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Unintended pregnancy and associated maternal preconception, prenatal and postpartum behaviors☆

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Abstract

Background: This study was conducted to determine the relationship between unintended pregnancy and maternal behaviors before, during and after pregnancy.
Study Design: Data were analyzed from a stratified random sample of 9048 mothers who delivered live born infants between 2001 and 2006 and completed the Pregnancy Risk Assessment Monitoring System (PRAMS) survey 2 to 9 months after delivery. Binary and ordinal logistic regression methods with appropriate survey weights were used to control for socio-demographic factors.
Results: Compared to women with intended pregnancies, mothers with unwanted pregnancies were more likely to consume less than the recommended amount of preconception folic acid [adjusted odds ratio (OR) 2.39, 95% confidence interval (CI) 1.7–3.2], smoke prenatally (OR 2.03, 95% CI 1.5–2.9), smoke postpartum (OR 1.86, 95% CI 1.35–2.55) and report postpartum depression (OR 1.98, 95% CI 1.48–2.64); they were less likely to initiate prenatal care during the first trimester (OR 0.34, 95% CI 0.3–0.5) and breastfeed for 8 or more weeks (OR 0.74, 95% CI 0.57–0.97). Compared to women with intended pregnancies, women with mistimed pregnancies were also more likely to consume inadequate folic acid, delay prenatal care and report postpartum depression.
Conclusion: Even after controlling for multiple socio-demographic factors, unwanted and mistimed pregnancies were associated with unhealthy perinatal behaviors.

Keywords: Unintended pregnancy; Prenatal; Preconception; Postpartum; Depression; Smoking

1. Introduction

The reduction of unintended pregnancy is a prominent reproductive health objective for Healthy People 2010 — a national set of goals aimed at decreasing significant preventable health threats [1]. With nearly half of all pregnancies in the US estimated to be unwanted or wanted later at the time of conception [2], the impact of unintended pregnancy is a major public health concern.

A 1995 Institute of Medicine report [3] summarized the potential consequences of unintended pregnancy. The report acknowledged that factors such as tobacco and alcohol exposure, physical abuse, prenatal care utilization, infant low birth weight, preterm birth and breastfeeding may not be directly related to pregnancy intention but may be due to the fact that unintended pregnancies are more common among women with disadvantaged backgrounds. In general, studies have produced differing results on the relationship between pregnancy intention and maternal prenatal behaviors depending on the population studied and the methodology used [4–9]. Most previous studies in the US have mainly examined the association between pregnancy intention and prenatal behaviors, pregnancy outcomes, and breastfeeding. There has been a paucity of studies on preconception or postpartum factors and we know of no large US population-based studies on the relationship between pregnancy intention and perinatal behaviors for births occurring after 1999.

The goal of our study was to examine the relationship between pregnancy intention and preconception, prenatal

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and postpartum maternal behaviors in a recent birth cohort while controlling for socio-demographic factors.

2. Methods

We examined survey data collected from a random sample of postpartum mothers in Maryland who delivered live births between 2001 and 2006 and completed the Pregnancy Risk Assessment Monitoring System (PRAMS) survey. The Maryland Department of Health and Mental Hygiene conducts the survey under a cooperative agreement with the Centers for Disease Control and Prevention (CDC). Stratified random sampling is used to oversample mothers 35 years of age or older and women who delivered low birth weight (<2500 g) infants. The annual sample, determined by the CDC for each PRAMS state, is large enough for estimating statewide risk factor proportions within 3.5% at a 95% confidence level. Mothers are sent up to three surveys followed by telephone interviews if no response is received by mail. Survey data are linked with birth certificate data to provide additional demographic, medical and pregnancy information. The 9048 responses to the survey received during the study years were weighted to make the results representative of all Maryland women delivering live born infants during the study period and to account for nonresponse. The overall response rate for the survey during this study period was 71%.

Pregnancy intention was assessed by response to the survey question, "Thinking back to just before you got pregnant, how did you feel about becoming pregnant?" For the purpose of this report, a woman who reported, "I wanted to be pregnant then" or "I wanted to be pregnant sooner" was considered to have had an intended pregnancy; a woman who reported, "I wanted to be pregnant later" was considered to have had a mistimed pregnancy; and a women who responded, "I didn't want to be pregnant then or at any time the future" was considered to have had an unwanted pregnancy. "I don't know" was not presented as a response option to this question.

