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Permalink

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Journal

Journal of Women's Health, 22(6)

ISSN

1540-9996

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Publication Date

2013-06-01

DOI

10.1089/jwh.2012.3885

Peer reviewed

Does a History of Unintended Pregnancy Lessen the Likelihood of Desire for Sterilization Reversal?

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Abstract

Background: Unintended pregnancy has been significantly associated with subsequent female sterilization. Whether women who are sterilized after experiencing an unintended pregnancy are less likely to express desire for sterilization reversal is unknown.

Methods: This study used national, cross-sectional data collected by the 2006–2010 National Survey of Family Growth. The study sample included women ages 15–44 who were surgically sterile from a tubal sterilization at the time of interview. Multivariable logistic regression was used to examine the relationship between a history of unintended pregnancy and desire for sterilization reversal while controlling for potential confounders.

Results: In this nationally representative sample of 1,418 women who were sterile from a tubal sterilization, 78% had a history of at least one unintended pregnancy and 28% expressed a desire to have their sterilization reversed. In unadjusted analysis, having a prior unintended pregnancy was associated with higher odds of expressing desire for sterilization reversal (odds ratio [OR]: 1.80; 95% confidence interval [CI]: 1.15–2.79). In adjusted analysis controlling for sociodemographic factors, unintended pregnancy was no longer significantly associated with desire for reversal (OR: 1.46; 95% CI: 0.91–2.34).

Conclusion: Among women who had undergone tubal sterilization, a prior history of unintended pregnancy did not decrease desire for sterilization reversal.

Introduction

SURGICAL STERILIZATION is the second most commonly used contraceptive method among U.S. women.¹ Although this is a very effective method of contraception, it is associated with a relatively high incidence of regret. The prevalence of sterilization regret has been reported to range from 1% to 30% across various studies and subpopulations.^{2–4} Young age, nonwhite race, low income, low parity, relationship conflict, and change in partners have been associated with regret of sterilization in previous studies.^{3, 5–8} Although there is no consensus regarding how or whether such information should guide sterilization counseling, it appears that providers do consider at least some of these factors when addressing sterilization requests. In a recent national survey study, providers indicated that their advice and willingness to

perform sterilization varied based on patient age, parity, and spousal agreement.⁹ Specifically, obstetrician-gynecologists were more likely to discourage a patient from undergoing sterilization if she was young, had few children, and was not in complete agreement with her spouse,⁹ presumably due to concerns that these women are at high risk for desiring reversal of sterilization in the future.

For many of these women, however, sterilization may be an appropriate and satisfactory contraceptive method. This may be particularly true for women who have a history of unintended pregnancy. There is emerging data concerning the link between unintended pregnancy and sterilization. Previous research using nationally representative data has shown that women with a history of unintended pregnancy are significantly more likely to undergo sterilization than women who have not had an unintended pregnancy, even after controlling

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for sociodemographic characteristics.¹⁰ The relationship between unintended pregnancy and regret, however, has not previously been explored. We hypothesized that women with a history of unintended pregnancy would be less likely to report desire for sterilization reversal, a commonly used measure of poststerilization regret. To test this hypothesis, we used data from the 2006–2010 National Survey of Family Growth.

Materials and Methods

Data source and study sample

This study used cross-sectional data collected for the 2006–2010 National Survey of Family Growth (NSFG). The NSFG is conducted by the National Center for Health Statistics and provides nationally representative data on family life, marriage and divorce, pregnancy, infertility, use of contraception, and men's and women's reproductive health. The NSFG uses a national probability sample designed to represent men and women aged 15–44 in the household population of all 50 states and the District of Columbia. African American, Hispanic, teenage, and female participants were oversampled; the NSFG provides sampling weights to adjust for the different sampling and response rates within the survey sample. In each randomly selected household, short screening interviews were initially conducted to determine if anyone aged 15–44 lived there. If so, one person from the household was chosen at random for the interview and offered a chance to participate. Interviewing was conducted from June 2006 to June 2010 at the selected person's home by trained female interviewers. The study population for the 2006–2010 NSFG included 12,279 women and 10,403 men. For this analysis, we included only women who reported that they were surgically sterile from a tubal sterilization at the time of interview and were asked about their desire for sterilization reversal.

