in traditional method use (greater for the rural commune than for the urban commune), the shifts may have contributed to higher method failure levels. Net of sociodemographic factors, intrauterine device adoption clearly reduces, and traditional method use increases, the likelihood of abortion. Expanding the availability and range of modern contraceptive methods in rural areas is indicated by these results. □

References

1. Allman J, Nhan VQ, Thang NM, San PB, Man VD. Fertility and family planning in Vietnam. *Stud Fam Plann.* 1991;22:308–317.
2. Goodkind D. Abortion in Vietnam: measurements, puzzles, and concerns. *Stud Fam Plann.* 1994;25:342–352.
3. *Vietnam Demographic and Health Survey 1988.* Hanoi, Vietnam: National Committee for Population and Family Planning; 1990.
4. General Statistical Office. *Vietnam Intercensal Demographic Survey 1994: Major Findings.* Hanoi, Vietnam: Statistical Publishing House; 1995.

Differences in Preconceptional and Prenatal Behaviors in Women with Intended and Unintended Pregnancies

Wendy L. Hellerstedt, PhD, MPH, Phyllis L. Pirie, PhD, Harry A. Lando, PhD, Susan J. Curry, PhD, Colleen M. McBride, PhD, Louis C. Grothaus, MA, and Jennifer Clark Nelson, MS

ABSTRACT

Objectives. This study examined whether pregnancy intention was associated with cigarette smoking, alcohol drinking, use of vitamins, and consumption of caffeinated drinks prior to pregnancy and in early pregnancy.

Methods. Data from a telephone survey of 7174 pregnant women were analyzed.

Results. In comparison with women whose pregnancies were intended, women with unintended pregnancies were more likely to report cigarette smoking and less likely to report daily vitamin use. Women with unintended pregnancies were also less likely to decrease consumption of caffeinated beverages or increase daily vitamin use.

Conclusions. Pregnancy intention was associated with health behaviors, prior to pregnancy and in early pregnancy, that may influence pregnancy course and birth outcomes. (*Am J Public Health.* 1998; 88:663–666)

Introduction

Despite a national health goal to reduce the rate of unintended pregnancy to 30% by the year 2000,[1] the frequencies of unintended pregnancies and unintended births appear to be increasing in the United States, after almost 2 decades of decline.[2,3] It has been estimated that 43% of all live births in the United States in 1988 were the result of unintended pregnancies.[4]

Unintended pregnancy is usually defined as a pregnancy that is mistimed (i.e., earlier than desired) or unwanted.[3,5] Infants of unintended pregnancies may be at risk for low birthweight,[6–8] preterm delivery,[8] and neonatal mortality.[9] The mechanisms linking unintended pregnancy to poor birth outcomes are not clear, but they may be associated with maternal socioeconomic risk factors, less than adequate prenatal care, and preconceptional and prenatal maternal behavioral risk factors.[4,5,10,11] Because many births in the United States are unintended, and because it is the goal of clinicians and health educators to influence maternal behaviors in order to optimize fetal growth and reduce pregnancy complications, it is important to understand whether pregnancy intention is associated with the behavioral risks a woman brings to her pregnancy or with the likelihood of behavioral change after pregnancy confirmation. Women with unintended pregnancies may be more likely to smoke cigarettes during pregnancy than those with intended pregnancies[7,12,13] and more likely to drink alcohol during pregnancy.[7,14] Data on the association between pregnancy intention and preconceptional and prenatal behavioral changes are meager.

The purpose of this study was to examine the associations of pregnancy intention to cigarette smoking, alcohol drinking, and use of vitamins and caffeinated drinks prior to pregnancy and during early pregnancy. It was hypothesized that women with unintended pregnancies would be more likely than those with intended pregnancies to engage in behaviors, prior to and during pregnancy, that could compromise fetal growth and the pregnancy course. It was also hypothesized that women with unintended pregnancies would be less likely than those with intended pregnancies to change health-compromising behaviors.

