, with higher spousal intentions increasing the probability of birth and lower spousal intentions decreasing the probability of birth (Schoen, Astone et al. 1999). Clifford et al. demonstrated that the level of spousal agreement on the value of children is significantly related to live births (Clifford, Lake et al. 1987). When fathers wanted the pregnancy, even if mothers did not, mothers were more likely to receive early prenatal care (Martin, McNamara et al. 2007). The risk of inadequate prenatal care and preterm birth increases when partners do not share intentions (Hohmann-Marriott 2009).

Determinants of couple agreement

In terms of maternal intention in the US 2006-2010, unmarried, non-Hispanic black, less-educated, and poor women remained at higher risk of unintended pregnancies and births compared to married, white, college-educated, and higher-income women (Mosher, Jones et al. 2012). Similar heterogeneity exists among groups in terms of couple agreement. Using data from 1988 National Survey of Growth, Williams found that never-married, black, teenage, or uneducated (never completed high-school) women were the least likely to report a pregnancy jointly desired by both partners (Williams 1994).

The mechanisms driving couple agreement are usually framed in terms of interpersonal power, bargaining power, and relative influence of the partner during couple decision-making (Beckman 1984, Williams 1994). For example, education may increase a woman's bargaining power in the relationship. A higher-educated woman may be more able to jointly time a pregnancy with a specific partner or prevent an unwanted pregnancy, thus allowing only intended pregnancies. Net of education, formal marital status may act through these mechanisms, given that marital unions are traditionally considered more stable than non-marital, cohabiting unions (Williams 1994). Stability of relationships and power differentials may act through age, race, education, and marital status. Worse health outcomes for the mother and child may be expected for each sub-group.

Research aims and hypotheses

Partner intentions could influence birth outcomes in several ways. For instance, if the father intended the pregnancy while the mother did not, then the father could encourage or enforce positive prenatal behaviors, such as ensuring vitamin intake or cessation of smoking. In cases where the mother also intends, then paternal intention could enhance existing maternal behaviors. In either case, paternal intention could encourage positive maternal behaviors and thus

birth outcomes. Indeed, previous literature has shown that paternal involvement during pregnancy is associated with entry into prenatal care (Schaffer and Lia-Hoagberg 1997, Martin, McNamara et al. 2007). Alternatively, lack of paternal intent could exacerbate poor maternal behaviors or impose a harmful influence on maternal behavior, thus influencing the severity of adverse birth outcomes.

Paternal intentions may effect of maternal intentions or act independently on birth outcomes. To assess the role of paternal pregnancy intentions, it becomes important to investigate the consequences of parental discordance in pregnancy intention. Therefore, the first aim of this study is (A) to estimate the effect of parental disagreement in pregnancy intention on birth outcomes. If divergent intentions reduce the likelihood of live birth, then the second aim is (B) to determine whether gender matters in terms of pregnancy intent.

To address these aims, the effect of couple agreement on birth outcomes can be framed in terms of two hypotheses: (1) the dose-response hypothesis; (2) the maternal predominance hypothesis (Korenman, Kaestner et al. 2002). The dose-response hypothesis postulates that birth outcomes manifest themselves along a dose-response scale in accordance with parental intentions. The best outcomes come from two-parent intent, followed by one-parent intent, and finally the worst outcomes result from two-parent non-intent. Evidence of this relationship would address the first research aim of this study. The maternal predominance hypothesis states that in cases of parental disagreement on fertility intention (one-parent intent), the outcome is better if the parental intent is maternal due to the more direct role a mother plays on the prenatal environment. This hypothesis could reflect increasing autonomy of the mother, presumably in accordance with education, income, or other indicators of female empowerment. As the dose-dependent hypothesis predicts no gendered difference of intent on birth outcomes, the maternal

predominance hypothesis predicts that maternal intention will yield a better outcome then paternal intention. Therefore, testing the maternal predominance hypothesis addresses the second research aim of this study.

These analyses are next stratified by marital status. Previous research has included marital status as a proxy for the couple context of pregnancy intention, assuming that marital status denotes a strong, stable partnership in comparison to unmarried persons. However, the union formation is drastically changing in the United States (Cherlin 2004, Cherlin 2005). With this de-institutionalization of the American marriage, one may expect older relationships between marriage and pregnancy intention to disappear. This paper uses recent data to examine differences by marital status to assess whether marital status matters with the added information of couple intentions.

DATA

This paper uses data from the 2006-2010 National Survey of Family Growth (NSFG), a nationally representative sample of women, aged 15-44 years, living in US households. The NSFG uses a multistage, area probability sample from 110 primary sampling areas across the country. Interviews are conducted in person by female interviewers, typically last 80 minutes, with a 78% response rate.

