**EXAMINING PREGNANCY INTENDEDNESS AMONG**

**PREGNANCIES ENDING IN SPONTANEOUS ABORTION**

by

**Rachel Flink-Bochacki**

MD, University at Buffalo, 2011

BS, Lehigh University, 2005

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This essay is submitted

by

Rachel Flink-Bochacki

on

August 2, 2016

and approved by

Essay Advisor:

David Finegold, MD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Director, Multidisciplinary Master of Public Health

Professor, Human Genetics

Graduate School of Public Health

University of Pittsburgh

Essay Reader:

Beatrice Chen, MD, MPH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Assistant Professor

Department of Obstetrics, Gynecology and Reproductive Sciences

School of Medicine

University of Pittsburgh

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David Finegold, MD

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 Rachel Flink-Bochacki, MPH

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**ABSTRACT**

**Objective:** Unintended pregnancy is a major public health issue. Spontaneous abortion affects over one million U.S. women each year, yet little is known about the intendedness of these pregnancies. We aimed to examine prevalence and correlates of unintended and unwanted pregnancies ending in spontaneous abortion.

**Methods:** We used nationally-representative cross-sectional data from the 2011-2013 National Survey of Family Growth to evaluate U.S. women aged 15-44 with pregnancy ending in spontaneous abortion. We used multivariable logistic regression models to evaluate associations between demographic and pregnancy characteristics and pregnancy intendedness of the most recent spontaneous abortion for each respondent.

**Results:** Among 948 pregnancies that ended in spontaneous abortion, 43.2% were unintended (unwanted or occurring sooner than desired). Younger women were more likely to report unintended pregnancies than women ≥30 years, and women ≤19 years reported unintended pregnancy most often [adjusted odds ratio (aOR)=11.5; 95% confidence interval (CI):5.3,24.9]. Unintended pregnancy was more likely among unmarried than married women [never married: aOR=6.6; 95%CI:3.4,13.0; previously married: aOR=5.3; 95%CI:2.1,13.3]. Other factors associated with unintended pregnancy were inter-pregnancy interval ≤12 months compared to >12 months [aOR=2.8; 95%CI:1.7,4.7], and multiparity compared to nulliparity [aOR=5.4; 95%CI:1.8,16.7 for ≥3 children; aOR=2.9; 95%CI:1.3,6.6 for 2 children]. Examining only unwanted pregnancies (17.2% of sample), we found similar associations, in addition to more unwanted pregnancies among black women compared to white women [aOR=2.3; 95%CI:1.1,4.7].

**Conclusion:** Similar to all pregnancies, a substantial proportion of pregnancies ending in spontaneous abortion are unintended and/or unwanted. Women with pregnancy loss, like all reproductive-aged women, should receive comprehensive counseling about reproductive planning and contraception.

**TABLE OF CONTENTS**

1. **INTRODUCTION ……………………………………………………………………….1**
2. **MATERIALS AND METHODS ………………………………………………………. 3**
3. **RESULTS ……………………………………………………………………………….. 6**
4. **DISCUSSION ………………………………………………………………………….. 12**

**BIBLIOGRAPHY …………………………………………………………………………….. 15**

**LIST OF TABLES**

Table 1. Characteristics of women with pregnancies ending in spontaneous abortion, by pregnancy intention ………………………………………………………………………………………….. 7

Table 2. Factors associated with unintended pregnancy ending in spontaneous abortion, as compared to intended pregnancy ……………………………………………………………….... 8

Table 3. Factors associated with unwanted pregnancies ending in spontaneous abortion, as compared to intended pregnancy ……………………………………………………………..… 10

1. **INTRODUCTION**

Over one million spontaneous abortions occur annually in the United States1, accounting for 15% of clinically-recognized pregnancies2 and affecting more than 1% of reproductive-aged women each year2, 3. While the prevalence of unintendedness among all pregnancies is nearly 50%4, the prevalence of unintended pregnancy among pregnancies ending in miscarriage is represented by a single point estimate of 43% in 20065. Researchers have sought to understand family planning and contraceptive needs after induced abortion and after live birth6, but similar research has not been conducted among those experiencing spontaneous pregnancy loss, despite a rapid return to fertility following miscarriage, with median ovulation 20 days post-miscarriage (range 13-103 days)7. Greater understanding of the prevalence and characteristics associated with unintended and unwanted pregnancy in this population could inform reproductive and contraceptive counseling strategies for women with miscarriages.