Study variables

The outcome variable was desire for reversal of tubal sterilization at the time of interview. All women who reported that they were surgically sterile from a tubal sterilization at the time of interview were asked, "As things look to you now, if your tubal sterilization could be reversed safely, would you want to have it reversed? Would you say definitely yes, probably yes, probably no, or definitely no?" Women who responded "definitely yes" or "probably yes" were considered as desiring sterilization reversal for this analysis.

The key independent variable of interest was self-reported history of unintended pregnancy. Women who had ever been pregnant were asked to characterize each of their pregnancies as either "unwanted," occurring at the "right time," "overdue," or "too soon," or to state whether they "didn't care" or "didn't know." Consistent with the conventional definition of unintended pregnancy,¹¹ women reporting pregnancies that were either "unwanted" or occurred "too soon" were considered to have a history of unintended pregnancy. For each pregnancy reported, the NSFG provides the month and year that each pregnancy began. Women who had a sterilization procedure were also asked to provide the month and year of their procedure. Using this retrospective sequence data, we were able to censor pregnancies that occurred after the sterilization procedure ($n=55$ pregnancies). Because we were

interested in understanding the relationship between unintended pregnancy and subsequent tubal sterilization decisions and desire for reversal, we included only pregnancies that occurred prior to tubal sterilization. For unintended pregnancies, we further categorized whether these pregnancies resulted in a live birth, abortion, or another outcome (miscarriage, stillbirth, ectopic).

Race/ethnicity, insurance status, education level, income, parity, marital status, religion, age at the time of sterilization, age at first birth, and time since sterilization were examined as covariates. For women who were married or cohabiting with a male partner at the time of the interview, the date that they began living with their current husband or cohabiting partner was provided. Using this information we were able to ascertain whether or not the participant's current marital or cohabiting relationship began after the date of their sterilization procedure. Because change in partner is associated with desire for sterilization reversal, we constructed a marital status variable that reflects both the informal marital status at the time of interview and whether or not there was a change in partner status for the subset of married and cohabiting women.

Statistical analysis

We examined the sociodemographic characteristics of the study sample by history of unintended pregnancy using chi-squared tests for categorical variables and *t*-tests for continuous variables. We then examined the bivariate associations between all covariates and desire for reversal, and calculated unadjusted odds ratios for each pair. We also tested for interactions between unintended pregnancy and race/ethnicity, age at surgery, and age at first birth on desire for sterilization reversal. For our main analysis, we used a multivariable logistic regression model to determine the adjusted odds ratio of reporting desire for sterilization reversal by history of unintended pregnancy (yes/no) while controlling for those covariates that demonstrated a significant association ($p < 0.10$) with either the primary independent variable (history of unintended pregnancy) or the outcome variable (desire for sterilization reversal) in bivariate analyses.

We also performed several exploratory and sensitivity analyses to examine how desire for sterilization reversal was affected by (1) the number of unintended pregnancies, (2) whether the last pregnancy prior to sterilization was unintended or ended in abortion, and (3) examination of unwanted pregnancies only (rather than unintended pregnancies which included pregnancies that were unwanted as well as those that occurred "too soon").

Statistical analyses for this project were conducted using SAS software (version 9.3, SAS Institute Inc., Cary, NC), utilizing appropriate modifications for the NSFG's complex sample design. All percentages shown have been weighted to reflect national estimates. This study was approved by the University of Pittsburgh Institutional Review Board.

Results

A total of 1,427 women in the NSFG dataset who were surgically sterile from a tubal sterilization at the time of interview were asked about desire for sterilization reversal. Nine of these women answered that they "did not know" whether they would want to have their tubal sterilization

reversed; these women were therefore excluded from analysis, resulting in a final sample of 1,418 women. Table 1 shows the sociodemographic characteristics of the study sample. Over 78% of the study sample reported at least one prior unintended pregnancy. Race/ethnicity, insurance status, annual household income, parity, marital status/change in partner, religion, age at surgery, and age at first birth were all

significantly associated with a history of unintended pregnancy. Only education level and time elapsed since the sterilization procedure were not associated with a history of unintended pregnancy.