Outcome variable

Two dichotomous outcomes will be investigated in this study: (1) pregnancy loss (2) low birth weight. Parental prenatal behaviors influence both outcomes, with detrimental prenatal behaviors increasing the likelihood of adverse birth outcomes. The outcome of pregnancy loss was dichotomized into a pregnancy resulting in a live birth or a pregnancy loss, which included miscarriage, stillbirth, or ectopic pregnancy. Current pregnancies or voluntary abortions were

excluded. The outcome of low birth weight recorded for only pregnancies resulting in a live birth was dichotomized into low birth weight (<2500 g) or not low birth weight (≥2500 g) babies. For the analysis of low birth weight, current pregnancies or pregnancies which did not result in a live birth were excluded.

Primary predictor: maternal and paternal intentions

The standard measure of unintended pregnancy is based on several questions, which sort pregnancies into three categories: intended, mistimed, or unwanted. Intended pregnancies occur about the time the mother/father wanted to become pregnant. Mistimed pregnancies are either "moderately" or "seriously" mistimed from when the mother/father wanted to become pregnant. Unwanted pregnancies are pregnancies unwanted by the mother/father regardless of timing. Mistimed and unwanted pregnancies are categorized as "unintended" to create a dichotomous intended vs. unintended variable for each reported pregnancy.

This grouping of "unintended" is the conventional form used in the literature (Santelli, Lindberg et al. 2009, Mosher, Jones et al. 2012), and thus is used here for comparison to previous research. Other studies have investigated differences between mistimed and unwanted, the composite measures for unintended pregnancies. The distinction between intended, mistimed, and wanted is particularly interesting in terms of contraceptive use. Among women with unintended births in the US 1998-2002, about 40% were using contraceptives and 60% were not (Mosher, Jones et al. 2012). Mistimed pregnancies may be more susceptible to "failure" of specific contraceptive methods, suggesting less motivation to prevent pregnancy, than unwanted pregnancies, for which stronger steps to avoid or terminate the pregnancy may be taken. This paper, however, concerns intentions in terms of the mechanisms (prenatal behaviors) leading towards poor birth outcomes.

The mother provides perceived paternal intentions, which have been shown to correlate with actual paternal intentions accurately (Morgan 1985). Therefore, a dichotomous variable of intent is determined per pregnancy for both the mother and father in the data. A four-level interaction variable was created to capture partner agreement. Each pregnancy is ultimately classified as: (a) both intend; (b) mother-only intends; (c) father-only intends; (d) neither intend.

Control variables

Due to significant sub-group heterogeneity in the level and consequences of intention, selectivity for poor birth outcomes may be an issue. Therefore various maternal demographic and behavioral variables are used for controls: religion; martial status; highest completed education, race, current insurance coverage, current employment status, and place of birth, dichotomized as within or outside of the United States. The paternal variable of father's age at time of live birth is included as an additional control when modeling the likelihood of low birth weight. As father's age was only collected in cases where the pregnancy resulted in a live birth, this variable is missing for all instances of pregnancy loss and is excluded when modeling the likelihood of live birth.

The maternal variables of smoking (pre- and post- knowledge of the pregnancy) and cohabitation status with her partner are included only in the descriptive analyses of Tables 1-3 due to high levels of missing observations. Similarly, current paternal employment is only included in descriptive analyses due to large degree of missing observations. The distribution of these excluded variables in the whole sample of pregnancies, by couple intentions, and by marital status can be seen in the descriptive tables.

METHODS

All analyses were performed with the software program STATA 12.1. Descriptive

analyses for all eligible pregnancies and stratified by couple intentions or marital statuses are summarized in Tables 1-3. Stratification by marital status was performed as marital status has traditionally been an indicator of couple stability and relationship strength. The proportion of unintended pregnancy, by the mother or both partners, is generally higher among unmarried women (Williams 1994, Finer and Henshaw 2006, Hohmann-Marriott 2009, Finer and Kost 2011). Unmarried women may face a greater risk of relationship instability and relationship strain (Carlson, McLanahan et al. 2004). Unmarried women also tend to be of lower education and socioeconomic status, which could lead to poor maternal behaviors or access to resources.

Unadjusted measures of association between each outcome or predictor variable and intentions (Table 2) or marital status (Table 3) were performed using the Pearson's chi-square test of significance for categorical variables and a two-sample t-test or one-way ANOVA for numerical variables (maternal and paternal age).

Logit regression models, adjusted for heteroskedasticity and clustering within mothers, are estimated at both the bivariate and full model level. The full model controls for the maternal variables: religion, age, education, race, current insurance, current employment status, and place of birth. Paternal age is included as an additional control for when modeling the likelihood of low birth weight. Listwise deletion was used to handle missing data.