Maternal behaviors studied included use of a multivitamin containing folic acid during the 3 months before pregnancy, smoking during the last 3 months of pregnancy, smoking postpartum, alcohol consumption during the last 3 months of pregnancy, time of initiation of prenatal care, breastfeeding initiation, breastfeeding for 8 or more weeks, infant sleep position and postpartum contraception use. Data were summarized using PROC CROSSTAB in SAS-callable SUDAAN (RTI International, Research Triangle Park, NC, USA). Binary and ordinal logistic regression methods using appropriate survey weights were used to control for socio-demographic factors including maternal age, race/ethnicity, Medicaid status, parity, marital status and educational level using Stata version 10.0 (StataCorp, College Station, TX, USA). The appropriate institutional review boards qualified this project as exempt research.

3. Results

A total of 41.4% of mothers reported that their pregnancies were unintended, including 31.1% that were mistimed and 10.3% that were unwanted. Both mistimed and unwanted pregnancies were more prevalent among mothers who were black, unmarried, completed 12 or less years of school and were enrolled in Medicaid. Teen mothers had the highest percentage of births that were mistimed (65.8%), while women 40 years of age and older had the highest percentage of births that were unwanted (20.8%) (Table 1).

With the exception of alcohol use during pregnancy and postpartum contraception use, unhealthy behaviors were more prevalent among mothers with unwanted births than mothers with mistimed or intended births (Table 2). After controlling for socio-demographic factors, unhealthy behaviors were still more likely to be associated with unwanted pregnancies than with intended or mistimed pregnancies (Table 3). However, pregnancy intention was no longer significantly associated with breastfeeding

Table 1
Maternal characteristics by pregnancy intention

Maternal characteristic*	Pregnancy intention		
	Intended (*n*=5798), %	Mistimed (*n*=2188), %	Unwanted (*n*=1062), %
Total, *N*=9048	58.7	31.1	10.3
Race/Hispanic origin			
White, non-Hispanic	68.5	25.2	6.3
Black, non-Hispanic	39.6	40.7	19.7
Asian, non-Hispanic	72.7	20.2	7.2
Hispanic	55.4	39.3	5.3
Other	55.1	36.7	8.1
Age, years			
<20	21.3	65.8	12.8
20–24	41.4	47.0	11.6
25–29	61.4	29.1	9.5
30–34	71.8	21.0	7.3
35–39	76.0	12.8	11.3
40+	72.9	6.3	20.8
Education, ages 20+			
<12 years	50.9	32.2	16.9
12 years	51.2	35.0	13.9
>12 years	69.9	23.0	7.0
Medicaid enrollment			
Yes	37.6	39.7	22.7
No	60.3	30.4	9.3
Marital status			
Married	74.0	20.1	5.9
Unmarried	32.6	49.8	17.6
Previous live births			
None	58.9	35.4	5.6
1	64.5	27.9	7.6
2	53.2	28.5	18.3
3 or more	47.2	26.0	26.8

* p<.01 for all comparisons.

Table 2
Preconception, prenatal and postpartum maternal behaviors by pregnancy intention

Maternal behaviors*	Pregnancy intention		
	Intended, %	Mistimed, %	Unwanted, %
Preconception			
Folic acid use, less than daily	41.5	16.6	14.9
Prenatal			
Cigarette use, 3rd trimester	8.3	11.7	23.3
Alcohol use, 3rd trimester**	9.7	8.4	6.1
Prenatal care began, 1st trimester	86.1	66.7	54.9
No prenatal care	0.4	1.5	2.7
Postpartum			
Cigarette use	11.7	18.5	28.7
Breastfed, ever	82.1	73.1	63.2
Breastfed, 8+ weeks	62.7	51.2	41.5
Infant sleep position, back	69.8	59.2	52.4
Depression	13.6	20.0	27.4
Contraception use**	80.4	83.6	84.8

* For all factors except alcohol use and contraception use, p<.01 for all comparisons.
** p<.05 for all comparisons.

initiation, infant sleep position and postpartum contraception use (Table 3).