Approximately 28% of the women in our study sample expressed desire for sterilization reversal. In bivariate analysis, history of unintended pregnancy, annual household

TABLE 1. SOCIODEMOGRAPHIC CHARACTERISTICS OF WOMEN IN THE NSFG DATASET WHO WERE SURGICALLY STERILE FROM A TUBAL STERILIZATION AT THE TIME OF INTERVIEW AND ASKED ABOUT DESIRE FOR REVERSAL OF THEIR STERILIZATION

| | Total study cohort (%) N=1418 | History of unintended pregnancy | | p-value |
|--|----------------------------------|---------------------------------|-------------------|---------|
| | | No (%) N=307 | Yes (%) N=1111 | |
| Race/Ethnicity | | | | <0.001 |
| White | 52.0 | 49.2 | 52.8 | |
| Hispanic | 23.1 | 33.6 | 20.0 | |
| African American | 17.2 | 12.5 | 18.5 | |
| Other | 7.7 | 4.7 | 8.6 | |
| Insurance status ^a | | | | 0.008 |
| Private | 46.6 | 56.2 | 43.7 | |
| Public/None | 53.4 | 43.8 | 56.3 | |
| Annual household income ^b | | | | <0.001 |
| <100% of poverty level | 34.5 | 26.1 | 37.0 | |
| 100–199% of poverty level | 29.1 | 21.5 | 31.4 | |
| ≥200% of poverty level | 36.3 | 52.4 | 31.5 | |
| Education level | | | | 0.148 |
| <HS diploma | 28.8 | 27.0 | 29.3 | |
| HS diploma or GED | 36.6 | 32.6 | 37.8 | |
| Some college but no degree | 16.1 | 15.3 | 16.3 | |
| College degree or higher | 18.5 | 25.0 | 16.6 | |
| Parity | | | | <0.001 |
| 0, 1, or 2 children | 40.0 | 53.6 | 36.0 | |
| ≥3 children | 60.0 | 46.4 | 64.0 | |
| Current marital status/Change in partner since sterilization | | | | <0.001 |
| Never been married | 10.1 | 5.2 | 11.5 | |
| Div/Wid/Sep | 20.8 | 12.5 | 23.3 | |
| Married, no change | 50.1 | 69.1 | 44.5 | |
| Married, new partner | 6.5 | 6.6 | 6.5 | |
| Cohabiting, no change | 5.7 | 3.3 | 6.5 | |
| Cohabiting, new partner | 6.7 | 3.3 | 7.8 | |
| Religion | | | | 0.051 |
| None | 16.2 | 9.6 | 18.2 | |
| Catholic | 22.6 | 27.2 | 21.3 | |
| Protestant | 56.7 | 59.4 | 55.9 | |
| Other | 4.4 | 3.9 | 4.6 | |
| Age at surgery | | | | <0.001 |
| < 30 years old | 55.6 | 39.6 | 60.3 | |
| ≥ 30 years old | 44.4 | 60.4 | 39.7 | |
| Age at first birth | | | | <0.001 |
| < 20 years old | 55.6 | 29.8 | 63.2 | |
| ≥ 20 years old | 44.4 | 70.2 | 36.8 | |
| Time since surgery (mean years) | 7.3 | 7.2 | 7.4 | 0.675 |

^aPrivate insurance included private health insurance and Medi-Gap; public insurance included Medicaid, Medicare, Children’s Health Insurance Program, state-sponsored health plans, military health care, or other government programs. No insurance included single-service plans and Indian Health Service, in addition to not being currently covered by health insurance.

^bPoverty threshold based on annual poverty levels defined by the U.S. Census Bureau, which takes into account total household income and number.

Weighted to reflect the U.S. female household population.

For “no” and “yes” history of unintended pregnancy, column percentages add up to 100%.

NSFG, National Survey of Family Growth; HS, high school; Div/wid/sep, Divorced, widowed, or separated.