Wendy L. Hellerstedt is with the Division of Health Management and Policy, School of Public Health, University of Minnesota, Minneapolis. Phyllis L. Pirie and Harry A. Lando are with the Division of Epidemiology, School of Public Health, University of Minnesota. Susan J. Curry, Louis C. Grothaus and Jennifer Clark Nelson are with the Center for Health Studies, Group Health Cooperative of Puget Sound, Seattle, Wash. Colleen M. McBride is with Cancer Control Research, Duke Comprehensive Cancer Center, Durham, NC.

Requests for reprints should be sent to Wendy L. Hellerstedt, PhD, MPH, Maternal and Child Health Program, Division of Health Management and Policy, School of Public Health, University of Minnesota, Box 97 Mayo, Minneapolis, MN 55454-1015.

This paper was accepted September 2, 1997.

Methods

Subjects were pregnant women who participated in a telephone health behavior survey. Subjects were selected from the appointment logs of women scheduled for their first prenatal care visit at either the Group Health Cooperative of Puget Sound in Washington State or Park-Nicollet of Minnesota. All potential subjects received introductory letters about the health behavior survey and could decline participation by making a toll-free telephone call or by returning a postcard to the investigator. Of the 8827 women telephoned over a 20-month period, 704 (8%) were not eligible for the survey because of language problems (n=138), miscarriage (n=419), termination of pregnancy (n=35), or other problems related to sampling error or subject characteristics. Of the 8123 women eligible for the survey, 7489 (92%) completed it. In the current study, 315 additional women were excluded because they were missing data on pregnancy intention (n=64) or they were more than 20 weeks pregnant at the time of the survey (n=251). Thus, the final sample size was 7174.

Pregnancy intention was categorized by responses to the following questions: "Thinking back to just before your pregnancy, how did you feel about becoming pregnant? Would you say you wanted to be pregnant sooner than you were (i.e., intended), wanted to be pregnant at this time (i.e., intended), wanted to be pregnant but at a later time (i.e., mistimed), or did not want to be pregnant now or in the future (i.e., unwanted)?"

Questions concerning health behaviors focused on 2 time periods: the time of the survey (i.e., within the first 20 weeks of pregnancy) and immediately before the subject became pregnant. Regarding intake of caffeinated beverages, subjects were asked whether they drank them "not at all, once a week or less, a few times a week, once a day, or a few times a day or more" during both periods. Alcohol intake was estimated by a question concerning the number of drinks the subject had in a typical week during both periods. Subjects reported average vitamin intake during both periods by endorsing one of the following responses: daily, a few times a week, occasionally, or not at all. Smoking status was determined by several questions. Subjects who reported that they had never smoked regularly or had not smoked more than 100 cigarettes in their lifetime were considered nonsmokers. Those who had "ever smoked regularly" were considered prenatal smokers if they reported smoking within 7 days of the survey. Subjects who reported smoking during the 30 days prior to learning they were pregnant were considered preconceptional smokers. Current (prenatal) and preconceptional smokers were also asked how many cigarettes they smoked daily, on average.

Chi-square analyses and analyses of variance were conducted to examine differences in demographic and behavioral characteristics among women whose pregnancies were intended, mistimed, and unwanted and to examine whether behavioral change was associated with pregnancy intention.[15] Behavioral change, from immediately before the pregnancy to the early prenatal period, was defined dichotomously as either no change/no improvement or improvement in behavior. Improvements in behavior were defined as self-reported reduction in intake or abstinence among alcohol and caffeine drinkers, smoking cessation among smokers, and an increase in or initiation of vitamin supplementation among women who were not daily users prior to pregnancy. As a means of further examining differences in behaviors and behavioral changes, multivariate logistic regression analyses were conducted to assess differences between women with intended pregnancies and women with unintended (i.e., mistimed or unwanted) pregnancies. The adjusted odds ratios and 95% confidence intervals produced by these regression analyses were controlled for the gestational age of the fetus at the time of the survey and maternal age, race, marital status, education, income, employment status, and study site. Analyses of prenatal behaviors and behavioral changes were also adjusted for self-reported history of "morning sickness."

