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Examining intendedness among pregnancies ending in spontaneous abortion☆☆☆,★

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Abstract

Objectives: Spontaneous abortion (SAB) affects over 1 million US women each year, yet little is known about the intendedness of these pregnancies. We examined prevalence and correlates of unintended and unwanted pregnancies ending in SAB.

Study design: We used nationally-representative cross-sectional data of US women aged 15–44 from the 2011–2013 National Survey of Family Growth to examine pregnancies ending in SAB. We used modified Poisson regression models to evaluate associations between demographic and pregnancy characteristics with unintended and unwanted pregnancy.

Results: Among 1351 pregnancies ending in SAB, 44.5% were unintended (i.e. unwanted or occurring sooner than desired). Younger women with SAB were more likely to report unintended pregnancies than women 30–44 years, and women 15–19 years reported unintended pregnancy most often [adjusted relative risk (aRR) = 3.0; 95% confidence interval (CI): 2.2–4.1]. Unintended pregnancy was two times more likely among unmarried than married women [never married: aRR=2.2; 95% CI: 1.7–2.7; previously married: aRR=2.2; 95% CI: 1.7–3.0]. Other factors associated with unintended pregnancy were multiparity compared to nulliparity [aRR=2.6; 95% CI: 1.7–4.1 for 3 children; aRR=1.8; 95% CI: 1.3–2.5 for 2 children] and inter-pregnancy interval 12 months compared to >12 months [aRR=1.4; 95% CI: 1.2–1.7]. We found similar associations with unwanted pregnancies ending in SAB (15.3% of pregnancies). Neither race/ethnicity nor

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socioeconomic indicators were independently associated with unintended or unwanted pregnancy ending in SAB.

Conclusions: Many 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.

Implications: Similar to all pregnancies, nearly half of pregnancies ending in spontaneous abortion are unintended and/or unwanted, suggesting that many women experiencing spontaneous abortion may benefit from a review of family planning desires and the provision of reproductive planning counseling and effective contraception to prevent future undesired pregnancy.

Keywords

Pregnancy intention; Spontaneous abortion; Miscarriage; Pregnancy loss; Unintended pregnancy; Unwanted pregnancy

1. Introduction

Over 1 million spontaneous abortions (SABs) occur annually in the United States [1], accounting for 15% of clinically-recognized pregnancies and affecting more than 1% of reproductive-aged women each year [2,3]. Nearly half of all pregnancies in the US are unintended [4], which is more common in the setting of previous unintended pregnancy and has been linked to adverse perinatal outcomes and maternal risk behaviors [5–7]. Some of the risk factors associated with unintended pregnancies, such as short inter-pregnancy interval, less education, lower socioeconomic status and maternal substance use, are also associated with increased risk of SAB [8–10], and while unintended pregnancy is more common in younger women [4], risk of SAB increases with age [11]. It is therefore unclear whether general population estimates of pregnancy intendedness are applicable to women with SAB. Unlike previous research into intendedness of pregnancies ending in SAB, which has drawn from heterogeneous data sources and yielded only crude point estimates [12,13], this study uses nationally-representative data from the 2011–2013 National Survey of Family Growth (NSFG) to clearly define the prevalence of and factors associated with unintendedness among pregnancies ending in SAB.

While researchers have sought to understand family planning and contraceptive needs after induced abortion and live birth [14], less research has been conducted to understand the contraceptive needs of women experiencing miscarriage. Unlike women undergoing induced abortion or live birth, who often want and are encouraged to avoid rapid repeat pregnancy [15], women experiencing SAB likely have more heterogeneous family planning needs, confounded further by the lack of clarity around patient desires and the optimal spacing after early pregnancy loss [16,17]. With women obtaining miscarriage care in diverse settings and potentially receiving inconsistent attention to future reproductive planning, women experiencing SAB may be at particularly high risk for future undesired pregnancy. This is especially of concern given the rapid return to fertility, with median ovulation 20 days post-miscarriage (range 13–103 days) [18]. Understanding the prevalence and correlates of

unintended pregnancy ending in SAB may further inform the importance of reproductive and contraceptive counseling for women experiencing miscarriage.

