Published in final edited form as:

J Marriage Fam. 2018 October ; 80(5): 1259–1270. doi:10.1111/jomf.12500.

Understanding Sterilization Regret in the United States: The Role of Relationship Context

Mieke C.W. Eeckhaut and

Department of Sociology and Criminal Justice, University of Delaware, 309 Smith Hall, 18 Amstel Ave., Newark, DE 19716, Phone: 302-831-2681

Megan M. Sweeney

Department of Sociology & California Center for Population Research, University of California, Los Angeles, 202 Haines Hall, 375 Portola Plaza, Los Angeles, CA 90095, Phone: 310-206-7290

Abstract

Although one fourth of sterilized reproductive-aged women in the U.S. express a desire to have their sterilization procedures reversed, the pathways leading to sterilization regret remain insufficiently understood. Particularly little is known about how cohabitation affects the likelihood of sterilization regret. This study used data from the 2006–2010 National Survey of Family Growth to investigate how relationship context shapes women's risk of sterilization regret. Our findings point to higher levels of regret among women who were cohabiting, rather than married or single at the time of sterilization. Experiencing post-sterilization union dissolution or post-sterilization union formation was also associated with an elevated risk of regret. Together, post-sterilization union instability and selected background characteristics largely explained elevated levels of regret observed among women who were cohabiting at the time of sterilization. An association between regret and post-sterilization union instability persisted, however, even when socioeconomic and reproductive background factors were controlled.

Keywords

cohabitation; fertility; health disparities; relationship dissolution; reproductive health

In the contemporary United States, one-in-four women using contraception relies on female sterilization, making it the second most prevalent method of contraception (Daniels, Daugherty, & Jones, 2014). Because of its permanent character—reversal surgery is invasive, expensive, and not necessarily successful—sterilization is often thought of as a method used only by married partners. Yet sterilization has long been common among unmarried women (Bumpass, Thomson, & Godecker, 2000), with cohabiting women as likely as first-married women to become sterilized in the contemporary United States (Eeckhaut, 2015).

Although contraceptive sterilization has improved the lives of many women and their families, a surprisingly large share of women express regret regarding having become sterilized. In 2002, nearly one-in-four women with unreversed tubal ligations expressed a desire to have their sterilizations reversed (Borrero et al., 2008). Nationally-representative studies indicate that being age 30 or younger at sterilization is a key risk factor for desiring a

reversal (Borrero et al., 2008; Grady et al., 2013; Henshaw & Singh, 1986). Although results vary across studies, other sociodemographic and reproductive correlates of sterilization regret include low parity (Shreffler et al., 2015), early childbearing (Grady et al., 2013), a history of unintended pregnancy (Grady et al., 2013), low education and income (Chandra, 1998; Grady et al., 2013; Henshaw & Singh, 1986), and minority background (Borrero et al., 2008; Chandra, 1998; Henshaw & Singh, 1986).

Little is known about how union context at the time of sterilization, and union change after sterilization, influence the likelihood of sterilization regret, even though a desire to have more children is one of the most commonly reported reasons for sterilization regret (Hillis et al., 1999) and childbearing intentions tend to be shaped by relationship experiences (Hayford, 2009; Heaton, Jacobson, & Holland, 1999). If a couple ends their relationship after sterilization, the desirability of having additional births may change. Childbearing desires may have been dampened in the context of low quality or unstable relationships, which should affect cohabiting relationships more than marriages (e.g., Lillard & Waite, 1993; Rijken & Liefbroer, 2009). New relationships may also increase desire for (additional) childbearing, possibly to indicate commitment to the new partnership (Balbo, Billari, & Mills, 2013). Moreover, male and female partners do not always agree on their personal childbearing preferences and thus childbearing plans may change in response to the desires of a new partner (Berrington, 2004; Stewart, 2002; Thomson, McDonald, & Bumpass, 1990).

Nationally-representative studies of sterilization regret have typically examined marital status at the time of interview, rather than at the time of sterilization. This limits our understanding of union context as a predictor of regret. For example, Henshaw and Singh (1986) considered whether a woman was married at the time of interview and Borrero and colleagues (2008) considered whether a woman had ever been married. Practice-based studies point to a higher risk of regret among women who were separated, divorced, or widowed (Wilcox, Chu, & Peterson, 1990), or unmarried (Hillis et al., 1999), as compared to married at sterilization, and among women who had a change in marital status after sterilization (Wilcox, Chu, & Peterson, 1990), but these associations have not yet been examined in a nationally-representative sample of sterilized women.

Past work has also been largely silent on the relationship between having been in a cohabiting union at the time of sterilization and subsequent regret. This is surprising given dramatic growth in the prevalence of cohabitation and the increased significance of cohabitation as a setting for childbearing (Cherlin, 2010). Reproductive behavior offers a window onto the place of cohabitation in the U.S. family system, providing insight into how strongly cohabitation resembles marriage in particular times and places. Contraceptive use differences between cohabiting and first-married women are eroding (Sweeney, 2010) and cohabiting women are as likely as first-married women to become sterilized (Eeckhaut, 2015). This suggests that cohabitation and marriage may be increasingly similar to one another as a context for childbearing. Yet, there are reasons to expect meaningful differences between cohabitation and marriage as a setting for sterilization decision-making. For example, cohabitation remains less stable than marriage in the contemporary U.S. and thus tends to carry greater future uncertainty (Cherlin, 2010; Heuveline & Timberlake, 2004).