TABLE 1—Characteristics, Preconceptional Behaviors, and Prenatal Behaviors, by Pregnancy Intention: 7174 Pregnant Women Who Sought Prenatal Care Prior to 20 Weeks Gestation in Washington or Minnesota

	Pregnancy Intention		
	Intended (n = 5285)	Mistimed (n = 1633)	Unwanted (n = 256)
Characteristics[a]			
Age, y, mean (SD)*	30.2 (4.5)	27.6 (5.0)	32.4 (5.4)
White, %*	89.1	82.6	77.7
Married, %*	97.9	81.4	89.1
Employed, %*	82.7	79.1	68.8
Education, %*			
Less than high school	14.9	24.9	24.6
Some post–high school	31.3	38.7	41.4
College degree	53.8	36.4	34.0
Annual household income >$30 000, %	85.4	67.3	75.8
Ever pregnant, %*	68.5	65.5	94.9
Preconceptional behaviors			
Cigarette smoker, %***	12.1	24.4	23.4
One or more alcoholic drinks per week, %**	44.2	44.6	35.2
Daily caffeine use, %*	67.5	69.8	73.8
Daily vitamin use, %***	30.3	19.8	20.3
Prenatal behaviors			
Cigarette smoker, %***	6.3	13.9	15.6
One or more alcoholic drinks per week, %	1.7	2.0	2.0
Daily caffeine use, %**	26.0	28.6	38.7
Daily vitamin use, %***	76.4	71.5	63.7

[a]Characteristics at the time of the telephone survey (i.e., 1–20 weeks gestation).
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$ (analysis of variance of means or chi-square analysis for differences among groups).

Results

Of the 7174 subjects, 74% reported that their pregnancies were intended, 23% reported that they were mistimed, and 4% reported that they were unwanted. On average, subjects were 8 weeks pregnant (SD = 4), with a range of 1 to 20 completed weeks of gestation. Subjects ranged in age from 18 to 48 years; 3% were 18 or 19 years old, 44% were 20 to 29 years old, and 53% were older than 29 years. Thirty-seven percent of the subjects had college degrees, and an additional 12% had some graduate education. Subjects were generally of middle

TABLE 2—Unadjusted and Adjusted Odds Ratios for Preconceptional Behaviors, Prenatal Behaviors, and Change in Behaviors in 1889 Women with Unintended Pregnancies vs 5285 Women with Intended Pregnancies

Maternal Behavior	Unadjusted Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio[a] (95% Confidence Interval)
Preconceptional behaviors		
Cigarette smoker	2.32 (2.03, 2.65)****	1.50 (1.28, 1.75)****
One or more alcoholic drinks per week	0.96 (0.87, 1.07)	1.15 (1.02, 1.29)*
Daily caffeine use	1.14 (1.02, 1.28)*	1.15 (1.01, 1.30)*
Daily vitamin use	0.57 (0.50, 0.65)****	0.66 (0.58, 0.76)****
Prenatal behaviors		
Cigarette smoker	2.44 (2.07, 2.88)****	1.54 (1.27, 1.88)****
One or more alcoholic drinks per week	1.15 (0.79, 1.70)	1.17 (0.77, 1.76)
Daily caffeine use	1.22 (1.08, 1.37)***	1.17 (1.03, 1.32)*
Daily vitamin use	0.74 (0.66, 0.83)****	0.79 (0.70, 0.90)***
Prenatal behavioral change		
Smoking cessation[b]	0.87 (0.65, 0.96)*	0.84 (0.64, 1.10)
Decrease in alcohol use[c]	0.99 (0.72, 1.20)	0.87 (0.57, 1.35)
Decrease in caffeine use[d]	0.93 (0.68, 0.97)***	0.87 (0.76, 1.00)*
Vitamin increase or initiation[e]	0.94 (0.83, 0.98)**	0.83 (0.72, 0.95)**

Note. Unadjusted and adjusted odds ratios, from logistic regression analyses, reflect the frequencies for women with unintended (i.e., mistimed or unwanted) pregnancies vs women whose pregnancies were intended.