Parental characteristics play a complex and ultimately immeasurable role in the course of a pregnancy to the birth event. For this reason, fixed-effects models were estimated of multiple pregnancies per mother at both the bivariate and full model level. The sample sizes for fixed-effects models are lower than the logit regressions due to the necessity of having at least two pregnancies per mother in the dataset. Of the 20,492 pregnancies recorded in the dataset, 12,954 (63%) of the pregnancies were of parity 2 or higher. Maternal characteristics are largely

accounted with the fixed-effects method as each mother serves as her own control. Paternal characteristics are also accounted for to an extent, as mothers often partner with the same father for repeated pregnancies. Time-varying variables include: intentions, maternal age, and paternal age. Observations with missing data were excluded from analysis using listwise deletion.

Hypothesis testing was performed for each regression. The test of the irrelevance of paternal intention was performed as a joint hypothesis of whether the effect of mother-only intent equaled the effect of both intend and the effect of father-only intent equaled the effect of neither intend. In other words, this joint hypothesis tested whether there is a benefit if the father did intend while the mother did not and there is no harm if the father didn't intend while the mother did. The test of gender differences in the case of discordance tested whether the effect of mother only intended equaled the effect of father only intended.

For the regression analyses, I will first discuss the logit regression results, in the bivariate model and full model. I will then discuss the fixed-effects results, again moving from the bivariate model to the full model. Tests of dose-dependent or maternal predominance hypotheses are discussed for each regression.

RESULTS

Descriptive results

The minority of pregnancies resulted in adverse birth outcomes (Table 1). Of 14,292 live births for which information on birth weight was available, only 9.22% were low birth weight babies. Of the 17,681 pregnancies for which information on live birth or pregnancy loss was available, 80.83% resulted in a live birth.

Table 2 shows descriptive characteristics of each pregnancy stratified by couple intent. As expected, the proportion of pregnancies resulting in low birth weight was lowest when both

parents intended the pregnancy. For the outcome of live birth, the proportion of pregnancies resulting in a live birth was highest for maternal-only intent. The proportion of pregnancies resulting in pregnancy loss was statistically significant between the four levels of parental intention. The maternal control variables of cohabitation, age, place of birth, marital status, education, race, current insurance, employment, religion, and smoking also varied significantly across the four levels of parental intention. The two paternal variables of age and employment varied significantly between levels of intention.

Table 3 shows descriptive characteristics of each pregnancy stratified by marital status. For both outcomes, pregnancies occurring to unmarried women show a higher proportion of adverse outcome events. The proportion of pregnancies resulting in pregnancy loss was statistically significant by marital status. The maternal control variables of cohabitation, age, place of birth, marital status, education, race, current insurance, religion, and smoking also varied significantly across the four levels of parental intention. The two paternal variables of age and employment varied significantly between levels of intention.

Regression analyses of parental pregnancy intention on birth outcome

Live Birth

In bivariate logit regression modeling the probability of live birth, those pregnancies intended by neither were significantly more likely to result in a pregnancy loss compared to pregnancies intended by both parents (Table 4). When including controls in the full model, those pregnancies intended by only the father became significantly more likely to result in a pregnancy loss compared to pregnancies intended by both parents. The coefficient of neither intended remained relatively constant and significant. Evidence for the dose-dependent hypothesis is supported here, albeit with weak magnitude, as the coefficients are significant and more strongly

negative going from father-only intent (ß=-0.19) to neither intend (ß=-0.21). Father-only intent is statistically different from mother-only intend, with a reversal in sign of the coefficient. The maternal predominance hypothesis is strongly supported here, suggesting that in cases of disagreement the lack of maternal intent is more relevant.

In bivariate fixed-effects analyses modeling the probability of live birth, there is strong evidence for the dose-dependent hypothesis. The coefficients are significant and more strongly negative going from father-only intent to neither intend. Similar to the evidence from logit analyses, there is evidence for the maternal predominance hypothesis, as the effect of father-only intent differs significantly from the effect of mother-only intent with a reversal of sign in favor of mother-only intent. As father-only intent significantly affects the likelihood of live birth while mother-only intent does not, it again appears that the important influence is the lack of maternal intent. These relationships hold in the full model, though the coefficients increase in magnitude.

Low Birth Weight

In bivariate logit regression modeling the probability of low birth, those pregnancies intended by only the mother were weakly significantly more likely to result in a low birth weight baby compared to pregnancies intended by both parents (Table 4). No other significant relationships were found in the bivariate or full model logit or fixed-effects regressions.