This could be of particular importance to childbearing intentions, which tend to be dynamic across the life course (Hayford, 2009) and are especially likely to shift when a partnership ends or a new partnership begins (e.g., Wilcox et al., 1990). Taken together, this would suggest a higher risk of sterilization regret for women who undergo the procedure within the context of a cohabiting relationship, as compared to marriage. In addition, there are reasons to expect meaningful differences between cohabiting and single women because contraceptive decision-making among partnered women—cohabiting or married—is likely a joint process that involves negotiating and compromising, and thus the potential for persuasion by one's partner (Bertotti, 2013). This may increase the risk of sterilization regret for women who undergo the procedure within the context of a cohabiting relationship, as compared to women who are single at sterilization, especially if the partnership were to end.

Efforts to decrease high levels of sterilization regret among U.S. women need to be grounded in a careful understanding of the pathways leading to regret. Yet relatively little is known about the possible role of post-sterilization union change in explaining differential regret by union status. Women who are single at the time of sterilization could display a higher risk of regret than those who are married because single women are more likely to enter a new partnership after sterilization. Some studies have acknowledged the potentially important role of union dynamics for understanding sterilization regret. For example, Shreffler and colleagues (2015) find that being in a new relationship is associated with an increased likelihood of regretting sterilization, although this effect appears to be explained by aspects of a woman's sterilization history, such as whether she was under 30 at sterilization. Grady and colleagues (2013) consider a combined measure of union status at interview and whether there had been a change in partner since sterilization, with ambiguous results. Yet no prior analysis of nationally-representative data, to our knowledge, examines the combined effects of union status at the time of sterilization and union change after sterilization. In addition, no study has considered whether the dissolution of the relationship prevailing at the time of sterilization is associated with subsequent regret. The risk of regret may be elevated for women who limited their fertility in the context of a relationship that later ended, regardless of whether they subsequently formed a new union.

Finally, identification of the predictors and pathways to regret hinges on the inclusion of the full set of important covariates, including a woman's union context at and after sterilization. In line with previous studies (cf., supra), we consider the role of key sociodemographic and reproductive correlates of regret, including age at sterilization, early childbearing, parity, history of unintended pregnancy, time since sterilization, education, racial and ethnic background, and nativity. We also include detailed measures of union status at sterilization and union change after sterilization, however, and hence will be able to examine if previously reported associations between these aforementioned characteristics and regret are more than just an artefact of certain groups of women being more likely to be unmarried at sterilization, and/or to experience union change after sterilization. In particular, higher levels of regret commonly found among economically-disadvantaged women and among women who were sterilized before age 30 could be explained by differences in union status at sterilization or union change after sterilization. Indeed, economically-disadvantaged women are less likely to be married and, if married, more likely to divorce, and they are more likely to have a birth outside of marriage (Cherlin, 2010). Women who were sterilized before age

30 have a longer period during which they could experience union change and consider future childbearing. Including union status at sterilization and union change after sterilization is thus vital to advancing understanding of broader processes leading to regret.

In this study, we examine associations between union context and expressed desire for sterilization reversal among U.S. women. We consider cohabiting women separately from married or single women and focus on union status at the time of sterilization rather than at the time of interview. We also consider whether post-sterilization transitions in union status explain any association between union status and regret. Finally, we investigate whether union context can explain associations between regret and other key sociodemographic and reproductive characteristics—most notably age at sterilization and education. By enhancing understanding of the links between union context and regret, the current research provides much-needed insight into persistently high levels of sterilization regret in the U.S. and strengthens our understanding of cohabitation as a unique context for U.S. reproductive decision-making.

METHOD

Data & Sample

Data for this study were drawn from the 2006–2010 National Survey of Family Growth (NSFG; https://www.cdc.gov/nchs/nsfg/nsfg_2006_2010_puf.htm), the latest available information on sterilization regret for the full NSFG sample. A questionnaire routing error in 2011–2013 and 2013–2015 inadvertently excluded women who reported not currently being married or in an opposite-sex partnership from being asked the sterilization reversal question (RWANTRVT), meaning that we unfortunately could not use data from these most recent surveys (Daniels, K., September 15, 2015, personal correspondence).

The NSFG, designed and administered by the National Center for Health Statistics (NCHS), has been conducted periodically from 1973 to 2002 and then moved to a continuous survey design in 2006. The NSFG data are representative of the U.S. non-institutionalized population ages 15–44 when properly weighted, and include oversamples of teens, blacks and Hispanics. For the 2006–2010 survey, in-home interviews were conducted by trained female interviewers with 12,279 women using computer-assisted personal interviewing (CAPI), resulting in a response rate of 78% (Martinez, Daniels, & Chandra, 2012). For the purposes of our analysis, the analytic sample was first limited to women who reported being currently sterile from a tubal sterilization ($N=1,656$). We then dropped 11 women who reported that their sterilization was performed for solely medical (as opposed to contraceptive) purposes ($N=1,645$), 230 additional women who reported any other female sterilization operation (e.g., hysterectomy, $N=1,415$), one woman with missing information on date of sterilization ($N=1,414$), and 34 women with conflicting or incomplete information on the start or end date of any previous co-residential unions (i.e., no end date, or start date after end date; $N=1,380$). All analyses and descriptive statistics were adjusted for the NSFG's complex sample design using the *svy* command in Stata 14.

Measures

Our primary dependent variable is sterilization regret. Regret was measured by the following question: “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?” In line with previous NSFG studies (Borrero et al., 2008; Grady et al., 2013), our regret variable considered women who responded “definitely yes” or “probably yes” as expressing regret.

Measures of union status at the time of sterilization, union dissolution after sterilization, and union formation after sterilization were based on retrospective reports of the beginning of all current cohabitations and marriages and of the beginning and end (i.e., the month and year) of up to six previous marriages and premarital cohabitations and up to four previous cohabitations with partners to whom she was never married. Union status at the time of sterilization distinguished between women who were single, cohabiting, and married. Union dissolution after sterilization identified women who reported that the cohabitation or marriage that they were in at the time of sterilization had ended between sterilization and interview. Union formation after sterilization identified women who reported being in a cohabitation or marriage at interview that had formed after sterilization. Union status at interview was based on the recoded variable ‘informal marital status’ (RMARITAL), and distinguished among women who were single, cohabiting, and married.