4. Discussion

Our findings show that unintended pregnancies are very common, accounting for two out of every five live births in Maryland. Furthermore, the association of mistimed and unwanted births with unhealthy perinatal behaviors persists after controlling for multiple socio-demographic factors.

Although current guidelines recommend that all women of childbearing age consume folic acid daily to prevent neural tube birth defects in case of unplanned pregnancy [10], our findings, similar to a prior study of 1998–1999 Oregon births [11], showed that only 15% of mothers with unwanted pregnancies met these recommendations. After controlling for socio-demographic factors, we found that mothers with unwanted or mistimed pregnancies were more than twice as likely to report inadequate daily consumption of folic acid before pregnancy as mothers with intended pregnancies. Since preconception health visits are usually only utilized by women who are actively planning a pregnancy, women may benefit from the incorporation of folic acid guidelines into routine family planning or other health services that young women utilize.

Our findings showed that women with unwanted or mistimed pregnancies were more likely to delay initiation of prenatal care until after the first trimester than women with intended pregnancies. The delay in prenatal care has been reported in other studies and, according to Kost et al. [4], most likely reflects a delay in recognition of the pregnancy. Although information about first trimester cigarette, alcohol and drug use is not collected through PRAMS survey, prior studies have shown that women with unplanned pregnancies are more likely to place their fetuses at risk during the first trimester through exposure to potential teratogens [9,12]. We found that women with unwanted pregnancies were more than twice as likely to smoke during the last 3 months of pregnancy than women with intended pregnancies. Since it is unlikely that nonsmokers would begin smoking during pregnancy, these women probably smoked throughout the pregnancy — placing their pregnancies at risk for many adverse outcomes [13]. In addition, a delay in care for women with medical disorders such as diabetes places their pregnancies at higher risk [14].

The findings that mothers with mistimed and unwanted births were as likely as mothers with intended births to initiate breastfeeding, place their infants to sleep on their backs and use postpartum contraception provide support for the concept that many mothers with unintended births

Table 3
Impact of pregnancy intention on preconception, prenatal and postpartum maternal behaviors

Maternal behaviors	Unadjusted odds ratio (95% CI)		Adjusted odds ratio* (95% CI)	
	Referent group=intended pregnancy		Referent group=intended pregnancy	
	Mistimed	Unwanted	Mistimed	Unwanted
Preconception				
Folic acid use, less than daily	3.57 (2.98–4.27)	4.06 (3.06–5.39)	2.17 (1.78–2.64)	2.33 (1.71–3.19)
Prenatal				
Prenatal care began, 1st trimester	0.32 (0.27–0.39)	0.20 (0.16–0.25)	0.54 (0.44–0.67)	0.34 (0.26–0.45)
Cigarette use during pregnancy	1.46 (1.15–1.86)	3.36 (2.53–4.44)	0.88 (0.65–1.19)	2.07 (1.47–2.92)
Alcohol use during pregnancy	0.86 (0.67–1.09)	0.60 (0.42–0.86)	1.27 (0.97–1.68)	0.76 (0.51–1.13)
Postpartum				
Cigarette use	1.71 (1.40–2.09)	3.03 (2.34–3.92)	0.99 (0.76–1.28)	1.86 (1.35–2.55)
Breastfed, ever	0.60 (0.50–0.71)	0.37 (0.30–0.47)	1.03 (0.83–1.27)	0.79 (0.60–1.05)
Breastfed, 8+ weeks	0.62 (0.54–0.72)	0.42 (0.34–0.53)	1.15 (0.96–1.39)	0.74 (0.57–0.97)
Infant sleep position, back	0.63 (0.54–0.73)	0.48 (0.38–0.60)	1.01 (0.84–1.21)	0.92 (0.71–1.18)
Depression	1.59 (1.32–1.92)	2.41 (1.87–3.10)	1.34 (1.08–1.68)	1.98 (1.48–2.64)
Contraception use	1.24 (1.02–1.50)	1.36 (1.01–1.83)	1.10 (0.89–1.37)	1.33 (0.96–1.84)

* Adjusted for maternal age, race/ethnicity, education, marital status, Medicaid status and parity.