2. Materials and methods

Our study was a secondary analysis of cross-sectional data from the 2011–2013 NSFG. The NSFG is administered by the National Center for Health Statistics, with the purpose of obtaining national estimates 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 US household population aged 15–44, using a multi-stage probability-based sampling design [19–22]. The 2011–2013 cycle had a female response rate of 73.4%. The University of Michigan’s Institute for Social Research conducted the statistical design, interviewing and data processing.

We included pregnancies from the NSFG in our study if the respondent was 15–44 years old at the time of pregnancy outcome, the pregnancy was reported to end in miscarriage or stillbirth, and pregnancy intendedness was available. Consistent with the medical definition of SAB [8], we excluded those pregnancies lasting beyond 20 weeks gestation. This analysis of the 2011–2013 NSFG data was given exemption by the University of Pittsburgh Institutional Review Board.

Our primary observations of interest were unintended and unwanted pregnancy. To assess these outcomes, we examined responses to the NSFG question, “Right before you became pregnant [with this specific pregnancy], did you yourself want to have a(nother) baby at any time in the future?” with possible responses of “yes,” “no,” and “not sure, don’t know.” Respondents in the NSFG who had answered affirmatively were 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, we considered both unwanted and mistimed pregnancies to be “unintended” [4]. Pregnancies for which women reported that they “didn’t care,” or were “indifferent” or “not sure” regarding intendedness and/or timing accounted for 2% of the overall sample, and we excluded these pregnancies from analysis due to inability to clarify unambiguous intendedness and wantedness.

Covariates examined included demographic and pregnancy characteristics at the time of SAB: age, relationship status, gestational age, inter-pregnancy interval (time from outcome of most recent prior pregnancy to conception of index pregnancy), number of previous SABs 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, and income.

We analyzed data using Stata SE software release 14.2 (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, as well as intended and unwanted pregnancies, using Pearson Chi-square tests for categorical variables. Given the high prevalence of both unintended and unwanted pregnancy, we used modified Poisson regression with a linearized variance estimator to evaluate the unadjusted associations between each covariate and our two observations of interest (unintended and unwanted pregnancy ending in SAB). We considered covariates with significance levels of $p < .1$ for inclusion in multivariable models that we developed using forward selection. To account for potential recall bias, we also adjusted both multivariable models for years elapsed between pregnancy outcome and interview date. Variables were retained in the final models for both unintended and unwanted pregnancy if the P value from the t -statistic was < 0.05 . To quantify the potential effect of multiple pregnancies occurring in the same respondent, we recreated identical multivariable models using a restricted dataset containing only the most recent SAB for each respondent (69% of our sample) and compared the results with our original findings.

3. Results

Of 9543 pregnancies in 5601 women reported in the 2011–2013 NSFG, we found that 1351 pregnancies in 938 women ended in SAB, representing nearly 16 million SABs, which occurred in the 30 years prior to the survey interview. Table 1 shows demographic, socio-economic and medical characteristics of the women with these 1351 pregnancies. The mean age of women at time of SAB was 26.4 ± 6.0 years. Median reported gestational age at time of SAB was 8 weeks (interquartile range 6–11 weeks). Altogether, 45.5% of pregnancies ending in SAB were unintended. Of all pregnancies in our sample, 15.3% were specifically unwanted.

Unadjusted and adjusted associations with unintended pregnancy ending in SAB are shown in Table 2. We found that age, race/ethnicity, relationship status, current education, current income, previous live born children, and inter-pregnancy interval were all significantly associated with unintended pregnancy in bivariable analyses. After adjusting for other significant factors, we found a significant association with younger age, unmarried relationship status, higher parity, and shorter inter-pregnancy interval.

Table 3 shows unadjusted and adjusted associations with unwanted pregnancy. We found significant associations between unwanted pregnancy and age, race/ethnicity, relationship status, current education, current income, and previous live born children in bivariable analyses. In adjusted analysis, we saw the greatest effect with higher number of previous children, with young age and unmarried relationship status also independently associated with unwanted pregnancy ending in SAB.

We did not find any effect of recall bias after controlling for time elapsed between pregnancy outcome and interview date in our multivariable models for unintended and unwanted pregnancy. In our subgroup analysis of only the most recent SABs for each respondent, meant to assess for potential effects of non-independence, we did not find meaningful differences in overall intendedness, demographics or pregnancy characteristics as compared

to the entire sample. We found similar significant and non-significant associations with unintended and unwanted pregnancy in this supplementary subgroup analysis, with all significant adjusted relative risk estimates within 25% of those from the primary analysis.