Unintended pregnancies are comprised of mistimed pregnancies (those occurring sooner than intended) and unwanted pregnancies (those occurring at a time when no future pregnancies were desired). Unintended pregnancy has been associated with adverse perinatal outcomes, with even stronger associations observed among pregnancies that are reported specifically as unwanted8. Some of the risk factors associated with unintended and unwanted pregnancies, such as short inter-pregnancy interval, less education, lower socioeconomic status and substance use, are also associated with increased risk of spontaneous abortion9-11. These associations have not been investigated in women with pregnancies ending in spontaneous abortion. This lack of knowledge limits the ability of clinicians and public health professionals to address the reproductive health needs and provide comprehensive care to women with spontaneous abortions.

We used nationally-representative data from the 2011-2013 National Survey of Family Growth (NSFG) to determine the prevalence of unintended and unwanted pregnancy in women experiencing spontaneous abortion, and to describe the independent patient-level factors associated with these outcomes.

1. **MATERIALS AND METHODS**

The NSFG is administered by the National Center for Health Statistics, with the purpose of estimating the incidence of factors affecting pregnancy, medical care associated with pregnancy, marriage and family formation, use of reproductive health services and attitudes about sex, childbearing and marriage. The NSFG collects cross-sectional data from a nationally-representative sample of the U.S. household population aged 15-44, using a multi-stage probability-based sampling design 12-15.

Data for the 2011-2013 NSFG were collected from September 2011 to September 2013 from 5,601 women aged 15-44, who had a total of 9,547 pregnancies. Interviews were conducted by trained female interviewers in participants’ homes, using computer-assisted personal interviewing and averaging 80 minutes in length. The female response rate was 73.4%. Statistical design, interviewing and data processing were conducted by the University of Michigan’s Institute for Social Research.

This analysis of the 2011-2013 NSFG data was given exemption by the University of Pittsburgh Institutional Review Board.

We included completed pregnancies that were less than 20 weeks gestation, excluding those reported to end in therapeutic abortion or ectopic pregnancy, consistent with the medical definition of spontaneous abortion. When multiple miscarriages had occurred in the same respondent, we used the most recent pregnancy ending in miscarriage for each respondent.

Our primary outcomes of interest were unintended and unwanted pregnancy. Participants were asked, “Right before you became pregnant [with this specific pregnancy], did you yourself want to have a(nother) baby at any time in the future?” If the woman answered affirmatively, she was then asked, “Would you say you became pregnant too soon, at about the right time, or later than you wanted?” We used a recoded variable created by the NSFG for pregnancy intendedness that categorized each pregnancy as intended (right time or overdue), mistimed (sooner than desired), or unwanted (occurring at a time when the respondent did not want any future pregnancies). Consistent with conventional measures 4, both unwanted and mistimed pregnancies were considered “unintended.” Pregnancies for which women reported that they “didn’t care,” were “indifferent” or were “not sure” regarding intention or timing accounted for 2% of the sample, and were excluded from analysis due to inability to clarify unambiguous intendedness and wantedness for these pregnancies.

Covariates examined included demographic and pregnancy characteristics at time of miscarriage: age, relationship status, gestational age, inter-pregnancy interval, number of previous miscarriages and number of previous live born children. In addition to these variables collected for each pregnancy, we examined socio-economic factors captured at the participant level at the time of the interview: race/ethnicity, educational level, income, and insurance status. We also examined time elapsed between spontaneous abortion and interview date, to assess the potential of recall bias affecting reported intentions.

We analyzed data using Stata SE software version 14 (StataCorp, College Station, TX). We applied sampling weights provided by the NSFG to adjust for the complex sampling design and to produce nationally-representative estimates. We compared baseline characteristics between intended and unintended pregnancies, and intended and unwanted pregnancies using Pearson Chi-square tests for categorical variables. We used bivariate regression to evaluate the unadjusted associations between each covariate and our two outcomes (unintended and unwanted pregnancy ending in spontaneous abortion). All covariates with significance levels of P<0.1 were considered for inclusion in a multivariable logistic regression model using forward selection. We retained variables in the final models for both unintended and unwanted pregnancy if the Wald chi-squared test statistic was significant at level P<0.05 in the multivariable model.