We also included in the analysis a selection of sociodemographic and reproductive background characteristics shown to be associated with regret in prior research (cf., supra). Sociodemographic characteristics included: education (less than high school, completed high school, some college, completed college), race/ethnicity (non-Hispanic white, Hispanic, non-Hispanic black, non-Hispanic other or multiple race), and nativity status (US-born, foreign-born). Reproductive characteristics in the analysis included: parity (0–1, 2, 3, 4+), early childbearing (first birth at age <20, first birth at ages 20–24, no birth before age 25), age at sterilization (<25 years, 25–29 years, 30–34 years, 35+ years), and whether the respondent had ever had an unintended pregnancy (1 if yes, 0 otherwise). We finally included a measure for years since sterilization (0–5, >5–10, >10).

Analyses

The analysis proceeded in two steps. First, we examined bivariate associations between sterilization regret and various measures of union status and union change using chi-squared tests. Second, we relied on binary logistic regression analysis to examine the association of sterilization regret with union status at the time of sterilization and union dissolution and union formation after sterilization. Model 1 regressed regret on each union variable separately, whereas Model 2 regressed regret on all union variables jointly, to examine the effects of each union variable, net of the other union variables. Model 3 examined the effect of union status at sterilization, net of the other sociodemographic and reproductive characteristics (except union dissolution and union formation after sterilization). Model 4, finally, entered all union variables jointly, and all of the other covariates, to examine the effects of each union variable, net of the other union variables and all sociodemographic and

reproductive characteristics. Wald tests were used to identify variables that have a statistically significant effect ($p < .05$) in the logistic regression models.

RESULTS

Our data reveal high levels of sterilization regret among American women, consistent with prior studies. One-in-four (24.6%) sterilized women in the NSFG sample reported that they “probably” or “definitely” would want to have their tubal sterilization procedure reversed, if they could do so safely (Table 1). Nearly half of these women (11.8%) expressed a strong desire for reversal of their procedure, stating that they would “definitely” want to have their sterilizations reversed.

We next consider bivariate associations between expressed desire for sterilization reversal and our relationship measures (Table 1). We identify a strong and significant association between union status at the time of sterilization and subsequent regret. A remarkable 33.3% of women who were cohabiting at the time of sterilization report “probably” or “definitely” wanting a reversal of their sterilization procedures, as compared to 26.2% of women who were single at the time of sterilization and 21.4% of women who were married at the time of sterilization.

Although our primary interest lies with union status at the time of sterilization, as explained above, we also consider the more typically investigated union status at the time of interview for comparison purposes. Although the overall association between this more conventional measure and regret is not statistically significant at conventional levels ($p = .054$), we note that it is being single, non-cohabiting, at the time of interview that stands out for being associated with the highest levels of regret (29.7%, compared with 28.2% of cohabiting women and 21.0% of married women), although regret for both currently single and cohabiting women is high relative to currently married women. In short, our understanding of the association between union context and regret changes considerably when looking at the union that was prevailing at the time the decision to sterilize was made.

We next consider changes in union status after sterilization, and find that post-sterilization union dissolution and post-sterilization union formation are associated with a similar increase in the risk of sterilization regret. Of women who had been in a co-residential partnership at the time of sterilization and had subsequently left these partnerships, 37.2% reported desiring a sterilization reversal, as compared with 19.9% of women who did not experience the dissolution of such relationships. Women who reported being in a cohabitation or marriage at interview that was formed after sterilization reported desiring a reversal 40.2% of the time, as compared with 22.3% of women who were not in such a relationship at interview.

As noted above, our bivariate analysis shows the highest levels of regret among women who were cohabiting at the time of sterilization, among women who were single at interview, and among women who had experienced union change after sterilization. Table 2 displays associations between our main union context variables and other sociodemographic and

reproductive characteristics. These associations indicate which covariates might explain observed associations of sterilization regret with union status and union change.

As expected, we first note that women who were cohabiting at sterilization are substantially more likely than those who were married at sterilization to have experienced union dissolution after sterilization (45.9% for cohabiting women, versus 28.6% for married women). This highlights the relatively greater future instability associated with cohabiting than married relationships prevailing at the time a sterilization decision is made. Conditional on having experienced union dissolution after sterilization, women who were cohabiting at sterilization are no more likely to be in a co-residential union at interview that had formed after sterilization than are women who were married at sterilization (28.3% (=13.0/45.9%) for cohabiting women, versus 28.7% (=8.2/28.6%) for married women; calculated based on Table 2)—and only slightly less likely to be in such a union than are women who were single at sterilization (30.7%).

Relative to other women, those who were married at sterilization and those who have not experienced union change since sterilization are more likely to be college educated, non-Hispanic white (except for union formation) or Hispanic, and foreign-born, but less likely to have had a birth before age 20 or to have a history of unintended childbearing. We also note that women who were married at sterilization and those who have not experienced union change since sterilization are considerably less likely to have been under age 25 at the time of sterilization. This difference is particularly important, as having been young at the time of sterilization is among the most consistently identified predictors of sterilization regret.

