

Pregnancy Intention and Its Relationship to Birth and Maternal Outcomes

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OBJECTIVE: To examine whether there are associations between pregnancy intention (intended, unwanted, mistimed, or ambivalent) and negative birth and maternal outcomes: low birth weight (less than 2,500 g), preterm delivery (fewer than 37 weeks), small for gestational age, premature labor, hypertension, and other maternal outcomes.

METHODS: We analyzed data from the population-based Pregnancy Risk Assessment Monitoring System, including 87,087 women who gave birth between 1996 and 1999 in 18 states. Information on pregnancy outcomes was derived from birth certificate data and a self-administered questionnaire completed postpartum. We employed SUDAAN (RTI International, Research Triangle Park, NC) for univariable and logistical regression analyses.

RESULTS: In analyses controlling for demographic and behavioral factors, women with unwanted pregnancies had an increased likelihood of preterm delivery (adjusted odds ratio [OR] 1.16, 95% confidence interval [CI] 1.01–1.33) and premature rupture of membranes (adjusted OR 1.37, 95% CI 1.01–1.85) compared with women with intended pregnancies. Women who were ambivalent toward their pregnancies had increased odds of delivering a low birth weight infant (adjusted OR 1.15, 95% CI 1.02–1.29); in contrast, women with mistimed pregnancies had a lower likelihood (adjusted OR 0.92, 95% CI 0.86–0.97).

CONCLUSION: Pregnancy intention, specifically unwanted and ambivalent, may be an indicator of increased risk for some poor birth and maternal outcomes and should be considered in interventions aimed at improving the health of the mother and child.

(*Obstet Gynecol* 2007;109:678–86)

LEVEL OF EVIDENCE: III

In the United States, an estimated 49% of pregnancies in 2001 were unintended.¹ An unintended pregnancy is defined as a pregnancy that is either unwanted or mistimed at the time of conception.^{2,3} Current definitions of unintended pregnancy also include women who are ambivalent about their pregnancy.⁴ Unintended pregnancy is associated with social and economic disadvantage and maternal behaviors such as smoking, alcohol consumption, and late initiation of prenatal care.^{5–8} Poor birth outcomes such as preterm delivery and low birth weight are prevalent in the United States; preterm delivery and low birth weight rates in 2002 were 12.1% and 7.8%, respectively, with the low birth weight rate reaching the highest level reported in three decades.⁹ Although several studies have examined the associations between pregnancy intention and birth outcomes, such as low birth weight, preterm delivery, and small for gestational age, the findings are inconsistent mainly due to small sample size and lack of adjustment for strong confounders.^{10–18}

Although globally and in the United States, safe-motherhood initiatives have drawn attention to the prevalence of maternal mortality and morbidity, population-based data and research examining factors associated with maternal morbidity are lacking. A handful of studies have documented associations between pregnancy intention and other outcomes, such as depression, physical abuse, and postpartum depression,^{19–21} but research focused specifically on the relationship between unintended pregnancy and maternal outcomes is limited.

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Supported by the Centers for Disease Control and Prevention.

The authors thank the members of the Pregnancy Risk Assessment Monitoring System Working Group for their work in data collection. See the Appendix for a listing of members.

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

Presented at the Society for Epidemiologic Research Annual Meeting, Salt Lake City, Utah, June 15–18, 2004, and the Society for Pediatric and Perinatal Epidemiologic Research, Salt Lake City, Utah, June 14–15, 2004.

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ISSN: 0029-7844/07



Because of the limited information about the effect of pregnancy intention on birth and maternal outcomes, this analysis aimed to examine the association between pregnancy intention (intended, unwanted, mistimed, or ambivalent) and birth outcomes (low birth weight, preterm delivery, and small for gestational age) or maternal outcomes (nausea, kidney or bladder infections, premature rupture of membranes, vaginal bleeding, diabetes, high blood pressure, premature labor, pregnancy complications, and hospitalizations during pregnancy). If such an association does exist, pregnancy intention may be an additional factor that clinicians can use to identify potential risk of poor pregnancy outcomes.