attempt to practice healthy behaviors. However, the more challenging behaviors, such as breastfeeding for 8 weeks' duration and smoking cessation, were less prevalent among women with unwanted pregnancies than among women with intended or mistimed ones. Past studies have similarly found that infants from unintended births are more likely to be breastfed shorter durations than infants from intended births [6,7,15]. In contrast, unlike these past studies, our research did not find differences in breastfeeding initiation. This may be due, in part, to PRAMS survey responses of breastfeeding even one time as a positive for breastfeeding initiation. Postpartum depression was also more prevalent among mothers with unwanted and mistimed births than among mothers with intended births. There has been surprisingly little research on the relationship between depression and unintended births in the US. The few studies that have looked at depression, mostly from other developed countries, have found higher levels of depression among mothers with unwanted births [16–18]. Our study confirms these findings, showing that women with unwanted births were nearly twice as likely to report feeling depressed during the postpartum period as women with intended births. Postpartum depression has been shown to result in poor mother–infant interactions and subsequent behavioral and cognitive difficulties for the child [19–21]. In its most severe form, depression can threaten the life and safety of the mother and her family. Mothers with depressive symptoms are less likely to continue breastfeeding [22] and more likely to smoke daily [23]. Postpartum smoking and its association with pregnancy intention have not been studied adequately either. It is likely that smoking cessation may be especially problematic for women undergoing the stress of an unwanted birth. In addition, outcomes from exposure to secondhand smoke such as sudden infant death syndrome (SIDS), disruption of normal maternal–infant interactions due to maternal depression, and the loss of the full benefits of breast milk may have potential long-term consequences for a child [13,21,24] well beyond the perinatal period.

The question of whether mistimed or unwanted pregnancies result in poor birth outcomes remains unanswered. A recent 18-state analysis of 1996–1999 births using PRAMS data revealed that unwanted births were more likely than intended births to be associated with preterm delivery but not infant birth weight [25]. However, the magnitude of this finding was relatively small (adjusted OR 1.15, 95% CI 1.01–1.33) [25] and other studies have not shown consistent findings for infant birth weight or preterm birth [5–7]. Future research should examine other outcomes such as neural tube defects, fetal or infant death, SIDS and later childhood cognitive or behavioral disorders that may be due to unhealthy behaviors associated with unwanted pregnancies.

There are several limitations to this study. As in any retrospective survey, the responses are subject to recall bias. Also, the ideal time to ascertain pregnancy intention is just before conception and not after delivery when conditions may change the perception of intendedness [26]. Also, the definition of unintended pregnancy (pregnancy wanted later or unwanted at any time) is innately problematic. The PRAMS survey does not assess whether the mother or father was pleased with the pregnancy nor does it assess ambivalent feelings about the pregnancy or other social and cultural factors that go into the individual's desirability of the pregnancy [26,27]. Surveys such as PRAMS are subject to social desirability. Questions about smoking, alcohol and physical violence may not be answered truthfully and the incidence of these behaviors may be underestimated. The determination of postpartum depression was based on the mother's self-reporting of her symptoms and not on a clinical diagnosis. The dataset used for this study includes information collected only from mothers who delivered live born infants. It is possible that the association between pregnancy intendedness and preconceptional or prenatal behaviors may be different among women whose pregnancies result in fetal loss or pregnancy termination.

In conclusion, unwanted pregnancies that result in live birth are associated with maternal smoking during pregnancy and postpartum, inadequate preconceptional folic acid consumption, delayed initiation of prenatal care until after the first trimester, postpartum depression and breastfeeding for less than 8 weeks. Mistimed births were also associated with poor folic acid intake, delayed prenatal care and postpartum depression but to a lesser extent than unwanted births. Prevention of mistimed and unwanted births through pregnancy planning and utilization of effective contraception will help to reduce the magnitude of these unhealthy perinatal factors. Integration of topics such as smoking cessation and folic acid intake into primary care and family planning services for women of reproductive age may help to increase healthy behaviors among women with unintended pregnancies. Further research is needed to elucidate the potential perinatal and long-term adverse effects of unintended pregnancy on mothers and families.

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References

[1] U.S. Department of Health and Human Services. Healthy People 2010. 2nd Ed.With understanding and improving health and objectives for improving health, vol. 1. Washington, DC: Government Printing Office; 2000.