The multivariate analyses examine if associations between regret and union status at the time of sterilization persist after adjusting for subsequent relationship instability and for other sociodemographic and reproductive characteristics. Table 3 shows a higher risk of regret for women who were cohabiting than for those who were married at the time of the procedure. This higher risk of regret is primarily explained by differences in women's sociodemographic and reproductive profile (Model 3). At the same time, Table 3 also indicates that women who have experienced post-sterilization union change display a substantially higher risk of sterilization regret. This higher risk is not explained by differences in union status at sterilization (Model 2) or by differences in women's sociodemographic and reproductive profile (Model 4). Even after adjusting for all the other covariates in Model 4, women who have experienced post-sterilization union dissolution and women who have experienced post-sterilization union formation are nearly two times more likely to report sterilization regret (ORs = 1.97 and 1.77, respectively). The fact that union formation is significantly associated with regret, even after adjusting for union dissolution, indicates that women who were in a coresidential relationship at sterilization and in a new coresidential relationship at interview (i.e., experienced union dissolution *and* union formation) are even more likely to express sterilization regret than are women who were in a coresidential relationship at sterilization and single at interview (see also Appendix A).

Finally, we had asked whether high levels of regret observed among disadvantaged women and those who were young at the time of sterilization might be explained by such women's relatively higher likelihood of being sterilized outside of marriage and their relatively greater

likelihood of experiencing union instability after their sterilizations were performed. Even after adjusting for these union history variables (and for the other sociodemographic and reproductive characteristics), women who were sterilized before age 30 are more likely to report sterilization regret than are women sterilized at relatively older ages. In addition, union history does not fully explain the higher level of regret observed among women with the least education as compared to those with a Bachelor's degree or higher—although the overall association with regret falls just short of conventional levels of statistical significance in the full model (Model 4; $p = .062$).

SENSITIVITY ANALYSES

Three sets of sensitivity analyses were performed. First, we considered a more direct measure of woman's childrearing responsibilities by replacing the variable 'parity' by a measure of the total number of children aged 18 or under in the household (see Appendix A), including biological children, step-children (i.e., children of spouse), adopted children, legal ward, foster children, partner's children, grandchildren, or nephews/nieces. Results are highly robust with only one exception; the coefficient for union formation is not statistically significant in Model 4, suggesting that the total number of children aged 18 or under in the household is partly mediating the association between post-sterilization union formation and regret.

Second, we considered whether results would change when replacing our current post-sterilization union formation variable by an alternative union formation variable that identified women who reported having formed a cohabitation or marriage between sterilization and interview, regardless of whether or not this newly formed union was still intact at interview (results available upon request). These additional analyses largely confirm results of the main analyses, with only one important exception; the coefficient for this alternative union formation variable is no longer statistically significant in Model 4, suggesting that the heightened risk of regret associated with union formation is limited to women whose newly formed union is still intact at interview.

Finally, we examined whether multicollinearity in age at first birth, age at sterilization, and years since sterilization affects our results, by estimating parallel analyses including only one of the three at a time rather than all three variables simultaneously, in Models 3 and 4 of Table 3 (results available upon request). These parallel analyses did not lead to substantively different conclusions.

DISCUSSION

This study offered two key innovations over prior work. By enhancing our understanding of the links between union context and sterilization regret, results of this study could help inform discussions between physicians and their female patients of the benefits and drawbacks of sterilization. By considering cohabitation as a distinct context for regret, we increased knowledge of cohabitation as a setting for reproductive decision-making.

Several key findings emerged from the analysis. First, one-in-four women sterile from a tubal sterilization in 2006–2010 expressed sterilization regret (i.e., they would “definitely”

or “probably” have their sterilization reversed, if it could be done safely), with about half of these women (12.0%) expressing strong sterilization regret (i.e., they would “definitely” have their sterilization reversed, if it could be done safely).

Second, in line with previous research, we found that women who were single at interview were more likely to report sterilization regret than women who were cohabiting (or married). However, results for union status at sterilization indicate that it is cohabitation that stands out for being associated with the highest levels of regret. In their practice-based study, Hillis and colleagues (1999) found a higher probability of regret among women who were unmarried at sterilization, but our results suggest that this higher probability may apply less to the subgroup of unmarried women who were single, as compared to those who were cohabiting at sterilization.

Third, women who were cohabiting at sterilization were more likely than those who were married to report sterilization regret. This is important in light of recent research showing that differences in contraceptive use between cohabiting and first-married women are eroding (Sweeney, 2010), and that cohabiting women are as likely as first-married women to get sterilized (Eeckhaut, 2015). Differences in regret by union status at sterilization were no longer significant after adjusting for a range of sociodemographic and reproductive characteristics. Rather than showing that union status at sterilization is inconsequential to regret, our results suggest a profile of women at high risk of regret. That is, of women who were cohabiting at sterilization in our sample only 3.8% had completed college, only 38.5% did not have a birth before age 20, only 35.9% were age 30 or older at sterilization, and only 9.7% never had an unintended birth (Table 2). All of these characteristics are independently associated with sterilization regret in our sample. This profile of cohabiting women is in line with previous research showing the relatively disadvantaged status of unmarried versus married parents (e.g., Tach & Edin, 2013).

Finally, post-sterilization union dissolution and post-sterilization union formation emerged as important risk factors for regret, even after adjusting for union status at sterilization and select sociodemographic and reproductive characteristics in the multivariate models. Women who were single or cohabiting at sterilization were much more likely to have experienced post-sterilization union change than those who were married. Nearly one-in-three (30.7%, Table 2) of women who were single at sterilization were in a newly formed co-residential union at sterilization. Nearly half (45.9%) of women who were cohabiting at sterilization saw this cohabitation end between sterilization and interview, and of those, more than one-in-four (13.0% out of 45.9%) subsequently formed a new cohabitation or marriage. The strong link between cohabitation and subsequent union change confirms previous research showing cohabitation to be a less stable union context than marriage (Cherlin, 2010; Heuveline & Timberlake, 2004). In fact, women who were cohabiting at sterilization were even less likely than those who were single to be in the same union status at interview (35.1% vs. 67.5%). While this may, at least in part, reflect the fact that cohabiting women are at risk of union dissolution and formation, whereas single women are at risk of union formation only, it also underscores the importance of considering cohabitation as a distinct relationship context in research on sterilization.