MATERIALS AND METHODS

We used data from the ongoing, population-based Pregnancy Risk Assessment Monitoring System,^{22,23} including 87,087 women who gave birth between 1996 and 1999 in 18 states, where survey response rates were 70% or more. In each state, every month, women who give birth are randomly chosen and sent a self-administered questionnaire 2 to 6 months postpartum. Women who fail to respond to the questionnaire after two attempts are offered a telephone interview. Because the Pregnancy Risk Assessment Monitoring System uses a stratified sampling process that oversamples women with specific risks and characteristics (eg, race), weights are created for this oversampling scheme. Weights are also created for nonresponse by examining factors that influence response (eg, maternal age). The data are statistically weighted to adjust for survey design, noncoverage, and nonresponse, thereby creating a study population that is representative of all female state residents who had a live birth in the state during 1996 and 1999. The self-administered questionnaire includes information about maternal behaviors and experiences before and during pregnancy. Data from the questionnaire are linked to the birth certificate. Women whose pregnancies ended in multiple births were excluded from this analysis. The Pregnancy Risk Assessment Monitoring System has been reviewed and approved by the Institutional Review Board of the Centers for Disease Control and Prevention.

Pregnancy intention was the main exposure of interest and was assessed by the question, "Thinking back to just before you got pregnant, how did you feel about becoming pregnant?" Women who responded, "I wanted to be pregnant sooner" or "I wanted to be pregnant then" were categorized as intending the pregnancy. Women who reported "I wanted to be pregnant later" were labeled as having a mistimed

pregnancy. Women who responded "I didn't want to be pregnant then or at any time in the future" were classified as having an unwanted pregnancy. Ambivalence was defined as women who answered "I don't know."

Data on birth outcomes came from birth certificates and included low birth weight (less than 2,500 g), preterm delivery (fewer than 37 weeks) and small for gestational age (defined as birth weight below the 10th percentile for the infant's gestational age based on race and parity-specific standards only available for white and African-American infants).²⁴ The methodology described by Whitehead et al²⁵ was used for determining the small for gestational age variable and for excluding incompatible infant birth weights and gestational ages. Odds ratios were calculated for maternal morbidities based on data from the birth certificate, the Pregnancy Risk Assessment Monitoring System questionnaire, or a combination of both data sources. The birth certificate provides only yes-or-no information regarding whether women had hypertension, vaginal bleeding, diabetes, premature rupture of the membranes, premature labor, or no complications at the time of the delivery. For the Pregnancy Risk Assessment Monitoring System questionnaire, women were asked if they had been hospitalized during their pregnancy. Women who answered yes were then asked to select the reason why they were hospitalized (premature labor, high blood pressure, vaginal bleeding or placenta problems, nausea, vomiting, dehydration, kidney or bladder infection, diabetes [high blood sugar], or other). While some women were hospitalized for these conditions during pregnancy, we do not know whether the condition (eg, diabetes) existed before the pregnancy. We combined the data for vaginal bleeding, diabetes, and high blood pressure because they were available from both the birth certificate and the Pregnancy Risk Assessment Monitoring System questionnaire. We also created three composite measures of maternal outcome based on whether any maternal outcome was reported only on the birth certificate, reported only in the Pregnancy Risk Assessment Monitoring System, or reported on either the birth certificate or in the Pregnancy Risk Assessment Monitoring System.

We employed SUDAAN (RTI International) for univariable and logistical regression analyses of our dependent variables: birth outcomes and maternal morbidities. For analytic purposes, we chose an a priori confounder set based upon the current literature on pregnancy intention and birth outcomes. We used the same confounder set for all analyses, because no one to our knowledge has studied the association



between pregnancy intention and maternal outcomes. The logistic regression models included maternal age, maternal race, maternal ethnicity, maternal education, marital status, parity, prenatal care, previous low birth weight infant or premature delivery, smoking during the pregnancy, and drinking during the pregnancy as confounders. Given that we do not know the true causal mechanism, we viewed these variables as confounders.