4. Discussion

In this nationally representative survey of US women, we found that 44.5% of SABs were unintended, with 15.3% of SABs specifically unwanted. These findings are consistent with the only previous estimates of unintendedness of pregnancies ending in miscarriage [12,13], and they underscore the relevance of clarifying future reproductive desires in this population. Given the documented rapid return to ovulation after SAB [23], there is a time-sensitive need to address reproductive planning in women experiencing pregnancy loss. Because many women have not yet established prenatal care at the point in pregnancy when most miscarriages occur [24], it is important for family planning needs to be addressed at the time of miscarriage care.

Despite finding similar bivariate associations between unintended pregnancy and black race, lower education level, and lower income as in previous reports [4,10,12,13], after controlling for other sociodemographic and pregnancy-related factors, our analysis revealed no independent socioeconomic or racial/ethnic associations with unintended or unwanted pregnancy ending in SAB. This discrepancy may be due to socioeconomic variables not being available at the time of miscarriage, or to differences between women with miscarriages and women with other pregnancy outcomes. However, the strong association we found between young age and unintendedness/unwantedness means that miscarriages experienced by younger women — regardless of race or income level — have a higher likelihood of being unplanned and/or unwanted. Given naturally high fertility rates and a long reproductive lifespan for young women [25], this group is at particularly high risk for future unintended or unwanted pregnancies. Miscarriage care for young women is therefore a practical time to offer contraceptive counseling and services. Other factors associated with unintended and unwanted pregnancy in our study, such as short inter-pregnancy interval and higher parity, may also be indicators of greater natural fertility, in addition to pre-existing childcare responsibilities.

There is limited published research to date on future reproductive plans following miscarriage, but prior research suggests that reproductive counseling in the post-miscarriage time period is acceptable and may be desired. The acceptability of post-miscarriage contraceptive counseling is intimated by Cisse et al. [26], who found that when contraceptive counseling after miscarriage in rural Senegal increased from 35% to 84%, contraceptive use increased from 0% to 33%. Although societal differences impact applicability of these findings to the United States, it is one of the only studies to highlight the opportunity to provide contraceptive counseling and services during miscarriage management. In a secondary analysis of US women desiring pregnancy after a prior pregnancy loss, Schliep et al. [27] found that 23.4% of couples waited more than 3 months, and 10.3% waited over a year before reattempting pregnancy, indicating that even among women who desire pregnancy after SAB, there may be a role for reproductive planning and contraception. These studies indicate a potential need and desire for reproductive and

contraceptive counseling following pregnancy loss, but without prospective studies in the United States, it is difficult to generalize to this population.

Our study is limited by the nature of self-reported survey data, including potential for social desirability and recall biases, though in analyzing time since miscarriage, we did not find any evidence of systemic recall bias. Because the NSFG only includes women who are currently of reproductive age, recent miscarriages are captured to a greater degree than miscarriages that are more remote. Previous analyses have shown lower reported rates of SAB in face-to-face Interviews (such as the NSFG) compared to self-administered surveys, however overall reported rates of SAB in the NSFG are consistent with other population estimates [2]. Because some NSFG respondents reported multiple miscarriages in our sample, our study had the potential to be affected by non-independence, however our subgroup analysis of just the most recent miscarriage for each respondent revealed only minor differences between groups. Given that the purpose of our study was description and not prediction, and that the independence and directionality of associations was identical between our subgroup and overall sample, we felt that a maximum 25% change in the relative risk estimates between our total sample and our most recent SAB subgroup was acceptable and did not affect the clinical meaningfulness of our findings. While we did not find any independent associations between pregnancy intendedness and socioeconomic variables, information on education and income level 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 that pregnancy intendedness can often be complex, and the categorical assessment in the NSFG may not have had the capacity to fully capture the range of feelings women may have about their pregnancies [28], limiting the applicability of these findings to individual women and their personal experiences.

In conclusion, we found that US women experiencing SAB often report that their pregnancies were unintended and/or undesired, indicating a potential unmet need for reproductive goals counseling at the time of miscarriage. Because women with intended pregnancies ending in loss may also desire pregnancy spacing, care for SAB presents an occasion to review family planning desires, provide reproductive planning counseling, and offer effective contraception for all women.