Our study was the first to examine union dissolution, in addition to union formation, thus extending previous nationally-representative research that has indicated the importance of union formation for regret. For example, in 1980 Poma wrote that “A new marriage was the single most common reason for seeking reversal of their [the women who came to the author’s office] sterilizations ...” (p. 44). Our results suggest that union dissolution may be as consequential to regret as union formation. Moreover, union dissolution is more common than union formation in our sample of sterilized women (Table 1, 27.3% vs. 12.9%, respectively; when using the more inclusive union formation variable (see ‘Sensitivity analyses’), 27.3% vs. 20.9%, respectively).

Finally, results from our analysis provide fresh insights into two well-established predictors of sterilization regret: education and age at which the procedure was performed. The multivariate analysis showed a higher risk of regret for women who were sterilized before age 30 as compared to women who were sterilized between the ages of 30 and 34, even after adjusting for differences in union context and the other sociodemographic and reproductive characteristics. In addition, the full multivariate model showed a higher risk of regret for women with less than high school education, as compared to women with a Bachelor’s degree—although the overall association with regret fell just short of conventional levels of statistical significance ($p = .062$). These results indicate that differences in regret by age at sterilization and by education are not (fully) explained by differences in union context (and the other sociodemographic and reproductive characteristics).

Several limitations need to be kept in mind when interpreting results. First, our study relied on a measure of regret at a single point in time, even though feelings of sterilization regret may change over time and the cumulative probability of regret has been shown to increase steadily with increasing time since sterilization (Hillis et al., 1999; Schmidt et al., 2000). This means that the proportion of sterilized women who *ever* experienced regret is likely higher than what is captured in this study. Future research would benefit from data collection efforts that include a nationally-representative sample of women undergoing sterilization and collect information on regret and other covariates over time.

Second, we followed previous NSFG studies (Borrero et al., 2008; Chandra, 1998; Grady et al., 2013; Henshaw & Singh, 1986) in defining regret as expressing a desire for reversal. Other studies have relied on other measures such as agreeing that sterilization as a permanent method of birth control was not a good choice for them (Hillis et al., 1999; Jamieson et al., 2002; Wilcox et al., 1991), agreeing that the surgery had prevented them from having children that they had wanted to have (Shreffler et al., 2015), having requested information on sterilization reversal (Jamieson et al., 2002; Schmidt et al., 2000; Wilcox, Chu, & Peterson, 1990), and actually undergoing reversal surgery (Jamieson et al., 2002; Schmidt et al., 2000; Wilcox, Chu, & Peterson, 1990). While desire for sterilization reversal can present an indication of sterilization regret, it is important to be mindful of the dangers of interpreting this (and other) ‘regret’ measure in terms of a woman regretting the original sterilization decision. Indeed, desiring a reversal does not necessarily mean that the woman wished she had not had the procedure, nor does it mean that she would choose another method of contraception if she could revisit her decision (Chandra, 1998). This should be

kept in mind when interpreting results, and when comparing estimates across studies, as estimates may vary depending on the specific regret measure used.

These concerns aside, our study offered important new insights into high levels of sterilization regret among American women. Although most U.S. women do not express regret regarding a past contraceptive sterilization, and women may equally regret not having obtained a sterilization (Gilliam et al., 2008), the fact that roughly one-in-four sterilized women does report a desire to reverse their procedure remains a concern. The current research revealed the particular importance of relationship instability as a risk factor for regret. Our findings highlight the potential for increasingly popular long-acting reversible contraceptive methods (LARCs) to provide a better “reproductive fit” than permanent sterilization for many U.S. women, whose fertility intentions and preferences may change over the life course in response to sometimes unanticipated changes in relationship status. At the same time, it is important to balance a desire to minimize sterilization regret with respect for individual women’s agency in reproductive decision-making (Gomez, Fuentes, & Allina, 2014; Higgins, 2014). More research is sorely needed to understand the broader context in which sterilization regret evolves over the life course, as well as the broader constellation of factors—shaping both preferences and perceived constraints—that contribute to high levels of contraceptive sterilization among U.S. women.

Acknowledgments

Research reported in this publication was supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) of the National Institutes of Health under Award Number F32-HD078037 to Mieke Eeckhaut and by the California Center for Population Research at UCLA, which receives core support (P2C-HD041022) from NICHD. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

References

- Balbo N, Billari FC, Mills M. Fertility in advanced societies: A review of research. *European Journal of Population*. 2013; 29(1):1–38. DOI: 10.1007/s10680-012-9277-y [PubMed: 23440941]
- Berrington A. Perpetual postponers? Women’s, men’s and couple’s fertility intentions and subsequent fertility behavior. *Population Trends*. 2004; 117:9–19.
- Bertotti AM. Gendered divisions of fertility work: Socioeconomic predictors of female versus male sterilization. *Journal of Marriage and Family*. 2013; 75:13–25. DOI: 10.1111/j.1741-3737.2012.01031.x
- Borrero S, Reeves MF, Schwarz EB, Bost JE, Creinin MD, Ibrahim SA. Race, insurance status, and desire for tubal sterilization reversal. *Fertility & Sterility*. 2008; 90(2):272–277. DOI: 10.1016/j.fertnstert.2007.06.041 [PubMed: 17880952]
- Bumpass LL, Thomson E, Godecker AL. Women, men, and contraceptive sterilization. *Fertility & Sterility*. 2000; 73:937–946. DOI: 10.1016/S0015-0282(00)00484-2 [PubMed: 10785218]
- Chandra A. Surgical sterilization in the United States: Prevalence and characteristics, 1965–95. *Vital and Health Statistics*. 1998; 23(20):1–33.
- Cherlin AJ. Demographic trends in the United States: A review of research in the 2000s. *Journal of Marriage and Family*. 2010; 72:403–419. DOI: 10.1111/j.1741-3737.2010.00710.x [PubMed: 22399825]
- Daniels K, Daugherty J, Jones J. NCHS Data Brief. Vol. 173. Hyattsville, MD: National Center for Health Statistics; 2014. Current contraceptive status among women aged 15–44: United States, 2011–2013.