RESULTS

In this population, 53.2% of women reported intended pregnancies, 10.6% had unwanted pregnancies, 30.2% had mistimed pregnancies, and 6.0% were ambivalent about their pregnancies from 1996 to 1999 (Table 1). For poor birth outcomes, 5.9% of the women had a low birth weight infant, 8.7% had a preterm delivery, and 8.2% had a small for gestational age infant (data not shown). The prevalence of poor maternal outcomes was low overall but varied by type of outcome; 3.8% of the women in the sample had nausea, 2.2% had kidney or bladder infections, 2.5% had premature rupture of membranes, 4.1% had vaginal bleeding, 3.2% had diabetes, 6.4% had high blood pressure, and 6.3% had premature labor (data not shown). Based on birth certificate data, 11.3% had one of the maternal outcomes and for the Pregnancy Risk Assessment Monitoring System questionnaire, 13.0% of women were hospitalized for one of the outcomes (data not shown). When combining the birth certificate and the Pregnancy Risk Assessment Monitoring System questionnaire data, 21.9% of women had at least one of the maternal outcomes (data not shown).

Women who had unintended (combining unwanted, mistimed, and ambivalent) pregnancies differed from women with intended pregnancies in nearly all of the maternal characteristics and behaviors, birth outcomes, and maternal outcomes (Table 1). The distribution of birth and maternal outcomes varied by levels of pregnancy intention, with women who had an unwanted pregnancy differing significantly from those who had an intended pregnancy on a number of birth and maternal outcomes; however, fewer differences were observed among women who had mistimed pregnancies or who were ambivalent about their pregnancies (Table 1).

In adjusted analyses (Table 2), women who reported that they felt ambivalent toward their pregnancies were more likely to have a low birth weight infant than women with intended pregnancies (adjusted OR 1.15, 95% CI 1.02–1.29). Women with unwanted pregnancies were at increased odds of preterm deliv-

ery (adjusted OR 1.16, 95% CI 1.01–1.33) and premature rupture of membranes (adjusted OR 1.37, 95% CI 1.01–1.85). Women who had mistimed pregnancies were at decreased odds of having a low birth weight infant (adjusted OR 0.92, 95% CI 0.86–0.97). No other associations were observed between pregnancy intention and birth and maternal outcomes, including the composite variable of maternal outcomes from both Pregnancy Risk Assessment Monitoring System and birth certificate data.

DISCUSSION

Unintended pregnancy was highly prevalent in this sample; nearly 50% of women reported an unintended pregnancy. Prevalence of low birth weight in our sample was similar to the national prevalence in 1999 (the time of this study); 5.9% of women in our sample had a low birth weight infant compared with 6.0% of women delivering singletons nationally. Preterm rates were lower in our study: 8.7% in our sample compared with 11.8% (includes multiple births) nationally.²⁶

We found that women who reported that their pregnancies were unwanted had higher odds of preterm delivery, which is consistent with other studies.^{12,16} Women who reported they were ambivalent about their pregnancies had higher odds of delivering a low birth weight infant. However, women with mistimed pregnancies were at decreased odds of having a low birth weight infant, which is not consistent with other studies.^{17,21,27} Overall, we found no associations between pregnancy intention and maternal outcomes, except for an association between unwanted pregnancy and premature rupture of membranes. Although these associations were statistically significant, they may be of limited clinical significance due to their relatively weak magnitude. In addition, it is unclear whether pregnancy intention itself is a risk factor for poor outcomes or whether it is simply a risk marker for other variables that influence pregnancy outcome, such as late initiation of prenatal care or smoking or drinking during pregnancy.^{5,6,8,21,28}

Previous studies have focused primarily on “unwanted” and “mistimed” pregnancies and have failed to include women who were ambivalent about their pregnancies^{16,17,27}; however, in this analysis women who were ambivalent about their pregnancy had different risks for poor birth outcomes. We defined ambivalence as women who responded “I don’t know” to the question asking how they felt about the timing of their pregnancy, but this does not capture clearly the complex contradictory emotions that women may have toward pregnancy. Ambivalence is