Regression analyses of parental pregnancy intention on birth outcome, by marital status

Live Birth

Regressions modeling the probability of live birth among pregnancies to married women resemble relationships seen in the full sample. In bivariate logit regression modeling the probability of live birth among married women, those pregnancies intended by neither parent were significantly more likely to result in a pregnancy loss compared to pregnancies intended by

both parents (Table 5). This effect increased slightly in magnitude and remained significant in the full logit regression model. Evidence for the dose-dependent hypothesis is partially supported here, insofar as the effect of neither-intend is the strongest, negative effect. Father-only intent is again statistically different from mother-only intent with a reversal in sign of the coefficient, thus partially supporting the maternal predominance hypothesis. However, neither the father-only or mother-only effect is significant at the bivariate or full model level. In bivariate fixed-effects regression modeling the probability of live birth among married women, those pregnancies intended by the father-only or neither parent are significantly more likely to result in a pregnancy loss compared to pregnancies intended by both parents. The coefficients become more strongly negative going from mother-only intent, to father-only intent, to neither-intent supporting both the dose-dependent hypothesis and the maternal predominance hypothesis. This relationship holds in the full model.

Regressions modeling the probability of live birth among pregnancies to unmarried women differ from the relationships seen in the full sample or among the sub-sample of married women. In logit regressions modeling the probability of live birth among unmarried women, no statistically significant effects of intention are found (Table 5). Fixed-effects modeling of the probability of live birth among unmarried women resembles the relationships found among married women. However, the effect of father-only intent is also statistically different from the effect of mother intent at both the bivariate and full model level. Thus the dose-dependent hypothesis and the maternal predominance hypothesis are reinforced using the fixed-effects methodology compared to the aforementioned logit regressions.

Low Birth Weight

No other significant relationships were found in the bivariate or full model logit or fixed-

effects regressions.

DISCUSSION

Earlier literature investigating the couple context of pregnancy merely includes information on the mother's marital status, cohabitation status, or level of social support (Hohmann-Marriott 2009). Few studies analyze the joint effect of maternal and paternal intention on birth outcomes. This report utilized rich couple pregnancy intention data to study the effect of couple context of pregnancy intent on the birth outcomes of live birth and birth weight. Previous work, on maternal pregnancy intention or the few studies looking at couple pregnancy intention, predominantly examines pregnancies resulting in live birth only. This paper extends previous work by considering all pregnancies, not limited to pregnancies resulting in live birth. Here, couple intentions correlate strongly with the outcome of pregnancy loss. A dose-response and maternal predominance relationship is supported for this outcome. Strong negative effects due to father-only intent and neither-parent intent were observed, increasing in magnitude moving from father-only to neither-parent. Therefore, the lack of maternal intent seems more relevant than the presence of maternal intent. Interestingly, these associations seem strongest in the married sample. This finding corroborates existing literature that consequences of partner discordance are differential by martial status (Hohmann-Marriott 2009), however previous work found results significant only for unmarried couples (Korenman, Kaestner et al. 2002). Pregnancies occurring to unmarried women are unilaterally worse off in this analysis, suggesting partner intent may play a reduced role in a less stable, formal couple context. Considering changing social norms regarding marriage in American society, the null effects found for unmarried couples may differ if measures of relationship strength are included, such as cohabitation status or duration of cohabitation. The 2006-2010 NSFG provides this information, and future analyses will

investigation unmarried couples more closely. This paper suggests that stratifying the sample by union status still may be relevant in the study of couple intentions.

The current study is limited methodologically for two reasons. First, paternal intention per pregnancy is collected from the mother's perception in this dataset. Mother's report correlates highly with actual father's intention in previous literature, however I cannot validate this measure here. The 2006-2010 NSFG did have a male sample in which fertility desires and intentions for future children were collected. While these intentions were not linked per pregnancy as in the female sample, robustness checks can be performed to assess the level of agreement in long-term fertility preferences and intentions between men and women. If certain subgroups prove to vary more in couple agreement, as has been shown in previous literature, then stratification by subgroup of the analyses shown in this report may be appropriate. The second methodological limitation is the collection of intention at one time point per individual. Previous research investigated the stability of pregnancy intention in women sampled during pregnancy and immediately following live birth (Joyce, Kaestner et al. 2000). Approximately 30% of the sample switched pregnancy intentions from unintended to intended after delivery. The NSFG relies on respondent recall for previous pregnancies and could be a source of bias in this data, effectively underestimating the extent of non-intent during pregnancy. Furthermore, Joyce et al. showed that instability of pregnancy intention associated with a higher degree of couple disagreement and the maternal characteristics of being unmarried and low SES. However, the study also demonstrated that adverse maternal prenatal behaviors associated with non-intent at either time-point. Therefore, our measure of intent, while limited, still captures the risk of poor prenatal characteristics.