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Table 1
 Characteristics of women with pregnancies ending in spontaneous abortion (SAB), by pregnancy intendedness^{*}.

	Total (%) n=1351 N=15,808,000	Intended (%) n=683 N=8,773,000	Unintended	
			All (%) [†] n=668 N=7,035,000	Unwanted (%) n=249 N=2,412,000
Overall	100	55.5	44.5	15.3
Age at time of miscarriage (years) ^{‡§}				
15–19	14.0	3.5	27.1	27.2
15–17	3.9	0.3	8.5	6.4
18–19	10.1	3.2	18.6	20.8
20–24	27.5	20.2	36.7	27.4
25–29	27.1	32.0	20.9	22.8
30–34	20.1	27.8	10.5	13.1
35–44	11.3	16.5	4.9	9.5
Race/ethnicity [§]				
Non-Hispanic White	60.5	65.5	54.3	45.0
Non-Hispanic Black	17.1	11.1	24.4	35.1
Hispanic	17.0	16.8	17.4	16.4
Non-Hispanic Other	5.4	6.6	4.0	3.5
Relationship status at time of miscarriage [§]				
Married	55.3	73.7	32.5	30.0
Cohabiting	18.6	14.8	23.4	19.2
Previously married	5.7	3.9	8.0	9.7
Never married	20.3	7.6	36.1	41.2
Current education [§]				
Less than high school diploma	12.3	9.6	15.6	19.7
High school diploma or GED	27.1	22.2	33.1	28.2
Some college or associate degree	32.1	30.2	34.6	38.1
Bachelor's degree or higher	28.5	38.1	16.7	14.1
Current income (% of federal poverty level) [§]				

	Total (%) n=1351 N=15,808,000	Intended (%) n=683 N=8,773,000	Unintended	
			All (%) [†] n=668 N=7,035,000	Unwanted (%) n=249 N=2,412,000
0–99%	27.8	21.0	36.2	40.2
100–199%	21.0	18.0	24.6	28.9
200% or greater	51.3	61.0	39.1	30.9
Gestational age at miscarriage				
0–12 weeks	83.1	84.5	81.3	82.5
13–19 weeks	16.9	15.5	18.7	17.5
Miscarriages before index miscarriage				
0	66.9	62.8	72.1	64.2
1	19.9	22.2	17.1	22.1
2 or more	13.2	15.1	10.8	13.7
Live born children before index miscarriage [§]				
0	46.8	42.8	51.8	36.5
1	31.8	37.9	24.2	25.2
2	13.5	13.2	13.9	21.1
3 or more	7.9	6.1	10.2	17.2
Inter-pregnancy interval [§]				
No previous pregnancies	31.8	27.3	37.3	27.1
0–12 months since last pregnancy	24.1	22.1	26.6	29.5
More than 12 months since last pregnancy	44.1	50.6	36.1	43.4

* Column totals by category=100% (excluding discrepancies due to rounding). n = unweighted sample size; N = national population estimate. All percentages weighted to reflect national population estimates.

[†] All unintended = mistimed + unwanted pregnancies.

[‡] Pregnancies in girls under 15 years of age were excluded from sample due to insufficient data.

[§] Prevalence differences between intendedness groups significant to p<0.05.

Table 2

Factors associated with unintended pregnancy ending in spontaneous abortion (compared to intended pregnancy).