TABLE 2. BIVARIATE ASSOCIATIONS AND UNADJUSTED AND ADJUSTED ODDS RATIOS OF EXPRESSING DESIRE FOR REVERSAL

| | Percent of women who desire reversal | Bivariate <i>p</i> -value | Unadjusted OR (95% CI) | Adjusted OR (95% CI) |
|--|---|------------------------------|---------------------------|-------------------------|
| History of unintended pregnancy | | 0.009 | | |
| No | 17.7 | | Reference | Reference |
| Yes | 27.9 | | 1.80 (1.15,2.79) | 1.46 (0.91,2.34) |
| Race/Ethnicity | | 0.324 | | |
| White | 22.5 | | Reference | Reference |
| Hispanic | 28.2 | | 1.35 (0.88,2.08) | 1.50 (0.89,2.52) |
| African American | 29.3 | | 1.43 (0.94,2.16) | 1.12 (0.69,1.81) |
| Other | 29.9 | | 1.47 (0.68,3.19) | 1.64 (0.68,3.95) |
| Insurance ^a | | 0.179 | | |
| Private | 23.1 | | Reference | Reference |
| Public/None | 27.7 | | 1.28 (0.89,1.83) | 0.74 (0.47,1.17) |
| Annual household income ^b | | 0.009 | | |
| <100% of poverty level | 31.8 | | Reference | Reference |
| 100–199% of poverty level | 25.8 | | 1.34 (0.89,2.04) | 1.12 (0.71,1.77) |
| ≥200% of poverty level | 19.3 | | 0.69 (0.43,1.10) | 0.88 (0.53,1.46) |
| Highest education level | | <0.001 | | |
| <HS diploma | 34.7 | | Reference | Reference |
| HS diploma or GED | 26.4 | | 0.25 (0.13,0.51) | 0.35 (0.16,0.76) |
| Some college but no degree | 23.0 | | 0.67 (0.44,1.02) | 0.67 (0.42,1.08) |
| College degree or higher | 11.9 | | 0.56 (0.34,0.94) | 0.63 (0.34,1.16) |
| Parity | | 0.491 | | |
| 0, 1, or 2 | 24.2 | | Reference | Reference |
| 3 or more | 26.5 | | 1.13 (0.79,1.62) | 0.96 (0.64,1.43) |
| Current marital status/Change in partner since sterilization | | <0.001 | | |
| Never been married | 33.8 | | Reference | Reference |
| Div/Wid/Sep | 30.0 | | 0.84 (0.47,1.50) | 0.95 (0.51,1.78) |
| Married, no change | 18.7 | | 0.45 (0.26,0.77) | 0.63 (0.35,1.16) |
| Married, new partner | 48.9 | | 1.88 (0.87,4.03) | 2.12 (0.94,4.81) |
| Cohabiting, no change | 23.7 | | 0.61 (0.27,1.38) | 0.69 (0.27,1.73) |
| Cohabiting, new partner | 30.3 | | 0.85 (0.40,1.82) | 0.82 (0.36,1.86) |
| Religion | | 0.185 | | |
| None | 20.4 | | Reference | Reference |
| Catholic | 25.6 | | 1.34 (0.76,2.37) | 1.48 (0.78,2.79) |
| Protestant | 28.0 | | 1.52 (0.93,2.48) | 1.71 (1.00,2.91) |
| Other | 13.3 | | 0.60 (0.17,2.11) | 0.89 (0.30,2.65) |
| Age at surgery | | <0.001 | | |
| < 30 years old | 32.6 | | Reference | Reference |
| ≥ 30 years old | 16.8 | | 0.42 (0.29,0.60) | 0.52 (0.34,0.81) |
| Age at first birth | | <0.001 | | |
| < 20 years old | 31.4 | | Reference | Reference |
| ≥ 20 years old | 18.3 | | 0.49 (0.34,0.70) | 0.82 (0.53,1.29) |
| Time since surgery | | 0.969 | 1.00 (0.97,1.03) | — |

^aPrivate insurance included private health insurance and Medi-Gap; public insurance included Medicaid, Medicare, Children's Health Insurance Program, state-sponsored health plans, military health care, or other government programs. No insurance included single-service plans and Indian Health Service, in addition to not being currently covered by health insurance.