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Table 1. Characteristics of a cohort of U.S. pregnancies based on the 2006-2010 NSFG

	Eligible Pregnancies (n=20492)	
	No.	%
Outcomes		
Low Birth Weight	1318	9.22
Pregnancy Loss	3,389	19.17
Child Characteristics		
Male	7,233	50.58
Maternal Characteristics		
Living with Partner		
Throughout pregnancy	7,236	50.53
At the beginning of pregnancy but not at the end	747	5.22
At the end of pregnancy but not at the beginning	912	6.37
Not at all throughout pregnancy	5,426	37.89
Age, years		
11-14	142	0.71
15-19	3832	19.18
20-24	6839	34.24
25-29	4863	24.35
30-34	3045	15.24
35-39	1082	5.42
40-44	171	0.86
Born outside US	4,207	20.54
Married	9,309	45.43
Education		
Less than High School Graduate	5,757	28.09
High School Graduate (Diploma or GED)	5,920	28.89
Some College/ Associate Degree	5,642	27.53
Bachelor's Degree	2,259	11.02
Graduate or Professional Degree	914	4.46
Maternal race/ethnicity		
Hispanic	5,300	25.86
Non-Hispanic White, Single Race	8,694	42.43
Non-Hispanic Black, Single Race	5,027	24.53
Non-Hispanic Other or Multiple Race	1,471	7.18
Current Insurance		
Private health insurance or Medi-Gap	9,193	44.86
Medicaid, CHIP, or a state-sponsored health plan	5,587	27.26
Medicare, military or government health care	788	3.85
Single-service plan, Indian Health Service, or no coverage	4,924	24.03
Currently employed	12,216	60.5
Religion		
No Religion	3,510	17.13
Catholic	5,261	25.67
Protestant	10,245	50.00
Other	1,476	7.20
Mother smoked before knowledge of pregnancy	1754	27.56
Mother smoked after knowledge of pregnancy	905	14.23
Paternal Characteristics		
Currently employed	4956	82.64
Age, years		
15-19	1372	9.74
20-24	3817	27.09
25-29	3814	27.07
30-34	2801	19.88
35-39	1425	10.11
40-44	581	4.12
45-49	178	1.26
50-54	63	0.44
55-65	42	0.30

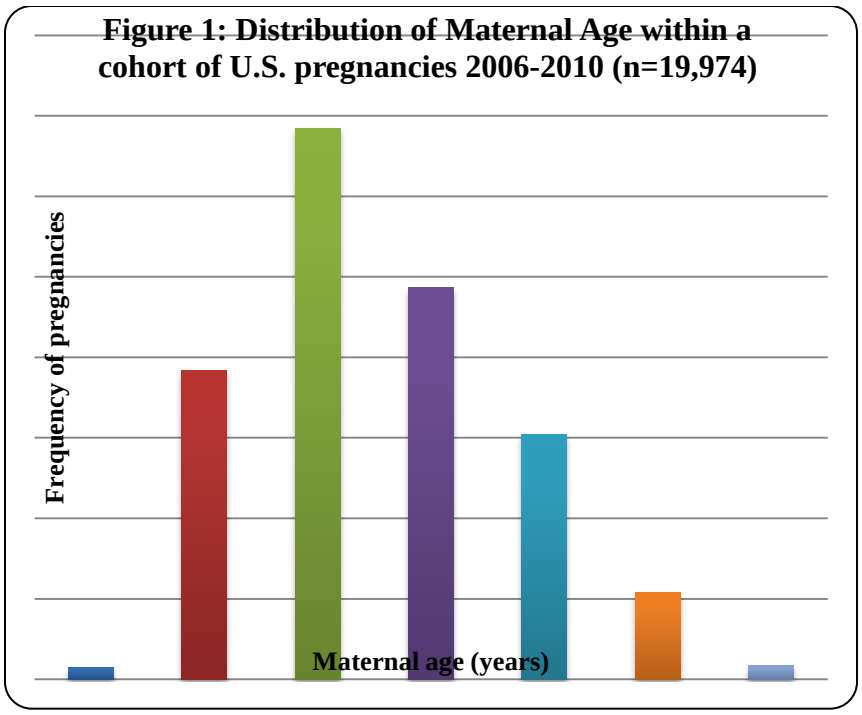
Figure 1: Distribution of Maternal Age within a cohort of U.S. pregnancies 2006-2010 (n=19,974)
Frequency of pregnancies
Maternal age (years)