1. **RESULTS**

Of 9,547 pregnancies in 5,601 women, we found 1,365 ending in spontaneous abortion for which intention data was available. We excluded 417 pregnancies due to repeat spontaneous abortion in the same respondent, leaving a sample of 948 pregnancies. Table 1 shows the demographic, socio-economic and medical characteristics of the pregnancies in our sample. The mean age at spontaneous abortion was 26.7 (standard deviation 6.3 years). Overall, 60% of pregnancies occurred in non-Hispanic white women, 17% in non-Hispanic black women, 18% in Hispanic women, and 5% in non-Hispanic women of other races. Forty-two percent of miscarriages were preceded by at least one live birth, and 29% were preceded by at least one prior miscarriage. Median gestational age at miscarriage was 8 weeks (interquartile range 6-11 weeks). Overall, 56.8% of pregnancies were intended and 43.2% were unintended. Of all pregnancies in our sample, 17.2% were specifically unwanted.

Bivariable and multivariable associations with unintended pregnancy are shown in Table 2. Age, race/ethnicity, relationship status, education, income, current insurance, gestational age, previous live born children, and inter-pregnancy interval were all found to be significantly associated with unintended pregnancy in bivariate regression. After controlling for other significant variables in the multivariable model, only age, relationship status, previous children and inter-pregnancy interval were independently associated with unintended pregnancy.

**Table 1**: Characteristics of women with pregnancies ending in spontaneous abortion, by pregnancy intention\*

|  |  |  |
| --- | --- | --- |
|  | **Intended (%)** | **Unintended** |
| **All† (%)** | **Unwanted (%)** |
| **Overall** (n=948) | 56.8% | 43.2% | 17.2% |
| **Age at time of miscarriage‡** |  |  |  |
| < 15 (n=13) | 40.9% | 59.1% | 20.0% |
| 15-19 (n=175) | 14.6% | 85.4% | 31.8% |
| 15-17 (n=83) | 10.0% | 90.0% | 25.8% |
| 18-19 (n=92) | 17.8% | 82.2% | 35.9% |
| 20-24 (n=270) | 49.5% | 50.5% | 17.4% |
| 25-29 (n=257) | 64.8% | 35.2% | 13.2% |
| 30-34 (n=149) | 72.9% | 27.2% | 15.9% |
| ≥ 35 (n=84) | 83.9% | 16.1% | 9.9% |
| **Race/ethnicity‡** |  |  |  |
| Non-Hispanic White  | 62.5% | 37.5% | 12.5% |
| Non-Hispanic Black | 33.1% | 66.9% | 39.2% |
| Hispanic | 59.5% | 40.5% | 14.2% |
| Non-Hispanic Other | 57.0% | 43.0% | 11.0% |
| **Relationship status at time of miscarriage‡** |  |  |  |
| Married | 75.6% | 24.4% | 8.9% |
| Cohabitating | 44.8% | 55.3% | 19.8% |
| Previously married | 40.8% | 59.2% | 26.8% |
| Never married | 23.9% | 76.1% | 33.0% |
| **Education‡** |  |  |  |
| Less than high school diploma | 41.1% | 59.0% | 27.6% |
| High school diploma or GED | 49.4% | 50.6% | 16.9% |
| Some college or associate degree | 53.8% | 46.2% | 20.6% |
| Bachelor’s degree or more | 76.2% | 23.8% | 8.7% |
| **Income (% FPL§) ‡**  |  |  |  |
| 0-99% FPL | 46.2% | 53.8% | 25.5% |
| 100-199% FPL  | 46.5% | 53.5% | 21.6% |
| ≥ 200% FPL | 67.6% | 32.4% | 10.4% |
| **Current insurance‡** |  |  |  |
| Private insurance | 64.9% | 35.1% | 12.4% |
| Public insurance | 37.8% | 62.2% | 30.1% |
| No insurance | 54.6% | 45.4% | 17.0% |
| **Gestational age at miscarriage‡** |  |  |  |
| 0-6 weeks | 51.0% | 49.0% | 17.5% |
| **Table 1 Continued** |  |  |  |
| 7-12 weeks | 64.5% | 35.5% | 16.9% |
| 13-19 weeks | 49.2% | 50.8% | 17.5% |
| **Number of previous miscarriages** |  |  |  |
| 0 | 55.2% | 44.8% | 15.5% |
| 1 | 58.8% | 41.2% | 22.1% |
| ≥2 | 63.6% | 36.4% | 17.2% |
| **Number of previous children‡** |  |  |  |
| 0 | 51.3% | 48.7% | 15.0% |
| 1 | 68.8% | 31.2% | 12.8% |
| 2 | 55.3% | 44.7% | 22.3% |
| ≥ 3 | 44.2% | 55.9% | 31.8% |
| **Pregnancy interval‡** |  |  |  |
| No previous pregnancies | 51.1% | 48.9% | 15.3% |
| 0-12 months since last pregnancy | 46.6% | 53.5% | 22.4% |
| > 12 months since last pregnancy | 64.5% | 35.5% | 16.2% |
| **Time since miscarriage** |  |  |  |
| ≤ 3 years | 59.6% | 40.4% | 15.0% |
| > 3 years | 55.5% | 44.5% | 18.2% |