- Eeckhaut MCW. Marital status and female and male contraceptive sterilization in the United States. *Fertility & Sterility*. 2015; 103(6):1509–1515. DOI: 10.1016/j.fertnstert.2015.02.036 [PubMed: 25881875]
- Gilliam M, Davis SD, Berlin A, Zite NB. A qualitative study of barriers to postpartum sterilization and women's attitudes toward unfulfilled sterilization requests. *Contraception*. 2008; 77:44–49. DOI: 10.1016/j.contraception.2007.09.011 [PubMed: 18082666]
- Gomez AM, Fuentes L, Allina A. Women or LARC first? Reproductive autonomy and the promotion of long-acting reversible contraceptive methods. *Perspectives on Sexual and Reproductive Health*. 2014; 46(3):171–175. DOI: 10.1363/46e1614 [PubMed: 24861029]
- Grady CD, Schwartz EB, Emeremni CA, Yabes J, Akers A, Zite N, Borrero S. Does a history of unintended pregnancy lessen the likelihood of desire for sterilization reversal? *Journal of Women's Health*. 2013; 22:501–506. DOI: 10.1089/jwh.2012.3885
- Hayford SR. The evolution of fertility expectations over the life course. *Demography*. 2009; 46(4): 765–783. DOI: 10.1353/dem.0.0073 [PubMed: 20084828]
- Heaton TB, Jacobson CK, Holland K. Persistence and change in decisions to remain childless. *Journal of Marriage and the Family*. 1999; 61(2):531–539. DOI: 10.2307/353767
- Henshaw SK, Singh S. Sterilization regret among U.S. couples. *Family Planning Perspectives*. 1986; 8(5):238–240. DOI: 10.2307/2134990
- Heuveline P, Timberlake JM. The role of cohabitation in family formation: The United States in comparative perspective. *Journal of Marriage and Family*. 2004; 66(5):1214–1230. DOI: 10.1111/j.0022-2445.2004.00088.x [PubMed: 24563549]
- Higgins JA. Celebration meets caution: LARC's boons, potential busts, and the benefits of a reproductive justice approach. *Contraception*. 2014; 89:237–241. DOI: 10.1016/j.contraception.2014.01.027 [PubMed: 24582293]
- Hillis SD, Marchbanks PA, Tylor LR, Peterson HB. Poststerilization regret: Findings from the United States Collaborative Review of Sterilization. *Obstetrics & Gynecology*. 1999; 93:889–895. DOI: 10.1016/S0029-7844(98)00539-0 [PubMed: 10362150]
- Jamieson DJ, Kaufman SC, Costello C, Hillis SD, Marchbanks PA, Peterson HB. for the USC Collaborative Review of Sterilization Working Group. A comparison of women's regret after vasectomy versus tubal sterilization. *Obstetrics & Gynecology*. 2002; 99(6):1073–1079. DOI: 10.1016/S0029-7844(02)01981-6 [PubMed: 12052602]
- Lillard LA, Waite LJ. A joint model of marital childbearing and marital disruption. *Demography*. 1993; 30(4):653–681. DOI: 10.2307/2061812 [PubMed: 8262286]
- Martinez G, Daniels K, Chandra A. National Health Statistics Reports. Vol. 51. Hyattsville, MD: National Center for Health Statistics; 2012. Fertility of men and women aged 15–44 years in the United States: National Survey of Family Growth, 2006–10.
- Poma PA. Why women seek reversal of sterilization. *Journal of the National Medical Association*. 1980; 72(1):41–48. [PubMed: 7373665]
- Rijken AJ, Liefbroer AC. The influence of partner relationship quality on fertility. *European Journal of Population*. 2009; 25(1):27–44. DOI: 10.1007/s10680-008-9156-8
- Schmidt JE, Hillis SD, Marchbanks PA, Jeng G, Peterson HB. for the USC Collaborative Review of Sterilization Working Group. Requesting information about and obtaining reversal after tubal sterilization: Findings from the U.S. Collaborative Review of Sterilization. *Fertility & Sterility*. 2000; 74(5):892–898. DOI: 10.1016/S0015-0282(00)01558-2 [PubMed: 11056229]
- Schreffler KM, McQuillan J, Greil AL, Johnson DR. Surgical sterilization, regret, and race: Contemporary patterns. *Social Science Research*. 2015; 50:31–45. DOI: 10.1016/j.ssresearch.2014.10.010 [PubMed: 25592919]
- Sweeney MM. The reproductive context of cohabitation in the United States: Recent change and variation in contraceptive use. *Journal of Marriage and Family*. 2010; 72:1155–1170. DOI: 10.1111/j.1741-3737.2010.00756.x
- Stewart SD. The effect of stepchildren on childbearing intentions and births. *Demography*. 2002; 39(1):181–197. DOI: 10.1353/dem.2002.0011 [PubMed: 11852836]