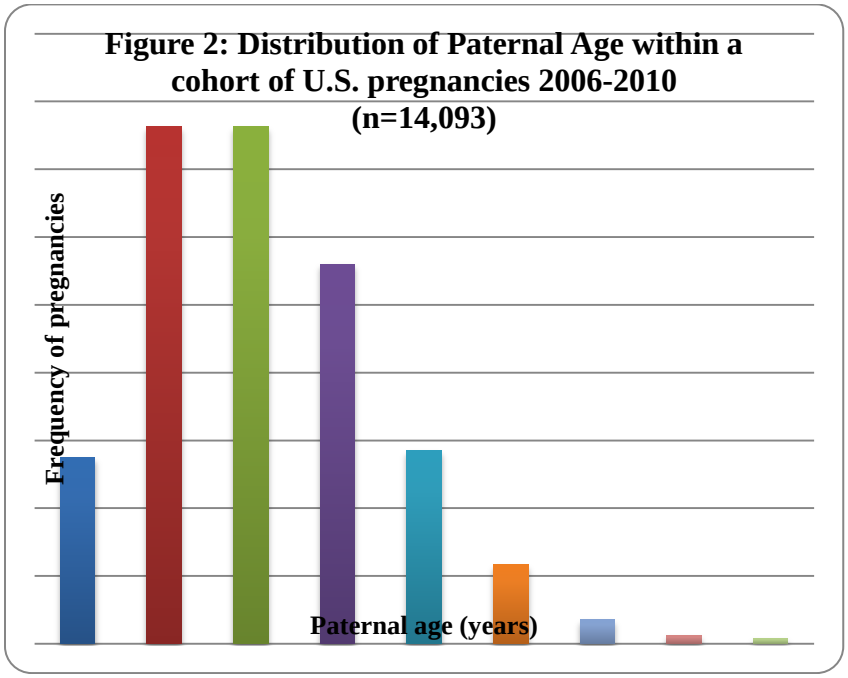
Figure 2: Distribution of Paternal Age within a cohort of U.S. pregnancies 2006-2010 (n=14,093)
Frequency of pregnancies
Paternal age (years)

Table 2. Characteristics of a cohort of U.S. pregnancies by parental intentions based on the 2006-2010 NSFG

	Both Intended (n=2146)		Mother Only Intended (n=806)		Father Only Intended (n=2245)		Neither Intended (n=6297)		Test of Significance~
	No.	%	No.	%	No.	%	No.	%	
Outcomes									
Low Birth Weight	144	8.58	67	11.02	140	9.35	369	10.02	
Pregnancy Loss	372	18.15	121	16.60	380	20.25	996	21.29	**
Child Characteristics									
Male	851	50.75	303	49.84	723	48.36	1,881	51.20	
Maternal Characteristics									
Living with Partner									**
Throughout pregnancy	966	70.20	312	45.28	925	47.93	1,813	33.76	
At the beginning of pregnancy but not at the end	57	4.14	46	6.68	137	7.10	259	4.82	
At the end of pregnancy but not at the beginning	79	5.74	55	7.98	140	7.25	381	7.09	
Not at all throughout pregnancy	274	19.91	276	40.06	728	37.72	2,917	54.32	
Age, years									**
11-14	1	0.05	1	0.13	19	0.87	88	1.43	
15-19	216	10.34	79	10.03	567	25.83	1906	30.92	
20-24	730	34.94	307	38.96	891	40.59	2370	38.44	
25-29	619	29.63	221	28.05	438	19.95	1084	17.58	
30-34	379	18.14	128	16.24	202	9.20	507	8.22	
35-39	115	5.51	46	5.84	66	3.01	174	2.82	
40-44	29	1.39	6	0.76	12	0.55	36	0.58	
Born outside US	1,611	75.07	687	85.24	1,868	83.24	5,351	85.04	**
Married	1,102	51.35	231	28.66	624	27.80	2,106	33.44	**
Education									**
Less than High School Graduate	605	28.19	217	26.92	723	32.20	1,813	28.79	
High School Graduate (Diploma or GED)	644	30.01	260	32.26	685	30.51	1,981	31.46	
Some College/ Associate Degree	584	27.21	248	30.77	669	29.80	1,825	28.98	
Bachelor's Degree	208	9.69	61	7.57	122	5.43	483	7.67	
Graduate or Professional Degree	105	4.89	20	2.48	46	2.05	195	3.10	
Maternal race/ethnicity									**
Hispanic	641	29.87	185	22.95	595	26.50	1450	23.03	
Non-Hispanic White, Single Race	809	37.70	361	44.79	623	27.75	2622	41.64	
Non-Hispanic Black, Single Race	538	25.07	212	26.30	858	38.22	1783	28.32	
Non-Hispanic Other or Multiple Race	158	7.36	48	5.96	169	7.53	442	7.02	
Current Insurance									**
Private health insurance or Medi-Gap	641	29.87	185	22.95	595	26.50	1450	23.03	
Medicaid, CHIP, or a state-sponsored health plan	809	37.70	361	44.79	623	27.75	2622	41.64	
Medicare, military or government health care	538	25.07	212	26.30	858	38.22	1783	28.32	
Single-service plan, Indian Health Service, or no coverage	158	7.36	48	5.96	169	7.53	442	7.02	
Currently employed	1259	59.39	324	40.86	898	40.41	2338	37.82	**
Religion									**
No Religion	309	14.40	156	19.35	401	17.86	1298	20.61	
Catholic	634	29.54	177	21.96	465	20.71	1348	21.41	
Protestant	1086	50.61	410	50.87	1281	57.06	3275	52.01	
Other	117	5.45	63	7.82	98	4.37	376	5.97	
Mother smoked before knowledge of pregnancy	207	25.09	102	36.04	215	31.02	574	36.03	**
Mother smoked after knowledge of pregnancy	117	14.18	54	19.08	103	14.88	299	18.81	**
Paternal Characteristics									
Currently employed	1232	85.97	297	78.57	809	79.78	2618	82.53	**
Age, years									**
15-19	84	5.05	39	6.55	199	13.47	668	18.51	
20-24	452	27.20	168	28.24	524	35.48	1277	35.39	
25-29	489	29.42	184	30.92	396	26.81	828	22.95	
30-34	352	21.18	109	18.32	214	14.49	479	13.28	
35-39	178	10.71	54	9.08	87	5.89	221	6.13	
40-44	71	4.27	21	3.53	39	2.64	83	2.30	
45-49	24	1.44	11	1.85	13	0.88	31	0.86	
50-54	8	0.48	7	1.18	3	0.20	9	0.25	
55-65	4	0.24	2	0.34	2	0.14	12	0.33	