Table 1. Maternal Characteristics, Maternal Behaviors, Birth Outcomes, and Maternal Outcomes by Pregnancy Intention

| | Intended (n=44,178) ^{††} | Unintended (n=42,909) | Unintended | | |
|--|--------------------------------------|--------------------------|-----------------------|------------------------|-------------------------|
| | | | Unwanted (n=9,684) | Mistimed (n=27,271) | Ambivalent (n=5,954) |
| Overall | 53.2 | 46.8 | 10.6 | 30.2 | 6.0 |
| Maternal characteristics | | | | | |
| Age [BC (y)] | | | | | |
| Less than 18 | 1.6 | 9.2 [‡] | 7.7 [‡] | 10.0 [‡] | 8.1 [‡] |
| 18–24 | 24.2 | 44.3 | 36.2 | 49.0 | 35.1 |
| 25–34 | 59.6 | 38.1 | 39.7 | 36.9 | 41.2 |
| 35 and older | 14.6 | 8.4 | 16.4 | 4.2 | 15.7 |
| Ethnicity (BC) [§] | | | | | |
| Hispanic | 12.7 | 12.0 | 12.6 | 11.8 | 12.0 |
| Non-Hispanic | 87.3 | 88.0 | 87.4 | 88.2 | 88.0 |
| Race (BC) [§] | | | | | |
| White | 85.9 | 67.1 [‡] | 56.1 [‡] | 70.2 [‡] | 71.3 [‡] |
| African-American | 10.5 | 28.8 | 40.3 | 25.8 | 23.3 |
| American Indian or Alaska Native | 1.1 | 1.8 | 1.7 | 1.7 | 2.6 |
| Asian and other | 2.5 | 2.3 | 1.9 | 2.3 | 2.8 |
| Marital status (BC) | | | | | |
| Yes | 83.1 | 48.2 [‡] | 42.6 [‡] | 49.3 [‡] | 53.0 [‡] |
| No | 16.9 | 51.8 | 57.4 | 50.7 | 47.0 |
| Education [BC (y)] | | | | | |
| Less than 12 | 13.9 | 27.7 [‡] | 30.6 [‡] | 26.4 [‡] | 29.2 [‡] |
| 12 | 30.4 | 37.7 | 38.7 | 37.0 | 39.6 |
| More than 12 | 55.7 | 34.6 | 30.7 | 36.6 | 31.2 |
| Parity (BC) | | | | | |
| No births | 43.1 | 42.0 [‡] | 23.4 [‡] | 49.3 [‡] | 38.5 [‡] |
| 1 live birth | 37.6 | 28.8 | 26.1 | 30.1 | 26.8 |
| 2 live births | 13.0 | 18.0 | 27.4 | 14.1 | 20.7 |
| 3 or more live births | 6.4 | 11.2 | 23.1 | 6.5 | 14.0 |
| Previous low birth weight or preterm delivery (P) | | | | | |
| Yes | 8.0 | 10.2 [‡] | 14.0 [‡] | 8.6 | 11.7 [‡] |
| No | 92.0 | 89.8 | 86.0 | 91.4 | 88.3 |
| Maternal behaviors | | | | | |
| Smoking during pregnancy (BC and P) | | | | | |
| Yes | 13.7 | 21.7 [‡] | 26.0 [‡] | 20.1 [‡] | 22.4 [‡] |
| No | 86.3 | 78.3 | 74.0 | 79.9 | 77.6 |
| Drinking during pregnancy (BC and P) | | | | | |
| Yes | 6.3 | 5.7 | 7.8 [¶] | 5.1 [‡] | 4.8 [¶] |
| No | 93.7 | 94.3 | 92.2 | 94.9 | 95.2 |
| Prenatal care during first trimester (BC) | | | | | |
| Yes | 89.3 | 74.6 [‡] | 67.6 [‡] | 76.5 [‡] | 77.5 [‡] |
| No | 10.7 | 25.4 | 32.4 | 23.5 | 22.5 |
| Stress (P) | | | | | |
| 0 to 2 Stressors | 75.6 | 52.1 [‡] | 47.6 [‡] | 52.4 [‡] | 58.3 [‡] |
| 3 to 5 Stressors | 20.3 | 35.1 | 36.5 | 35.4 | 31.3 |
| 6 to 13 Stressors | 4.1 | 12.8 | 15.9 | 12.2 | 10.4 |
| Birth outcomes | | | | | |
| Low birth weight (BC) | | | | | |
| Yes | 5.0 | 6.8 [‡] | 7.8 [‡] | 6.3 [‡] | 7.6 [‡] |
| No | 95.0 | 93.2 | 92.2 | 93.7 | 92.4 |