[a]Adjusted for the gestational age of the fetus at the time of the survey, study site, experience of morning sickness during pregnancy (for prenatal behavior analyses only), maternal age, race, income, education, employment, and marital status.

[b]n = 1099; 641 women with intended and 458 women with unintended pregnancies smoked prior to conception.

[c]n = 3154; 2337 women with intended and 817 women with unintended pregnancies drank alcohol prior to conception.

[d]n = 4897; 3569 women with intended and 1328 women with unintended pregnancies drank caffeinated beverages prior to conception.

[e]n = 5196; 3683 women with intended and 1513 women with unintended pregnancies did not use vitamins daily prior to conception.

*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$; ****$P \leq .0001$ (differences between women with unintended and intended pregnancies from chi-square analyses for unadjusted frequencies or multivariate logistic regression analyses).

income; 56% reported annual household incomes above $45 000, and 4% reported incomes of less than $15 000. Women with intended pregnancies appeared to be at the lowest sociodemographic risk for poor birth outcomes, although even women with unwanted pregnancies were apparently stable socially and economically (Table 1). Women with unwanted pregnancies, however, varied from women with mistimed pregnancies in separate chi-square analyses of these 2 groups. Women with unwanted pregnancies, in comparison with those whose pregnancies were mistimed, were less likely to be White ($P = .05$) or to be employed ($P = .001$) but were more likely to be married ($P = .003$), to have annual incomes over $30 000 ($P = .004$), and to have ever been pregnant ($P = .001$). Women with unwanted pregnancies were also, on average, 5 years older than women with mistimed pregnancies ($P = .0001$).

Preconceptional behaviors varied by pregnancy intention, with the most marked differences in cigarette smoking and daily vitamin supplement use. Among the 1099 smokers prior to pregnancy, there were no differences in the total number of cigarettes smoked daily by pregnancy intention. On average, prepregnancy smokers smoked 14.5 (SD = 9) cigarettes daily. Alcohol intake among drinkers in this sample was low; 56% reported drinking no alcohol in a typical week, and less than 3% reported typically drinking more than 7 drinks per week prior to pregnancy.

Prenatal behaviors generally varied by pregnancy intention. The frequencies of cigarette smoking, alcohol drinking, and caffeine use were lower during pregnancy than the frequencies reported prior to pregnancy, and daily vitamin use was much higher during pregnancy. Among the 601 women who smoked during pregnancy, smoking intensity did not vary by pregnancy intention. However, the average number of cigarettes smoked daily by all smokers during pregnancy (mean = 8.5, SD = 6) was lower than the average number prior to pregnancy. The frequency of alcohol drinking during pregnancy was low—less than 2%—with no variation by pregnancy intention. Among the 373 women who reported some alcohol drinking during their pregnancy, 65% reported typically consuming less than one drink per week.

Multivariate analyses showed that the frequencies of preconceptional smoking, alcohol intake, and caffeine use were higher, and daily vitamin intake was lower, for women with unintended pregnancies than for women whose pregnancies were intended (Table 2). The slightly higher frequencies for women with unintended pregnancies persisted in early pregnancy, except for alcohol use, which had markedly decreased from the preconceptional level for all women.

Pregnancy intention was not strongly associated with behavioral changes in multivariate analyses. However, women with intended pregnancies were more likely than those with unintended pregnancies to report increased vitamin use and decreased consumption of caffeine in early pregnancy. Smoking cessation was more likely among women with intended pregnancies, but significance did not persist in adjusted analyses.