~ Unadjsuted measures of association between outcome or predictor variables and parental intentions tested statistically using the Pearson's chi-square test of significance for categorical variables and one-way ANOVA for numerical variables (maternal and paternal age)

*** p<0.05*

Table 3. Characteristics of a cohort of U.S. pregnancies by marital status based on the 2006-2010 NSFG

	Married (n=9309)		Not married (n=11183)		Test of Significance~
	No.	%	No.	%	
Outcomes					
Low Birth Weight	509	7.33	809	11.01	
Live Birth	1,492	17.69	1897	20.51	**
Child Characteristics					
Male	3,535	50.94	3688	50.24	
Maternal Characteristics					
Living with Partner					**
Throughout pregnancy	1,964	57.16	5272	48.43	
At the beginning of pregnancy but not at the end	124	3.61	623	5.72	
At the end of pregnancy but not at the beginning	247	7.19	665	6.11	
Not at all throughout pregnancy	1,101	32.04	4325	39.73	
Age, years					**
11-14	64	0.71	413	3.79	
15-19	1335	14.73	3883	35.59	
20-24	2609	28.79	3629	33.26	
25-29	2548	28.12	1908	17.49	
30-34	1799	19.85	804	7.37	
35-39	637	7.03	250	2.29	
40-44	70	0.77	24	0.22	
Born outside US	2,414	25.95	1793	16.04	**
Education					**
Less than High School Graduate	1,925	20.68	3832	34.27	
High School Graduate (Diploma or GED)	2,384	25.61	3536	31.62	
Some College/ Associate Degree	2,617	28.11	3025	27.05	
Bachelor's Degree	1,643	17.65	616	5.51	
Graduate or Professional Degree	740	7.95	174	1.56	
Maternal race/ethnicity					**
Hispanic	2,470	26.53	2830	25.31	
Non-Hispanic White, Single Race	4,926	52.92	3768	33.69	
Non-Hispanic Black, Single Race	1,181	12.69	3846	34.39	
Non-Hispanic Other or Multiple Race	732	7.86	739	6.61	
Current Insurance					**
Private health insurance or Medi-Gap	5,948	63.90	3245	29.02	
Medicaid, CHIP, or a state-sponsored health plan	1,153	12.39	4434	39.65	
Medicare, military or government health care	281	3.02	507	4.53	
Single-service plan, Indian Health Service, or no coverage	1,927	20.70	2997	26.80	
Currently employed	5619	60.73	6597	60.30	
Religion					**
No Religion	1,179	12.67	2331	20.84	
Catholic	2,826	30.36	2435	21.77	
Protestant	4,324	46.45	5921	52.95	
Other	980	10.53	496	4.44	
Mother smoked before knowledge of pregnancy	537	17.86	1217	36.23	**
Mother smoked after knowledge of pregnancy	236	7.85	669	19.94	**
Paternal Characteristics					
Currently employed	8,271	88.85	2290	75.53	**
Age, years					**
15-19	386	5.60	986	13.70	
20-24	1456	21.12	2361	32.81	
25-29	1908	27.67	1906	26.48	
30-34	1715	24.87	1086	15.09	
35-39	931	13.50	494	6.86	
40-44	362	5.25	219	3.04	
45-49	90	1.31	88	1.22	
50-54	29	0.42	34	0.47	
55-65	18	0.26	23	0.32	

~ Unadjsuted measures of association between outcome or predictor variables and marital status tested statistically using the Pearson's chi-square test of significance for categorical variables and two-sample t-test for numerical variables (maternal and paternal age)
*** p<0.05*