\* Row totals for intended + all unintended pregnancies = 100% (excluding rounding)

**†** All unintended = mistimed + unwanted pregnancies

‡ Differences between groups significant to *P*<0.05

§ FPL: Federal Poverty Level

**Table 2**: Factors associated with unintended pregnancy ending in spontaneous abortion (compared to intended pregnancy)

|  |  |  |
| --- | --- | --- |
|  | **OR (95% CI)** | **aOR (95% CI)\*** |
| **Age at time of miscarriage** |  |  |
| ≤ 19 | 16.4 (8.2,32.5) | 11.5 (5.3,24.9) |
| 20-24 | 3.4 (1.9,6.0) | 3.7 (2.0,6.7) |
| 25-29 | 1.8 (1.0,3.3) | 1.9 (0.99,3.8) |
| ≥ 30 | Reference | Reference |
| **Race/ethnicity** |  |  |
| Non-Hispanic White | Reference |  |
| Non-Hispanic Black | 3.4 (1.9,6.1) |  |
| Hispanic | 1.1 (0.7,1.9) |  |
| Non-Hispanic Other | 1.3 (0.6,2.7) |  |
| **Relationship status at time of miscarriage** |  |  |
| **Table 2 Continued** |  |  |
| Married | Reference | Reference |
| Cohabitating | 3.8 (2.4,6.1) | 2.7 (1.5,4.8) |
| Previously married | 4.5 (1.8,11.4) | 5.3 (2.1,13.3) |
| Never married | 9.9 (5.9,16.5) | 6.6 (3.4,13.0) |
| **Education** |  |  |
| Less than high school diploma | 4.6 (2.7,7.7) |  |
| High school diploma or GED | 3.3 (1.8,6.0) |  |
| Some college | 2.7 (1.6,4.7) |  |
| Bachelor’s degree or more | Reference |  |
| **Income (% FPL†)** |  |  |
| 0-99% FPL | 2.4 (1.5,4.0) |  |
| 100-199% FPL | 2.4 (1.4,4.1) |  |
| ≥ 200% FPL | Reference |  |
| **Current insurance** |  |  |
| Private insurance  | Reference |  |
| Public insurance | 3.0 (2.1,4.4) |  |
| No insurance | 1.5 (0.9,2.7) |  |
| **Gestational age at miscarriage** |  |  |
| 0-6 weeks | Reference |  |
| 7-12 weeks | 0.6 (0.4,0.9) |  |
| 13-19 weeks | 1.1 (0.6,2.0) |  |
| **Previous miscarriages** |  |  |
| 0 | Reference |  |
| 1 | 0.9 (0.5,1.4) |  |
| ≥2 | 0.7 (0.3,1.6) |  |
| **Number of previous live born children** |  |  |
| 0 | Reference | Reference |
| 1 | 0.5 (0.3,0.8) | 1.0 (0.5,2.2) |
| 2 | 0.9 (0.5,1.5) | 2.9 (1.3,6.6) |
| ≥3 | 1.3 (0.6,3.0) | 5.4 (1.8,16.7) |
| **Inter-pregnancy interval** |  |  |
| No previous pregnancies | 1.7 (1.2,2.5) | 1.1 (0.5,2.6) |
| 0-12 months since last pregnancy | 2.1 (1.3,3.3) | 2.8 (1.7,4.7) |
| > 12 months since last pregnancy | Reference | Reference |
| **Time since miscarriage** |  |  |
| ≤ 3 years | Reference |  |
| > 3 years | 1.2 (0.8,1.8) |  |