	RR (95% CI)	Adjusted RR[†] (95% CI)	p-value[*]
Age at time of miscarriage (years)			< 0.001
15–19	3.9(2.8–5.5)	3.0 (2.2–4.1)	
20–24	2.7(1.9–3.9)	2.5 (1.9–3.4)	
25–29	1.6(1.1–2.4)	1.5 (1.1–2.2)	
30–44	Reference	Reference	
Race/ethnicity			< 0.001
Non-Hispanic White	Reference		
Non-Hispanic Black	1.6(1.3–2.0)		
Hispanic	1.1(0.8–1.5)		
Non-Hispanic Other	0.8(0.5–1.4)		
Relationship status at time of miscarriage			< 0.001
Married	Reference	Reference	
Cohabiting	2.1(1.7–2.7)	1.6 (1.2–2.0)	
Previously married	2.4(1.7–3.3)	2.2 (1.7–3.0)	
Never married	3.0(2.4–3.8)	2.2 (1.7–2.7)	
Current education			< 0.001
Less than high school diploma	2.2(1.5–3.1)		
High school diploma or GED	2.1(1.5–2.9)		
Some college	1.8(1.3–2.7)		
Bachelor's degree or higher	Reference		
Current income (% of federal poverty level)			< 0.001
0–99%	1.7(1.3–2.2)		
100–199%	1.5(1.2–2.0)		
200% or greater	Reference		
Gestational age at miscarriage			0.224
0–12 weeks	Reference		
13–19 weeks	1.1(0.9–1.4)		
Miscarriages before index miscarriage			0.055

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	RR (95% CI)	Adjusted RR [†] (95% CI)	p-value [*]
0	Reference		
1	0.8(0.6–0.99)		
2 or more	0.8(0.5–1.2)		
Live born children before index miscarriage			0.032
0	Reference	Reference	
1	0.7(0.5–0.9)	1.1 (0.8–1.6)	
2	0.9(0.7–1.2)	1.8 (1.3–2.5)	
3 or more	1.2(0.8–1.6)	2.6 (1.7–4.1)	
Inter-pregnancy interval			0.001
No prior pregnancies	1.4(1.2–1.7)	1.2 (0.9–1.8)	
0–12 months since last pregnancy	1.4(1.1–1.7)	1.4 (1.2–1.7)	
More than 12 months since last pregnancy	Reference	Reference	

RR, relative risk; CI, confidence interval.

^{*} Pvalue listed for bivariable analysis.[†] Adjusted for age, relationship status, live born children, inter-pregnancy interval, and time since pregnancy outcome.

Table 3

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

	RR (95% CI)	Adjusted RR[†] (95% CI)	p-value[*]
Age at time of miscarriage (years)			<0.001
15–19	5.5 (3.4–8.9)	4.9(2.8–8.5)	
20–24	2.2 (1.4–3.5)	2.3(1.4–3.7)	
25–29	1.3 (0.8–2.3)	1.3(0.8–2.1)	
30–44	Reference	Reference	
Race/ethnicity			<0.001
Non-Hispanic White	Reference		
Non-Hispanic Black	2.9 (1.9–4.6)		
Hispanic	1.3 (0.8–2.3)		
Non-Hispanic Other	0.8 (0.3–1.9)		
Relationship status at time of miscarriage			<0.001
Married	Reference	Reference	
Cohabiting	2.6 (1.6–4.2)	1.9(1.1–3.0)	
Previously married	4.0 (2.2–7.3)	3.3(1.8–6.0)	
Never married	5.9 (3.9–9.0)	4.2(2.6–6.7)	
Current education			0.004
Less than high school diploma	3.9 (1.9–7.8)		
High school diploma or GED	2.8 (1.4–5.5)		
Some college	2.8 (1.3–5.8)		
Bachelor's degree or higher	Reference		
Current income (% of federal poverty level)			<0.001
0–99%	2.8 (1.8–4.5)		
100–199%	2.5 (1.3–4.7)		
200% or greater	Reference		
Gestational age at miscarriage			0.645
0–12 weeks	Reference		
13–19 weeks	1.1 (0.7–1.8)		
Miscarriages before index miscarriage			0.968

	RR (95% CI)	Adjusted RR [†] (95% CI)	* p-value
0	Reference		
1	1.0 (0.6–1.5)		
2 or more	0.9 (0.4–1.9)		
Live born children before index miscarriage			0.003
0	Reference	Reference	
1	0.8 (0.5–1.4)	1.6(0.99–2.5)	
2	1.6 (0.9–2.8)	3.5(2.1–5.8)	
3 or more	2.3 (1.4–3.9)	5.7(3.3–10.0)	
Inter-pregnancy interval			0.336
No prior pregnancies	1.1 (0.7–1.8)		
0–12 months since last pregnancy	1.4 (0.9–2.3)		
More than 12 months since last pregnancy	Reference		

RR, relative risk; CI, confidence interval.

* *P*value listed for bivariable analysis.

[†] Adjusted for age, relationship status, live born children, and time since pregnancy outcome.