Discussion

Pregnancy intention was consistently associated with preconceptional and prenatal behaviors in the hypothesized directions, although some associations were not strong. The findings suggest that women with unintended pregnancies may enter their pregnancies with behaviors that could influence the course of pregnancy and that such behaviors may persist after pregnancy confirmation. However, pregnancy intention did not appear to be strongly associated with behavioral change.

The relatively low odds for health-compromising behaviors among women with unintended pregnancies reported here and elsewhere[7,12,13] may reflect the fact that pregnancy intention is not strongly associated with some maternal behaviors or that reporting and sampling biases significantly obscure the magnitude of true associations. In the current study, the relatively low overall frequencies of self-reported health-compromising behaviors could have influenced the observed associations between pregnancy intention and behavior. Fifteen percent of this sample smoked cigarettes prior to pregnancy; in contrast, the 1990 National Health Interview Survey on Health Promotion and Disease Prevention estimated that

25% of women 18 to 44 years of age smoked cigarettes in the year before they became pregnant.[16] The reports of cigarette smoking and alcohol use during pregnancy in this sample were also lower than those from national data. Eight percent of the study sample smoked cigarettes during early pregnancy, as compared with the estimate from the 1990 National Health Interview Survey on Health Promotion and Disease Prevention that 15% of women smoke at some time during pregnancy.[16] Two percent of the study sample drank alcohol early in pregnancy, in comparison with a 1988 national estimate that 34% of all pregnant women drink alcohol at some time during pregnancy.[17] Preconceptional and prenatal cigarette smoking and alcohol drinking may be underreported in samples of relatively well-educated women, such as this one, although a recent small study of pregnant women showed that self-reported smoking correlated well with saliva cotinine levels.[18] Furthermore, early prenatal care may be associated with maternal behavioral change or disposition toward prepregnancy or prenatal behavioral risks, independent of pregnancy planning status.[13] Because this sample was restricted to women who sought prenatal care relatively early, the data may not be generalizable to women who receive later, or no, care.

Data from the 1988 National Maternal and Infant Health Survey show that 36% of the births occurring in the United States are mistimed and that 7% are unwanted.[4] Unintended pregnancy resulting in birth in the United States is most common among women who have less than adequate prenatal care and who are non-White, poorly educated, adolescent, and living in poverty.[2–4,19] The unintended pregnancy prevalence of 27% in this study was lower than the national average but higher than might have been expected given that the women in this study were from relatively secure sociodemographic backgrounds and were seeking prenatal care early in pregnancy.[7,14,19] The demographic profiles of women with unwanted and mistimed pregnancies were of particular interest because they suggest that the risk for unwanted pregnancy in women of relatively secure backgrounds may cluster among multiparas who thought they had completed their families. Women with unwanted pregnancies were about 5 years older, more likely to be married, and of higher average income than women with mistimed pregnancies. These data are not consistent with national data, which show that unwanted births cluster among young, unmarried, poor women.[10] It is plausible, then, that self-reported pregnancy intention, risk for unintended pregnancy, and/or resolution of unintended pregnancy may vary by maternal socioeconomic factors.

Two implications from this study deserve further consideration. One is that, in this sample of insured, well-educated, middle-class women, more than one quarter reported that the pregnancies they intended to carry to term were mistimed or unwanted. These data, and those from another study indicating that 43% of unintended pregnancies occurred among couples who were using some form of contraception during the month of conception,[20] suggest that the availability of effective contraceptives is less than optimal for individuals in all social classes.

This study also suggests that knowledge of pregnancy intention may be relevant in the provision of prenatal health education and services. Women with unintended pregnancies in this study were almost twice as likely to be smokers as women with intended pregnancies, an association as strong as those of conventional sociodemographic factors to maternal smoking. A mistimed or unwanted pregnancy can have negative professional and personal consequences. It is possible that some women enter their pregnancies with low motivation to make behavioral changes that could optimize fetal growth, perhaps because they have more immediate mental, physical, or practical health or service needs associated with adaptation to an unplanned pregnancy. The effective promotion of healthy pregnancies through behavioral change may thus involve consideration of maternal attitudes and adjustment to the pregnancy. □

Acknowledgments

This research was supported by National Institutes of Health grant HL48121 (Susan J. Curry, principal investigator).