\* Controlled for age, relationship status, live born children, and inter-pregnancy interval

† FPL: Federal Poverty Level

Bivariable and multivariable associations with unwanted pregnancy are shown in Table 3. Age, race/ethnicity, relationship status, education, income, current insurance, and previous live born children were all found to be significantly associated with unintended pregnancy in bivariate regression. Unlike unintended pregnancy, gestational age and inter-pregnancy interval were not significantly associated with unwanted pregnancy in bivariate regression at the p<0.05 level, but because inter-pregnancy interval was associated with unwanted pregnancy at the p<0.1 level, it was included for testing in the multivariable model. After controlling for other significant variables, age, race/ethnicity, relationship status, previous children and inter-pregnancy interval were all independently associated with unwanted pregnancy.

**Table 3.** Factors associated with unwanted pregnancies ending in spontaneous abortion (compared to intended pregnancy)

|  |  |  |
| --- | --- | --- |
|  | **OR (95% CI)** | **aOR (95% CI)\*** |
| **Age at time of miscarriage** |  |  |
| ≤ 19 | 10.2 (4.4,23.7) | 7.8 (1.8,32.7) |
| 20-24 | 2.0 (0.97,4.0) | 1.8 (0.7,4.5) |
| 25-29 | 1.1 (0.5,2.6) | 1.1 (0.4,3.1) |
| ≥ 30 | Reference | Reference |
| **Race/ethnicity** |  |  |
| Non-Hispanic White | Reference | Reference |
| Non-Hispanic Black | 5.9 (2.8,12.4) | 2.3 (1.1,4.7) |
| Hispanic | 1.2 (0.6,2.2) | 0.7 (0.3,1.4) |
| Non-Hispanic Other | 1.0 (0.3,2.7) | 0.8 (0.3,2.2) |
| **Relationship status at time of miscarriage** |  |  |
| Married | Reference | Reference |
| Cohabitating | 3.7 (1.9,7.5) | 2.4 (1.1,5.1) |
| Previously married | 5.6 (2.0,15.6) | 4.9 (1.6,15.3) |
| Never married | 11.7 (5.6,24.6) | 7.4 (2.7,20.2) |
| **Education** |  |  |
| Less than high school diploma | 5.9 (2.3,15.1) |  |
| High school diploma or GED | 3.0 (1.1,7.8) |  |
| Some college | 3.4 (1.2,9.0) |  |
| Bachelor’s degree or more | Reference |  |
| **Income (% FPL†)** |  |  |
| 0-99% FPL | 3.6 (1.8,7.0) |  |
| **Table 3 Continued** |  |  |
| 100-199% FPL | 3.0 (1.4,6.5) |  |
| ≥ 200% FPL | Reference |  |
| **Current insurance** |  |  |
| Private insurance  | Reference |  |
| Public insurance | 4.2 (2.4,7.1) |  |
| No insurance | 1.6 (0.8,3.4) |  |
| **Gestational age at miscarriage** |  |  |
| 0-6 weeks | Reference |  |
| 7-12 weeks | 0.8 (0.4,1.3) |  |
| 13-19 weeks | 1.0 (0.5,2.3) |  |
| **Previous miscarriages** |  |  |
| 0 | Reference |  |
| 1 | 1.3 (0.7,2.7) |  |
| ≥2 | 1.1 (0.3,3.9) |  |
| **Number of previous live born children** |  |  |
| 0 | Reference | Reference |
| 1 | 0.6 (0.3,1.2) | 2.0 (0.6,6.2) |
| 2 | 1.4 (0.6,3.0) | 6.2 (1.6,24.4) |
| ≥3 | 2.5 (1.0,5.9) | 13.9 (3.2,60.9) |
| **Inter-pregnancy interval** |  |  |
| No previous pregnancies | 1.2 (0.6-2.2) | 1.3 (0.3,6.5) |
| 0-12 months since last pregnancy | 1.9 (0.98-3.7) | 2.3 (1.2,4.4) |
| > 12 months since last pregnancy | Reference | Reference |
| **Time since miscarriage** |  |  |
| ≤ 3 years | Reference |  |
| > 3 years | 1.3 (0.7-2.4) |  |

