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Marital Status and Female and Male Contraceptive Sterilization in the United States

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Abstract

Objective—To examine female and male sterilization patterns in the United States based on marital status, and to determine if sociodemographic characteristics explain these sterilization patterns.

Design—Survival analysis of cross-sectional data from the female and male samples of the 2006–2010 National Survey of Family Growth (NSFG).

Setting—A trained female interviewer conducted in-home interviews.

Patient(s)—The 2006–2010 NSFG is designed to be representative of the U.S. civilian non-institutionalized population ages 15–44.

Intervention(s)—None.

Main outcome measure(s)—Vasectomy and tubal sterilization.

Result(s)—In the United States, vasectomy is the near exclusive domain of married men. Never- and ever-married single men and never-married cohabiting men had a low relative risk of vasectomy (RRs=0.1, 0.3, and 0.0, respectively) when compared to men in first marriages. Tubal sterilization was not limited to currently married, or even to ever-married women, though it was less common among never-married single women (RR=0.2) and more common among women in higher-order marriages (RR=1.8), as compared to women in first marriages. In contrast to vasectomy, differential use of tubal sterilization by marital status was driven in large part by differences in parity.

Conclusion(s)—This study shows that being unmarried at sterilization—an important risk factor for post-sterilization regret—was much more common among women than men. In addition to contributing to the predominance of female versus male sterilization, this pattern highlights the

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importance of educating women on the permanency of sterilization, as well as an opportunity to increase reliance on long-acting reversible contraceptive methods.

Keywords

tubal sterilization; vasectomy; marital status; contraception; National Survey of Family Growth

Sterilization has been the most prevalent method of contraception in the United States for decades (1). It is a cost-effective, highly effective, 'forgettable' method of contraception (2). Its main drawback is that procedures are not necessarily reversible if childbearing preferences change, meaning that it is an appropriate technique only for those who wish to end childbearing. Accordingly, most studies have examined its use among married men and women (3–6) often treating tubal sterilization and vasectomy as competing strategies. Yet, research suggests that contraceptive sterilization is prevalent among unmarried individuals as well (1,7).

Studies that have included unmarried individuals have generally documented marital status at interview, rather than at the time of sterilization. Thus, they are unable to determine whether ever-married individuals were sterilized before, during, or after marriage, and whether never-married individuals were sterilized while single or while cohabiting. With the exception of practice-based studies (8), which are often limited in scope and generalizability, no study has considered *female* sterilization within union histories since the careful survival analyses of tubal ligations in 1990–1995 (9,10). These analyses showed that nearly one in three operations occurred to unmarried women, with more than half of these occurring to never-married women. Knowledge of the union context of *male* sterilization is even more limited, as the single survival analysis of vasectomies in the 1980s (9) reported that only 7% of operations occurred to unmarried men, but did not consider the risk by cohabitation status or marital history. More recent studies that have included union context *at the time of interview* show that contraceptive sterilization has increased among never-married, non-cohabiting women in recent decades (1,7), though it appears to remain relatively uncommon among never-married, non-cohabiting men (11). The union context of childbearing has also continued to transform (12,13), with unmarried individuals being increasingly likely to reach their targeted number of children, and thus to consider sterilization for fertility control. These trends are important, as prospective U.S. research on post-sterilization regret has identified being unmarried at sterilization (14) and having a change in marital status after sterilization (15) as important risk factors. Updating our knowledge of the union context of female and male sterilization could thus advance understanding of persistently high levels of post-sterilization regret in the United States—more than one in four women with unreversed tubal ligations express a desire for sterilization reversal (17), and nearly one in five men with unreversed vasectomies express a desire for future children (18). In addition, increased use of sterilization by unmarried women has been proposed (9,10) as an explanation for the predominance of female versus male sterilization since the 1970s (16)—yet no study has examined male sterilization within union histories, let alone compared the union context of male versus female sterilization within a single time period. Some researchers (10) have linked increased use of sterilization

by unmarried women to the changing context of childbearing decisions—yet no study has examined the role of parity in explaining differential use of vasectomy by marital status.