(continued)



Table 1. Maternal Characteristics, Maternal Behaviors, Birth Outcomes, and Maternal Outcomes by Pregnancy Intention (*continued*)

| | Intended (n=44,178) ^{††} | Unintended (n=42,909) | Unintended | | |
|-------------------------------------|--------------------------------------|--------------------------|-----------------------|------------------------|-------------------------|
| | | | Unwanted (n=9,684) | Mistimed (n=27,271) | Ambivalent (n=5,954) |
| Small for gestational age (BC) | | | | | |
| Yes | 7.5 | 9.0 [‡] | 9.5 [‡] | 8.7 [‡] | 9.7 [¶] |
| No | 92.5 | 91.0 | 90.5 | 91.3 | 90.3 |
| Preterm delivery (BC) | | | | | |
| Yes | 8.1 | 9.5 [‡] | 11.7 [‡] | 8.6 | 9.7 [¶] |
| No | 91.9 | 90.5 | 88.3 | 91.4 | 90.3 |
| Maternal outcomes | | | | | |
| Nausea (P) | | | | | |
| Yes | 3.1 | 4.7 [‡] | 4.5 [‡] | 4.9 [‡] | 3.9 |
| No | 96.9 | 95.3 | 95.5 | 95.1 | 96.1 |
| Kidney and bladder infections (P) | | | | | |
| Yes | 1.7 | 2.8 [‡] | 3.1 [‡] | 2.7 [‡] | 2.4 |
| No | 98.3 | 97.2 | 96.9 | 97.3 | 97.6 |
| Premature rupture of membranes (BC) | | | | | |
| Yes | 2.4 | 2.5 | 2.8 | 2.5 | 2.5 |
| No | 97.6 | 97.5 | 97.2 | 97.5 | 97.5 |
| Vaginal bleeding (BC and P) | | | | | |
| Yes | 3.7 | 4.6 [‡] | 5.1 [‡] | 4.5 [‡] | 4.0 |
| No | 96.3 | 95.4 | 94.9 | 95.5 | 96.0 |
| Diabetes (BC and P) | | | | | |
| Yes | 3.5 | 2.8 [‡] | 3.5 | 2.4 [‡] | 3.0 |
| No | 96.5 | 97.2 | 96.5 | 97.6 | 97.0 |
| High blood pressure (BC and P) | | | | | |
| Yes | 6.2 | 6.7 [¶] | 7.0 | 6.8 | 6.1 |
| No | 93.8 | 93.3 | 93.0 | 93.2 | 93.9 |
| Premature labor (P) | | | | | |
| Yes | 5.4 | 7.4 [‡] | 7.6 [‡] | 7.5 [‡] | 6.8 [‡] |
| No | 94.6 | 92.6 | 92.4 | 92.5 | 93.2 |
| Any maternal outcomes (P) | | | | | |
| Yes | 11.3 | 15.0 [‡] | 15.5 [‡] | 14.9 [‡] | 14.2 [‡] |
| No | 88.7 | 85.0 | 84.5 | 85.1 | 85.8 |
| Any maternal outcomes (BC) | | | | | |
| Yes | 11.6 | 10.8 [¶] | 11.7 | 10.5 [¶] | 10.8 |
| No | 88.4 | 89.2 | 88.3 | 89.5 | 89.2 |
| Any complications (BC) | | | | | |
| Yes | 36.9 | 34.5 [‡] | 33.0 [‡] | 35.1 [¶] | 34.4 [¶] |
| No | 63.1 | 65.5 | 67.0 | 64.9 | 65.6 |
| Any maternal outcomes (BC and P) | | | | | |
| Yes | 20.6 | 23.4 [‡] | 24.3 [‡] | 23.3 [‡] | 22.3 |
| No | 79.4 | 76.6 | 75.7 | 76.7 | 77.7 |

BC, variable from birth certificate; P, variable from Pregnancy Risk Assessment Monitoring System questionnaire.