\* Controlled for age, race/ethnicity, relationship status, live born children, and inter-pregnancy interval

† FPL: Federal Poverty Level

1. **DISCUSSION**

In this nationally representative survey of U.S. women, we found that 43.2% of spontaneous abortions were unintended and 17.2% were unwanted. This is consistent with the only previous estimate of unintended pregnancies ending in miscarriage5. Given the documented rapid return to ovulation after spontaneous abortion16, there is a time-sensitive need to address reproductive planning and contraceptive needs in women experiencing pregnancy loss. Because many women have not yet established prenatal care at the point in pregnancy when most miscarriages occur17, it is important to address these needs at the time of miscarriage when women are engaged with the health care system, rather than relying on follow-up care.

There is limited published research on contraceptive needs following miscarriage. Prior research suggests that contraceptive counseling in the post-miscarriage time period is acceptable and may be beneficial. In an evaluation of a program to centralize miscarriage services in rural Senegal, Cisse et al. found that when contraceptive counseling after miscarriage increased from 35% to 84%, contraceptive use increased from 0% to 33%18. This indicates a potential unmet need for counseling, and shows that some women may be interested in contraception after a miscarriage. However, without similar studies in the United States, it is difficult to generalize to this population. In a secondary analysis of women desiring pregnancy after a prior pregnancy loss, Schliep et al. found that 23.4% of couples waited more than three months, and 10.3% waited over a year before reattempting pregnancy19, indicating that even among women with desired pregnancies ending in spontaneous abortion, there may be a need for reproductive planning and contraception.

By understanding the demographic and obstetric characteristics of all women with spontaneous abortions, counseling and interventions can be directed toward each woman’s individual needs. Pregnancies in younger women, especially adolescents, had the strongest correlation with unintendedness, and a strong correlation with unwantedness. Given naturally high fertility rates and a long reproductive lifespan in young women20, this group is at high risk of future unintended or unwanted pregnancies. Other factors associated with unintended and unwanted pregnancy in our sample, such as short inter-pregnancy interval and higher parity, may also be indicators of greater natural fertility, in addition to pre-existing childcare responsibilities. It is important for clinicians to elicit future reproductive goals in these patients, to ensure their needs are being addressed.

In contrast to previously-reported correlates of unintended pregnancy 4, 11, there were no independent socioeconomic associations with unintended or unwanted pregnancy in our sample. We did note a racial disparity with regard to unwanted pregnancy, consistent with known racial disparities in access to and use of contraception in black women 21, 22, which further underscores the importance offering contraception at the time of miscarriage management, when women are engaging with clinicians.

This study is limited by the nature of self-reported survey data, including potential for misreporting and recall bias. Previous analyses have shown different reported rates of spontaneous abortion in face-to-face interviews compared to self-administered surveys, however overall reported rates of spontaneous abortion in the NSFG are consistent with other population estimates2. There is potential for recall bias in self-reported retrospective data, although we did not find that time elapsed since miscarriage was significantly associated with reported intendedness. While we did not find any independent associations between pregnancy intention and socioeconomic variables, information on education and income was only available at the time of the interview and not the time of miscarriage, which limits the ability to fully study these potential relationships. Another limitation to consider is the dichotomous nature of pregnancy intention questions in the NSFG, which do not fully capture the complex range of feelings women may have about their pregnancies23, limiting the applicability of these findings to individual women and their pregnancy experiences.

In conclusion, we found that U.S. women experiencing spontaneous abortion often report that these pregnancies were unintended, thus indicating a need for reproductive goals counseling at the time of miscarriage . Because women with intended pregnancies ending in loss may also desire pregnancy spacing, comprehensive counseling and provision of contraception should be offered to all women experiencing spontaneous abortion, regardless of pregnancy intention.

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