[2] Finer LB, Henshaw SK. Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. Perspect Sex Reprod Health 2006; 38:90–6.

[3] Institute of Medicine. The best intentions: unintended pregnancy and the well-being of children and families. Washington, DC: National Academy Press; 1995.

[4] Kost K, Landry DJ, Joyce T. Predicting maternal behaviors during pregnancy: does intention status matter? Fam Plann Perspect 1998;30: 79–88.
[5] Kost K, Landry DJ, Darroch JE. The effects of pregnancy planning status on birth outcomes and infant care. Fam Plann Perspect 1998;30: 223–30.
[6] Joyce TJ, Kaester R, Korenman SD. Effect of pregnancy intention on child development. Demography 2000;37:83–94.
[7] Korenman S, Kaestner R, Joyce T. Consequences for infants of parental disagreement in pregnancy intention. Perspect Sex Reprod Health 2002;34:198–205.
[8] D'Angelo DV, Gilbert BC, Rochat RW, Santelli JS, Herold JM. Differences between mistimed and unwanted pregnancies among women who have live births. Perspect Sex Reprod Health 2004;36: 192–7.
[9] Than LC, Honein MA, Watkins ML, Yoon PW, Daniel KL, Correa A. Intent to become pregnant as a predictor of exposures during pregnancy: is there a relation? J Reprod Med 2005;50:389–96.
[10] Toriello HV. Folic acid and neural tube defects. Genet Med 2005;7: 283–4.
[11] Rosenberg KD, Gelow JM, Sandoval AP. Pregnancy intention and the use of periconceptional folic acid. Pediatrics 2003;111:1142–5.
[12] Han JY, Nava-Ocampo AA, Koren G. Unintended pregnancies and exposure to potential human teratogens. Birth Defects Res A Clin Mol Teratol 2005;73:245–8.
[13] U.S. Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. Washington, DC: DHHS; 2006.
[14] American Diabetes Association. Preconception care of women with diabetes. Diabetes Care 2003;26:S91–3.
[15] Taylor JS, Cabral HJ. Are women with an unintended pregnancy less likely to breastfeed? J Fam Pract 2002;51:431–6.
[16] Barber JS, Axinn WG, Thornton A. Unwanted childbearing, health, and mother–child relationships. J Health Soc Behav 1999;40: 231–57.
[17] Nakku JN, Nakasi G, Mirembe F. Postpartum major depression at six weeks in primary health care: prevalence and associated factors. Afr Health Sci 2006;6:207–14.
[18] Najman JM, Morrison J, Williams G, Andersen M, Keeping JD. The mental health of women 6 months after they give birth to an unwanted baby: a longitudinal study. Soc Sci Med 1991;32:241–7.
[19] Murray L, Fiori-Cowley A, Hooper R, Cooper P. The impact of postnatal depression and associated adversity on early mother–infant interactions and later infant outcomes. Child Dev 1996;67:2512–26.
[20] Cohn JF, Tronick E. Specificity of infants' response to mothers' affective behavior. J Am Acad Child Adolesc Psychiatry 1989;28:242–8.
[21] Weinberg MK, Tronick EZ. The impact of maternal psychiatric illness on infant development. J Clin Psychiatry 1998;59(Suppl 2):53–61.
[22] McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. Maternal depressive symptoms at 2 to 4 months post partum and early parenting practices. Arch Pediatr Adolesc Med 2006;160:279–84.
[23] Breslau N, Peterson EL, Schultz LR, Chilcoat HD, Andreski P. Major depression and stages of smoking. Arch Gen Psych 1998;55:161–6.
[24] American Academy of Pediatrics. Breastfeeding and the use of human milk. Pediatrics 2005;115:496–506.
[25] Mohllajee AP, Curtis KM, Morrow B, Marchbanks PA. Pregnancy intention and its relationship to birth and maternal outcomes. Obstet Gynecol 2007;109:678–86.
[26] Santelli J, Rochat R, Hatfield-Timajchy K, et al. The measurement and meaning of unintended pregnancy. Perspect Sex Reprod Health 2004; 35:94–101.
[27] Klerman LV. The intendedness of pregnancy: a concept in transition. Matern Child Health J 2000;4:155–62.