Data are %. Totals may exceed 100% because of rounding.

* Based on nonweighted data.

† Based on weighted data.

‡ $P < .001$; compared with intended pregnancies.

§ As categorized by the birth certificate.

¶ Smoking and drinking during pregnancy were defined as women who smoked (drank) in the last 3 months of pregnancy (based on the Pregnancy Risk Assessment Monitoring System questionnaire) or women who said that they smoked (drank) at any time during their pregnancy according to the birth certificate.

¶ $P < .05$; compared with intended pregnancies.

not a very well-understood construct and does not have a standard measurement. However, those in the field of unintended pregnancy have argued the need to understand and assess ambivalence.^{29–31} Our anal-

ysis suggests that disaggregating those women who are ambivalent from the overall group of women with unwanted pregnancies may highlight a group of women who have unique characteristics and risks.



Table 2. Adjusted Odds Ratios for the Association Between Pregnancy Intention and Birth and Maternal Outcomes*

| | Unadjusted Odds Ratio [†] (95% Confidence Interval) | Adjusted Odds Ratio [†] (95% Confidence Interval) |
|-------------------------------------|---|---|
| Birth outcomes | | |
| Low birth weight (BC) | | |
| Unwanted | 1.59 (1.49–1.70) | 1.06 (0.97–1.16) |
| Mistimed | 1.26 (1.20–1.32) | 0.92 (0.86–0.97) |
| Ambivalent | 1.56 (1.42–1.71) | 1.15 (1.02–1.29) |
| Small for gestational age (BC) | | |
| Unwanted | 1.28 (1.13–1.45) | 1.08 (0.92–1.26) |
| Mistimed | 1.17 (1.07–1.28) | 1.01 (0.91–1.13) |
| Ambivalent | 1.31 (1.12–1.54) | 1.03 (0.85–1.24) |
| Preterm delivery (BC) | | |
| Unwanted | 1.51 (1.36–1.67) | 1.16 (1.01–1.33) |
| Mistimed | 1.07 (0.99–1.15) | 0.91 (0.83–1.00) |
| Ambivalent | 1.22 (1.08–1.39) | 1.03 (0.88–1.19) |
| Maternal outcomes | | |
| Nausea (P) | | |
| Unwanted | 1.48 (1.24–1.76) | 1.20 (0.94–1.54) |
| Mistimed | 1.61 (1.41–1.83) | 1.14 (0.98–1.33) |
| Ambivalent | 1.26 (0.98–1.63) | 0.98 (0.73–1.31) |
| Kidney and bladder infections (P) | | |
| Unwanted | 1.87 (1.50–2.33) | 1.06 (0.79–1.43) |
| Mistimed | 1.64 (1.38–1.94) | 0.96 (0.77–1.18) |
| Ambivalent | 1.42 (1.03–1.97) | 0.94 (0.65–1.37) |
| Premature rupture of membranes (BC) | | |
| Unwanted | 1.14 (0.92–1.43) | 1.37 (1.01–1.85) |
| Mistimed | 1.02 (0.87–1.18) | 1.03 (0.86–1.24) |
| Ambivalent | 1.04 (0.79–1.36) | 1.06 (0.77–1.47) |
| Vaginal bleeding (BC and P) | | |
| Unwanted | 1.43 (1.21–1.68) | 1.08 (0.89–1.31) |
| Mistimed | 1.24 (1.10–1.39) | 1.06 (0.92–1.23) |
| Ambivalent | 1.09 (0.87–1.37) | 0.88 (0.67–1.14) |
| Diabetes (BC and P) | | |
| Unwanted | 0.98 (0.79–1.22) | 0.93 (0.70–1.24) |
| Mistimed | 0.69 (0.59–0.80) | 0.86 (0.71–1.04) |
| Ambivalent | 0.86 (0.66–1.11) | 0.83 (0.61–1.13) |
| High blood pressure (BC and P) | | |
| Unwanted | 1.15 (1.00–1.32) | 1.17 (0.98–1.39) |
| Mistimed | 1.10 (1.00–1.21) | 1.04 (0.92–1.17) |
| Ambivalent | 0.98 (0.83–1.16) | 0.87 (0.72–1.05) |
| Premature labor (P) | | |
| Unwanted | 1.44 (1.26–1.65) | 1.02 (0.86–1.21) |
| Mistimed | 1.43 (1.30–1.58) | 1.12 (1.00–1.26) |
| Ambivalent | 1.28 (1.06–1.53) | 0.95 (0.77–1.18) |
| Any maternal outcomes (P) | | |
| Unwanted | 1.44 (1.30–1.59) | 1.06 (0.93–1.21) |
| Mistimed | 1.38 (1.28–1.48) | 1.06 (0.97–1.16) |
| Ambivalent | 1.30 (1.13–1.49) | 0.98 (0.84–1.15) |
| Any maternal outcomes (BC) | | |
| Unwanted | 1.01 (0.90–1.13) | 1.09 (0.94–1.25) |
| Mistimed | 0.89 (0.83–0.97) | 0.98 (0.89–1.08) |
| Ambivalent | 0.92 (0.80–1.06) | 0.91 (0.77–1.07) |
| Any complications (BC) | | |
| Unwanted | 0.84 (0.78–0.91) | 0.93 (0.85–1.03) |
| Mistimed | 0.93 (0.88–0.98) | 0.94 (0.89–1.01) |
| Ambivalent | 0.90 (0.81–0.99) | 0.93 (0.83–1.05) |
| Any maternal outcomes (BC and P) | | |
| Unwanted | 1.24 (1.14–1.35) | 1.07 (0.95–1.19) |
| Mistimed | 1.17 (1.10–1.24) | 1.04 (0.96–1.11) |
| Ambivalent | 1.11 (0.99–1.24) | 0.94 (0.82–1.07) |