- Tach L, Edin K. The compositional and institutional sources of union dissolution for married and unmarried parents in the United States. *Demography*. 2013; 50:1789–1818. DOI: 10.1007/s13524-013-0203-7 [PubMed: 23661248]
- Thomson E, McDonald E, Bumpass LL. Fertility desires and fertility: Hers, his, and theirs. *Demography*. 1990; 27(4):579–588. DOI: 10.2307/2061571 [PubMed: 2249746]
- Wilcox LS, Chu SY, Eaker ED, Zeger SL, Peterson HB. Risk factors for regret after tubal sterilization: 5 years of follow-up in a prospective study. *Fertility & Sterility*. 1991; 55(5):927–933. DOI: 10.1016/S0015-0282(16)54301-5 [PubMed: 2022271]
- Wilcox LS, Chu SY, Peterson HB. Characteristics of women who considered or obtained tubal reanastomosis: Results from a prospective study of tubal sterilization. *Obstetrics & Gynecology*. 1990; 75:661–665. [PubMed: 2179781]

Appendix A. Exponentiated Coefficients in Binary Logistic Regression Analyses of Sterilization Regret Using a Measure of ‘Number of Children Age <19 in the Household’: Women Currently Sterile from a Tubal Ligation, Weighted (N = 1,380)

	Model 1	Model 2	Model 3	Model 4
<i>Union status at sterilization (ref. Married)</i>	*			
<i>Cohabiting</i>	1.83	1.60	1.14	1.08
<i>Single</i>	1.30	1.10	0.88	1.05
<i>Union dissolution (ref. No dissolution)</i>	***	***		**
<i>Union dissolution</i>	2.39	2.21		1.96
<i>Union formation (ref. No union formation)</i>	***	*		
<i>Union formation</i>	2.35	1.61		1.44
<i>Education (ref. Less than high school)</i>	**		*	
<i>Completed high school</i>	0.79		0.84	0.81
<i>Some college</i>	0.62		0.67	0.65
<i>Completed college</i>	0.17		0.19	0.21
<i>Race/ethnicity (ref. Non-Hispanic white)</i>			*	*
<i>Hispanic</i>	1.49		2.22	2.32
<i>Non-Hispanic black</i>	1.54		1.68	1.61
<i>Non-Hispanic other or multiple race</i>	1.68		2.32	1.98
<i>Nativity (ref. US-born)</i>				
<i>Foreign-born</i>	0.81		0.68	0.71
<i>Number of children age <19 in the household (ref. 3)</i>				
0–1	1.26		1.49	1.25
2	1.35		1.60	1.57
4+	0.96		0.74	0.76
<i>Early childbearing (ref. No birth at age <25)</i>	**			
<i>First birth at age 20–24</i>	1.45		0.71	0.70
<i>First birth at age <20</i>	2.35		0.80	0.75
<i>Age at sterilization (ref. 30–34 years)</i>	**		**	*
<25 years	2.72		2.55	2.21

	Model 1	Model 2	Model 3	Model 4
<i>25–29 years</i>	2.02		2.13	2.06
<i>35+ years</i>	0.78		0.62	0.62
History of unintended pregnancy (ref. <i>No</i>)	*			
<i>Yes</i>	1.72		1.48	1.34
Years since sterilization (ref. <i>0–5</i>)			*	**
<i>>5–10</i>	0.98		0.75	0.62
<i>>10</i>	0.87		0.41	0.33

Note: Variables that have a significant association in the logistic models (based on Wald tests) are indicated as *** ($p < .001$), ** ($p < .01$), or * ($p < .05$) opposite the variable name. Boldface indicates coefficient differs significantly from reference group ($OR = 1.00$), at $p < .05$ level. Model 1 is the unadjusted model, Model 2 included all union variables jointly (*union status at sterilization*, *union dissolution*, and *union formation*), Model 3 included union status at sterilization and the sociodemographic and reproductive characteristics (except *union dissolution* and *union formation*), and Model 4 is the fully adjusted model.

Table 1

Percentage Distribution of the Dependent and Key Independent Variables, and Percent Expressing a Desire for Sterilization Reversal by the Key Independent Variables: Women Currently Sterile from a Tubal Ligation, Weighted ($N = 1,380$)

	Total	Sterilization regret (<i>definitely or probably yes</i>)
Desire for sterilization reversal		
<i>Definitely yes</i>	11.8	
<i>Probably yes</i>	12.8	
<i>Probably no</i>	13.5	
<i>Definitely no</i>	61.7	
<i>Don't know</i>	0.3	
Full Sample	100.0	24.6
Union status at sterilization		*
<i>Married</i>	63.1	21.4
<i>Cohabiting</i>	20.1	33.3
<i>Single</i>	16.8	26.2
Union status at interview		
<i>Married</i>	57.0	21.0
<i>Cohabiting</i>	12.3	28.2
<i>Single</i>	30.8	29.7
Union dissolution since sterilization		***
<i>No</i>	72.8	19.9
<i>Yes</i>	27.3	37.2
Union formation since sterilization		***
<i>No</i>	87.1	22.3
<i>Yes</i>	12.9	40.2

Note:

 $p < .001$,

*
 $p < .05$ (based on Chi-squared tests).