^bPoverty threshold based on annual poverty levels defined by the U.S. Census Bureau, which takes into account total household income and number.

Weighted to reflect the U.S. female household population.

HS, high school; Div/wid/sep, Divorced, widowed, or separated.

income, education level, marital status/change in partner, age at surgery, and age at first birth were associated with desire for sterilization reversal (Table 2). In unadjusted analysis, women who had at least one unintended pregnancy were more likely to express desire for reversal than a woman who reported that all her pregnancies were intended (OR: 1.80, 95% CI: 1.15–2.79). The relationship between unintended pregnancy and desire for reversal did not vary by race/ethnicity ($p=0.170$), age at sterilization ($p=0.146$), or age at first

birth ($p=0.233$) in unadjusted interaction assessments. Compared to having less than a high school diploma, having a high school diploma or college degree was associated with decreased desire for sterilization reversal (OR: 0.25; 95% CI: 0.13–0.51 and OR: 0.56; 95% CI: 0.34–0.94, respectively). Compared to having never been married, being married to the same partner as at the time of sterilization was also associated with less desire for reversal (OR: 0.45; 95% CI: 0.26–0.77). Having been 30 years or older at the time of the sterilization

procedure rather than having been under 30 years of age (OR: 0.42; 95% CI: 0.29–0.60), and having had a first birth after age 20 rather than during teenage years (OR: 0.49; 95% CI: 0.34–0.70) were also significantly associated with decreased desire for reversal in unadjusted analysis.

Results from the multivariable regression analysis are also shown in Table 2. All of the covariates examined, except for time elapsed since sterilization, were significantly associated with either the primary independent variable (history of unintended pregnancy) or the outcome (desire for sterilization) and were included in the multivariable model. In the final adjusted analysis, having had an unintended pregnancy was no longer significantly associated with desire for reversal (OR: 1.46; 95% CI: 0.91–2.34). Only having a high school diploma (OR: 0.35, 95% CI: 0.16–0.76) and age over 30 at sterilization (OR: 0.52; 95% CI: 0.34–0.81) remained significantly associated with decreased desire for reversal in adjusted analysis.

In exploratory analyses, we did not find any differences in likelihood of desire for sterilization reversal based on the number of unintended pregnancies that a woman reported. Compared to women with no history of unintended pregnancy, women with only one unintended pregnancy had significantly higher odds of expressing desire for sterilization reversal (unadjusted OR: 1.94; 95% CI: 1.15–3.28) as did women with two or more unintended pregnancies (unadjusted OR: 1.67; 95% CI: 1.05–2.65). Women whose last pregnancy prior to sterilization was unintended were as likely to express desire for reversal as those women whose last pregnancy prior to sterilization was intended (unadjusted OR: 1.19; 95% CI: 0.83–1.70). Among the 660 women whose last pregnancy prior to sterilization was unintended, 66 (10%) had an abortion. Having the last pregnancy prior to sterilization end in an abortion was also not associated with desire for sterilization reversal (unadjusted OR: 1.11; 95% CI: 0.57–2.17). A sensitivity analysis using a history of unwanted pregnancy rather than unintended pregnancy (which included pregnancies that were “unwanted” as well as occurred “too soon”) dropped the point estimate below 1 but was statistically nonsignificant (unadjusted OR: 0.92; 95% CI: 0.64–1.32). Using a history of abortion produced similar results (unadjusted OR: 0.85; 95% CI: 0.60–2.17).

Discussion

Contrary to our initial hypothesis, in this nationally representative sample of 1,418 women who had undergone tubal sterilization, we found no evidence that a prior history of unintended pregnancy reduced a woman’s likelihood to desire reversal of her tubal sterilization in adjusted analysis. Interestingly, the odds for expressing desire for reversal in unadjusted analysis were actually significantly higher for women who had at least one unintended pregnancy compared to women who reported that all of their pregnancies were intended.