BC, variables from birth certificate; P, variables from Pregnancy Risk Assessment Monitoring System.

* Referent group is women with intended pregnancies.

† All outcomes adjusted for maternal age, maternal race, maternal ethnicity, maternal education, marital status, parity, prenatal care, smoking during pregnancy, drinking during pregnancy, and previous low birth weight or preterm delivery.



One of the main limitations in this study is the retrospective assessment of pregnancy intention at the time of conception. Several studies have shown that women underreport unintended pregnancy when asked about intention retrospectively, eg, a woman may state that she did not intend to become pregnant at the time of conception but then change her intention status after giving birth.^{32–34} Women's recall of pregnancy intention at the time of conception may be influenced by experiences during pregnancy, delivery, and the postpartum period. Using data from the National Longitudinal Survey of Youth, an analysis of pregnancy intention during and after pregnancy has shown that switching of intention does occur when women are asked retrospectively; however this switching occurs in both directions: from unintended to intended and intended to unintended. The authors concluded that even with this switching, there is not an underestimate or overestimate of the number of unintended pregnancies or potential consequences of unintendedness, including very low birth weight.³³ Two studies that examined pregnancy intention prospectively found that women who had unwanted pregnancies were at a higher risk of premature labor, which is consistent with our results.^{12,16}

Misclassification of ambivalence may also be a limitation. Women who responded to the mailed questionnaire could read all the response options for the pregnancy intention question; women who failed to answer the mailed questionnaire, but responded to the Pregnancy Risk Assessment Monitoring System questionnaire by phone, were not explicitly given the option "I don't know." In this case, only if a woman specifically stated that she did not know was she labeled as being ambivalent. In these data, 18% of participants responded by phone. Women participating by phone were less likely to respond "I don't know" than women participating by mail ($P<.001$). This may indicate misclassification of ambivalence; however, when we excluded women from our analysis who responded by phone, the estimates for ambivalence did not change substantially.