Table 2

Percentage Distribution of Sterilized Women by Select Sociodemographic and Reproductive Characteristics—All According to Union Status at Sterilization and Post-sterilization Union Change ($N = 1,380$)

	<i>Total</i>	Union status at sterilization			Union dissolution		Union formation	
		<i>Married</i>	<i>Cohabiting</i>	<i>Single</i>	<i>No</i>	<i>Yes</i>	<i>No</i>	<i>Yes</i>
Union dissolution			***					
Yes	27.3	28.6	45.9	0.0				
Union formation			***					
Yes	12.9	8.2	13.0	30.7				
Union status at interview			***		***		***	
<i>Married</i>	57.0	75.8	31.0	17.2	73.0	14.3	57.8	51.8
<i>Cohabiting</i>	12.3	4.2	35.1	15.3	11.0	15.8	6.9	48.2
<i>Single</i>	30.8	20.0	33.9	67.5	16.1	69.9	35.3	0.0
Education			***		**		**	
<i>Less than high school</i>	30.5	25.7	42.3	34.3	30.0	32.8	29.9	34.6
<i>Completed high school</i>	34.5	34.2	32.8	38.1	33.2	38.0	33.5	41.3
<i>Some college</i>	23.1	23.1	21.1	25.6	22.3	25.4	23.1	23.3
<i>Completed college</i>	11.9	17.1	3.8	2.1	14.9	3.8	13.5	0.8
Race/Ethnicity			***		**			
<i>Non-Hispanic white</i>	51.0	55.0	42.0	46.6	52.0	48.1	49.6	60.0
<i>Hispanic</i>	23.8	25.0	25.6	17.5	26.2	17.4	25.5	12.5
<i>Non-Hispanic black</i>	17.4	12.1	23.9	29.9	15.7	22.2	17.2	18.8
<i>Non-Hispanic other or mult. race</i>	7.8	8.0	8.6	6.1	6.1	12.3	7.6	8.8
Nativity			*		***		**	
<i>Foreign-born</i>	17.4	19.4	17.2	10.0	21.7	9.5	20.2	10.1
Parity								
<i>0–1</i>	5.5	4.4	5.3	9.9	5.6	5.4	5.1	8.7
<i>2</i>	34.1	34.4	35.5	31.3	33.1	36.6	33.6	37.1
<i>3</i>	35.8	37.7	29.8	36.0	36.4	34.3	35.5	37.9
<i>4+</i>	24.6	23.6	29.3	22.8	24.9	23.7	25.8	16.3
Early childbearing			***		***		***	

	Union status at sterilization			Union dissolution		Union formation	
	Total	Married	Cohabiting	Single	No	Yes	No
No birth at age <25	21.4	26.5	11.2	14.3	25.0	11.9	23.5
First birth at age 20–24	37.8	41.5	27.3	36.7	39.7	32.8	38.4
First birth at age <20	40.8	32.0	61.5	49.0	35.3	55.4	38.1
Age at sterilization			**			***	***
<25 years	23.8	18.9	35.3	28.3	17.9	39.4	20.4
25–29 years	31.3	32.2	28.8	31.1	30.1	34.4	30.8
30–34 years	30.2	34.1	24.6	22.4	34.0	20.0	32.0
35+ years	14.7	14.9	11.3	18.3	17.9	6.2	16.8
History of unintended childbearing			***			***	*
Yes	76.9	70.4	90.3	85.5	73.3	86.6	75.7
Years since sterilization						***	***
0–5	40.6	39.7	39.4	45.5	48.4	19.9	44.8
>5–10	30.8	29.5	36.3	29.4	29.3	35.1	30.3
>10	28.6	30.8	24.3	25.1	22.4	45.0	24.9

Note:

 $p < .001$,**
 $p < .01$,*
 $p < .05$ (based on Chi-squared tests)

Table 3

Exponentiated Coefficients in Binary Logistic Regression Analyses of Sterilization Regret: Women Currently Sterile from a Tubal Ligation, Weighted ($N = 1,380$)

	Model 1	Model 2	Model 3	Model 4
Union status at sterilization (ref. <i>Married</i>)	*			
<i>Cohabiting</i>	1.83	1.60	1.26	1.17
<i>Single</i>	1.30	1.10	0.91	1.06
Union dissolution (ref. <i>No union dissolution</i>)	***	***		**
<i>Union dissolution</i>	2.39	2.21		1.97
Union formation (ref. <i>No union formation</i>)	***	*		*
<i>Union formation</i>	2.35	1.61		1.77
Education (ref. <i>Less than high school</i>)	**		*	
<i>Completed high school</i>	0.79		0.81	0.79
<i>Some college</i>	0.62		0.66	0.64
<i>Completed college</i>	0.17		0.21	0.24
Race/ethnicity (ref. <i>Non-Hispanic white</i>)			*	*
<i>Hispanic</i>	1.49		2.24	2.39
<i>Non-Hispanic black</i>	1.54		1.64	1.62
<i>Non-Hispanic other or multiple race</i>	1.68		2.35	2.08
Nativity (ref. <i>US-born</i>)				
<i>Foreign-born</i>	0.81		0.62	0.67
Parity (ref. 3)				
0–1	0.82		1.11	1.05
2	0.73		0.81	0.81
4+	0.62		0.51	0.54
Early childbearing (ref. <i>No birth at age <25</i>)	**			
<i>First birth at age 20–24</i>	1.45		0.75	0.73
<i>First birth at age <20</i>	2.35		0.91	0.82
Age at sterilization (ref. <i>30–34 years</i>)	**		**	*
<25 years	2.72		2.33	2.07
25–29 years	2.02		2.03	1.99
35+ years	0.78		0.68	0.68
History of unintended pregnancy (ref. <i>No</i>)	*			
<i>Yes</i>	1.72		1.36	1.29
Years since sterilization (ref. <i>0–5</i>)				**
>5–10	0.98		0.83	0.68
>10	0.87		0.53	0.39

Note: Variables that have a significant association in the logistic models (based on Wald tests) are indicated as *** ($p < .001$), ** ($p < .01$), or * ($p < .05$) opposite the variable name. Boldface indicates coefficient differs significantly from reference group ($OR = 1.00$), at $p < .05$ level. As described in the text, Model 1 is the unadjusted model, Model 2 included all union variables jointly (*union status at sterilization*, *union dissolution*, and *union formation*), Model 3 included union status at sterilization and the sociodemographic and reproductive characteristics (except *union dissolution* and *union formation*), and Model 4 is the fully adjusted model.