Our unanticipated finding of a strong association between unintended pregnancy and higher likelihood of desire for sterilization reversal in unadjusted analysis may reflect underlying psychosocial factors that link these two variables. For example, women with low self-efficacy may be more likely to experience unintended pregnancy^{12,13} and also have lower confidence about their subsequent sterilization decisions. Another possibility is that women who are most likely to

experience unintended pregnancy in this country, those from a racial/ethnic minority and from socioeconomically disadvantaged backgrounds,¹⁴ are also those women whose life circumstances are less stable and more likely to change, such as change in partner or death of a child—both of which are associated with sterilization regret.^{15–18} This likely explains why we observed a drop in significance when we controlled for race and socioeconomic variables in the adjusted analysis. Another explanation may be that women may make reactionary decisions to undergo sterilization after having an unintended pregnancy. This may be especially true for women who experienced teenage pregnancies, as we saw that these women were significantly more likely to express desire for reversal in unadjusted analysis. However, when we examined whether the odds of desire for sterilization reversal was higher for women whose last pregnancy prior to sterilization was unintended compared to those women whose last pregnancy was not unintended, we found no difference.

Recent data suggest that providers attempt to identify risk factors for regret and adjust their advice or recommendations accordingly.⁹ However, to some degree regret is inevitable, and we wonder if actively discouraging women who desire sterilization is appropriate, as it comes with the risk of thwarting patient reproductive autonomy and potentially jeopardizing the patient–provider relationship. For example, in one qualitative study with women who had either undergone sterilization or were considering the procedure, participants commonly reported that their providers attempted to dissuade them from getting the sterilization procedure or refused to do the procedure, citing their young age or low parity as too highly correlated with subsequent regret.¹⁹ These women expressed frustration that their providers did not respect their preferences. Providers who are counseling women requesting sterilization may certainly find it challenging to balance respect for women’s reproductive choices with current regret statistics, especially in light of the availability of highly effective, reversible contraceptive methods such as intrauterine devices (IUDs) and implants. Sterilization counseling can be fraught with complexity because sterilization permanently ends a woman’s reproductive capacity, because there has been a history of coercive sterilization in this country among low-income and minority populations, and because issues surrounding fertility and reproductive control remain politically and ethically charged. Perhaps instead of trying to identify women who will experience regret and persuading them to select another contraceptive method, clinicians should focus on providing comprehensive, high-quality counseling to all women to ensure that their decisions are as informed as possible at the time they are making them, recognizing that circumstances may change later.

Several limitations need to be considered in interpreting the results of this analysis. First, there is debate about the validity of survey categories in capturing the nuances of pregnancy intendedness and whether the interpretation of these categories may vary across cultural and socioeconomic groups.^{11,13} We have adhered to the conventional definition of unintended pregnancy,¹¹ and we also use the NSFG database, which is currently considered the United States’ gold standard for reproductive data, including unintended pregnancy. Moreover, we conducted sensitivity analyses using a history of unwanted pregnancy as well as abortion, which are less ambiguous constructs and therefore less susceptible to

misclassification, and still found no statistically significant reduction in poststerilization regret. Second, regret is similarly a difficult construct to measure because it encompasses a complex spectrum of feelings that may vary over time and circumstances. Expressing desire to reverse sterilization in the context of a survey or hypothetical situation might not necessarily mean that a woman would not make the same choice again if given another chance. As such, the questions posed by the NSFG to elicit women's desire for sterilization reversal may overestimate true sterilization regret.

Conclusions

In summary, we found that among women who had undergone tubal sterilization, a history of unintended pregnancy in no way precludes desire for sterilization reversal. Having an unintended pregnancy makes women more likely to pursue a sterilization procedure¹⁰ but does not ensure that she will ultimately be satisfied with this decision.

Acknowledgments

Dr. Borrero's effort on this project was supported by the National Center for Research Resources and the National Center For Advancing Translational Sciences of the National Institutes of Health through Grant Number 2KL2RR024154-06.

Author Disclosure Statement

No competing financial interests exist.

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