Another limitation may be an underestimation of maternal morbidity based on the information from birth certificate data and the Pregnancy Risk Assessment Monitoring System. An analysis comparing hospital discharge data, birth certificates, and Pregnancy Risk Assessment Monitoring System questionnaires showed low agreement between Pregnancy Risk Assessment Monitoring System and birth certificate records (Whitehead N, Callaghan W, Johnson C, Williams L. Maternal Morbidity Surveillance: Comparison of hospital discharge data, birth certi-

cates, and confidential questionnaires [abstract]. *Am J Epidemiol* 2004;159:S87). However, it is important to note that Pregnancy Risk Assessment Monitoring System, discharge data, and birth certificates are usually measuring different constructs. For example, the Pregnancy Risk Assessment Monitoring System measure of high blood pressure includes preeclampsia or toxemia, while in the birth certificate only hypertension status is recorded. Pregnancy Risk Assessment Monitoring System data are based on whether a woman recalls that she was hospitalized for a certain condition and, therefore, most likely underestimates the number of women who experienced one of the maternal outcomes. Furthermore, there is no detailed information about the condition, for example the type of diabetes. Birth certificates are more likely to capture events at delivery, and the collection process for the birth certificate data varies by hospital. We decided in this analysis that since both have shortcomings, it would be better to include the data from both. Even if there is misclassification by using a composite maternal outcome measure of the Pregnancy Risk Assessment Monitoring System and birth certificate data, it is unlikely that misclassification would differ by intention status. We conducted a sensitivity analysis for the outcomes of vaginal bleeding, diabetes, and hypertension to examine whether the associations with pregnancy intention were different when using only one source of data. The results only changed substantially for hypertension among pregnancies that were unwanted with a significant association when using the Pregnancy Risk Assessment Monitoring System data only.

Finally, some may argue that our results are an artifact of conducting a number of comparisons; however, all of our analyses were biologically plausible and based upon *a priori* hypotheses. We have reported all of our associations, not just the subset that was statistically significant.

The relationship between pregnancy intention and maternal morbidities has been understudied. A recent study emphasized that maternal morbidities during labor and delivery are much more frequent than previously thought and that elucidation of the factors related to this burden is necessary³⁵; more research will be necessary to determine the validity of our results. Our findings suggest that pregnancy intention may be an indicator for increased risk of poor outcomes, including low birth weight, preterm delivery, and premature rupture of the membranes. Therefore, knowledge of pregnancy intention may help clinicians provide the best possible care to their patients.



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APPENDIX

The authors thank the following members of the Pregnancy Risk Assessment Monitoring System Working Group for their work in data collection: Alabama—Albert Woolbright, PhD; Alaska—Kathy Perham-Hester, MS, MPH; Arkansas—Mary McGehee, PhD; Colorado—Alyson Shupe, PhD; Florida—Helen Marshall; Georgia—Carol Hoban, MS, MPH; Hawaii—Limin Song, MPH, CHES; Illinois—Theresa Sandidge, MA; Louisiana—Joan Wightkin; Maine—Kim Haggan; Maryland—Diana Cheng, MD; Michigan—Yasmina Bouraoui, MPH; Minnesota—Jan Jernell; Mississippi—Vernesia Wilson; Montana—JoAnn Dotson; Nebraska—Jennifer Severe-Oforah; New Jersey—Lakota Kruse, MD; New Mexico—Ssu Weng, MD, MPH; New York State—Anne Radi-



gan-Garcia; New York City—Candace Mulready-Ward, MPH; North Carolina—Paul Buescher, PhD; North Dakota—Sandra Anseth, RN; Ohio—Lily Tatham; Oklahoma—Dick Lorenz; Oregon—Ken Rosenberg, MD, MPH; Rhode Island—Sam Viner-Brown; South Carolina—Jim Ferguson,

DrPH; Texas—Tanya J. Guthrie, PhD; Utah—Laurie Baksh; Vermont—Peggy Brozicevic; Washington—Linda Lohdefinck; West Virginia—Melissa Baker, MA; CDC Pregnancy Risk Assessment Monitoring System Team, Applied Sciences Branch, Division of Reproductive Health.

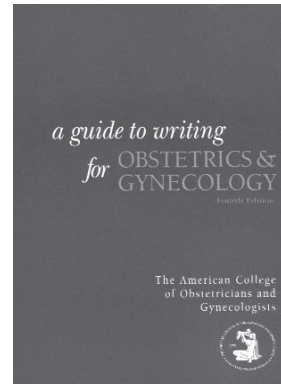


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