Portions of this paper were presented at the 17th Annual Meeting of the International Society of Behavioral Medicine, March 1996, Washington, DC.

References

1. *Promoting Health/Preventing Disease: Year 2000 Objectives for the Nation. 1991.* Washington, DC: Public Health Service; 1991. DHHS publication PHS 91-50213.
2. Forrest JD. Epidemiology of unintended pregnancy and contraceptive use. *Am J Obstet Gynecol.* 1994;170:1485–1489.
3. Williams LB, Pratt WF. Wanted and unwanted childbearing in the United States: 1973–1988. *Adv Data Vital Health Stat.* September 26, 1990;No. 189.
4. Kost K, Forrest JD. Intention status of US births in 1988: differences by mothers' socioeconomic and demographic characteristics. *Fam Plann Perspect.* 1995;27:11–17.
5. Klerman LV, Jekel JF. Unwanted pregnancy. In: Bracken MB, ed. *Perinatal Epidemiology.* New York, NY: Oxford University Press Inc; 1984:283–300.
6. Myhrman A. The Northern Finland cohort, 1966–82: a follow-up study of children unwanted at birth. In: David HP, Dytrych Z, Matejcek Z, Schuller V, eds. *Born Unwanted: Developmental Effects of Denied Abortion.* New York, NY: Springer; 1988:103–110.
7. Pamuk ER, Mosher WD. *Health Aspects of Pregnancy and Childbirth, United States, 1982.* Hyattsville, Md: US Dept of Health and Human Services; 1988. DHHS publication PHS 89-1992.
8. Sharma R, Synkewecz C, Raggio T, Mattison DR. Intermediate variables as determinants of adverse pregnancy outcome in high-risk inner-city populations. *J Natl Med Assoc.* 1994;86:857–860.
9. Bustan MN, Coker AL. Maternal attitude toward pregnancy and the risk of neonatal death. *Am J Public Health.* 1994;84:411–414.
10. Brown SS, Eisenberg L, eds. *The Best Intentions: Unintended Pregnancy and the Well-Being of Children and Families.* Washington, DC: National Academy Press; 1995:21–90.
11. American College of Obstetrics and Gynecology. Preconceptional care. *Int J Gynaecol Obstet.* 1995;50:201–207.
12. Cartwright A. Unintended pregnancies that lead to babies. *Soc Sci Med.* 1988;27:249–254.
13. Weller RH, Eberstein IW, Bailey M. Pregnancy wantedness and maternal behavior during pregnancy. *Demography.* 1987;24:407–412.
14. McCormick MC, Brooks-Dunn J, Shorter T, Wallace CY, Homes JH, Heagarty MC. The planning of pregnancy among low-income women in central Harlem. *Am J Obstet Gynecol.* 1987;156:145–149.
15. *SAS Language and Procedures: Usage, Version 6.* Cary, NC: SAS Institute Inc; 1989.
16. LeClere FB, Wilson JB. Smoking behavior of recent mothers, 18–44 years of age, before and after pregnancy: United States, 1990. *Adv Data Vital Health Stat.* July 25, 1997;No. 288.
17. Chandra A. Health aspects of pregnancy and childbirth: United States, 1982–88. *Vital Health Stat 23.* 1995;No. 18.
18. Parazzini F, Davoli E, Rabaiotti M, et al. Validity of self-reported smoking habits in pregnancy: a saliva cotinine analysis. *Acta Obstet Gynecol Scand.* 1996;75:352–354.
19. Joyce TJ, Grossman M. Pregnancy wantedness and the early initiation of prenatal care. *Demography.* 1990;27:1–17.
20. Gold RB. *Abortion and Women's Health: A Turning Point for America?* New York, NY: Alan Guttmacher Institute; 1990.