Table 4. Coefficients from logit analyses (standard errors) indicating effect of parental pregnancy intention on birth outcomes, by model type

Outcome	Cross-sectional		Fixed-effects	
	Bivariate	Full Model	Bivariate	Full Model
Live Birth~	(n=9334)	(n=9198)	(n=2864)	(n=2810)
Maternal only intended	0.11 (0.12)	0.19 (0.12)	0.12 (0.20)	0.10 (0.20)
Paternal only intended	-0.14 (0.09)	-0.19** (0.10)	-0.37** (0.13)	-0.45** (0.14)
Neither parent intended	-0.20** (0.07)	-0.21** (0.08)	-0.54** (0.12)	-0.62** (0.12)
Both intended	ref	ref	ref	ref
p-value from X^2				
Father doesn't matter	*0.449*	*0.284*	*0.254*	*0.294*
Father = Mother intent	*0.038*	*0.001*	*0.011*	*0.005*
Low Birth Weight	(n=7465)	(n=7230)	(n=885)	(n=835)
Maternal only intended	0.28* (0.16)	0.23 (0.16)	0.42 (0.35)	0.42 (0.37)
Paternal only intended	0.09 (0.13)	-0.08 (0.13)	-0.17 (0.25)	-0.19 (0.26)
Neither parent intended	0.17 (0.11)	0.10 (0.11)	0.16 (0.23)	0.20 (0.24)
Both intended	ref	ref	ref	ref
p-value from X^2				
Father doesn't matter	*0.246*	*0.113*	*0.136*	*0.086*
Father = Mother intent	*0.160*	*0.058*	*0.073*	*0.067*

*p≤0.1 ** p<0.05

~ Paternal age excluded in each model as it does not vary with the outcome (collected only for live births)

Full model: religion, age, education, race, current insurance, work, born outside us, paternal age

Table 5. Coefficients from logit analyses (standard errors) indicating effect of parental pregnancy intention on birth outcomes, by marital status and model type

Outcome	Married				Unmarried			
	Cross-sectional		Fixed-effects		Cross-sectional		Fixed-effects	
	Bivariate	Full Model	Bivariate	Full Model	Bivariate	Full Model	Bivariate	Full Model
Live Birth~	(n=3467)	(n=3445)	(n=988)	(n=981)	(n=5867)	(n=5753)	(n=1876)	(n=1829)
Maternal only intended	0.27 (0.22)	0.28 (0.22)	-0.17 (0.36)	-0.21 (0.36)	0.10 (0.15)	0.20 (0.15)	0.25 (0.24)	0.24 (0.24)
Paternal only intended	-0.13 (0.14)	-0.19 (0.15)	-0.53** (0.23)	-0.60** (0.23)	-0.09 (0.12)	-0.15 (0.12)	-0.29* (0.17)	-0.37** (0.17)
Neither parent intended	-0.21** (0.11)	-0.27** (0.11)	-0.59** (0.19)	-0.66** (0.19)	-0.15 (0.10)	-0.15 (0.11)	-0.49** (0.15)	-0.57** (0.16)
Both intended	ref	ref	ref	ref	ref	ref	ref	ref
p-value from X^2								
Father doesn't matter	*0.376*	*0.341*	*0.863*	*0.185*	*0.597*	*0.407*	*0.150*	*0.184*
Father = Mother intent	*0.084*	*0.043*	*0.335*	*0.300*	*0.169*	*0.012*	*0.018*	*0.009*
Low Birth Weight	(n=2821)	(n=2766)	(n=274)	(n=266)	(n=4644)	(n=4464)	(n=611)	(n=569)
Maternal only intended	0.41 (0.27)	0.34 (0.29)	1.09 (0.71)	1.10 (0.81)	0.11 (0.19)	0.17 (0.20)	0.29 (0.42)	0.32 (0.43)
Paternal only intended	0.13 (0.22)	0.03 (0.22)	-0.62 (0.46)	-0.68 (0.48)	-0.03 (0.16)	-0.10 (0.17)	0.01 (0.31)	0.06 (0.33)
Neither parent intended	0.03 (0.18)	-0.06 (0.18)	0.08 (0.35)	0.08 (0.39)	0.13 (0.14)	0.15 (0.14)	0.23 (0.30)	0.35 (0.31)
Both intended	ref	ref	ref	ref	ref	ref	ref	ref
p-value from X^2								
Father doesn't matter	*0.276*	*0.452*	*0.080*	*0.161*	*0.348*	*0.114*	*0.514*	*0.394*
Father = Mother intent	*0.344*	*0.318*	*0.020*	*0.030*	*0.430*	*0.165*	*0.456*	*0.504*

*p≤0.1 ** p<0.05

~ Paternal age excluded in each model as it does not vary with the outcome (collected only for live births)

Full model: religion, age, education, race, current insurance, work, born outside us, paternal age