This study uses survival analysis techniques to describe the timing and level of female and male sterilization in the United States, and examine female and male sterilization patterns based on marital status. The analysis also explores if sociodemographic and reproductive characteristics explain these sterilization patterns. This will provide the most recent information on the union context of contemporary sterilization, detail the prevalence of an important risk factor for post-sterilization regret (14,15), and contribute to the literature on the longstanding predominance of female versus male sterilization (16)—despite male sterilization being a safer, less invasive method (19,20).

METHODS

Data for this study were drawn from the 2006–2010 National Survey of Family Growth (NSFG). The NSFG is designed and administered by the National Center for Health Statistics (NCHS), and has been conducted periodically since 1973. The survey was approved by the University of Michigan Institutional Review Board (21), and my institution does not require IRB approval for analysis of deidentified public-use data. The NSFG data are representative of the U.S. civilian non-institutionalized population ages 15–44 when properly weighted, and include oversamples of respondents who are black or Hispanic. For the 2006–2010 survey, in-home interviews were conducted by trained female interviewers with 12,279 women and 10,403 men using computer-assisted personal interviewing (CAPI). Response rates were 78% for women and 75% for men (22). All analyses and descriptive statistics were adjusted for the NSFG's complex sample design using the *svy* command in Stata 12.

Sterilized respondents were identified as those women and men who reported ever having had a tubal sterilization or a vasectomy, respectively. While these procedures could include operations that occurred for non-contraceptive reasons, sensitivity analyses for the female sample—which does allow for a distinction based on respondents' retrospective reports—suggested that limiting the analyses to operations that occurred mainly for contraceptive purposes, while censoring respondents who had a sterilization operation for non-contraceptive reasons at the date of the operation (i.e., the month and year of the operation), does not affect the substantive conclusions (data not shown). Marital status was based on retrospective reports of the beginning and end (i.e., the month and year) of all previous and current cohabitations and marriages, and identified six categories: never-married single, ever-married single, never-married cohabiting, ever-married cohabiting, first-order marriage, and higher-order marriage. Other sociodemographic and reproductive characteristics included in the analysis were: parity (based on retrospective reports of the month and year of birth of each biological child: categories were 0, 1, 2, 3+), early childbearing (had a first birth before age 18, had no early birth), education (less than high school, completed high school, completed college), race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), and nativity (native-born, foreign-born).

The analytic samples were limited to respondents ages 18–44 because of the upper age limit of the NSFG, and the fact that sterilization is rare at younger ages. I omitted respondents who indicated that it is not physically possible for them to have a baby for reasons other than surgical sterilization, or who had missing information on any covariate in the analysis. An exception was made for the relatively large number of respondents with missing information on the start or end date of any previous cohabitation in the male sample (8%, as compared to 1% in the female sample). Furthermore, reporting on cohabitations in the male sample was limited to current and first cohabitations, meaning that it was impossible to determine the timing of all previous cohabitations for the 13% of male respondents who reported more than one previous cohabitation. Sensitivity analyses were conducted to control for possible bias, but excluding male respondents with missing or incomplete information on previous cohabitations did not lead to substantively different conclusions (data not shown). I also omitted respondents who had conflicting information on the start or end date of any co-residential union. Any date relating to the start or end of a co-residential union, or the birth of a biological child was coded as missing if the event was recorded to have occurred at an unlikely young age of the respondent below 10. If the date reflected an age between 10 and 18, it was coded as an event that occurred at age 18, and thus affected the starting values of the variables marital status and parity. Taken together, these restrictions reduced the sample sizes by 1% for males and females.

The analysis proceeded in two stages. A first stage examined the timing and level of female and male sterilization using the Kaplan-Meier estimator of the survivor function. This estimator calculates the probability of survival beyond each specific age for a synthetic cohort based on the age at sterilization of the male and female respondents. Data were organized into person-month records, with one record for each monthly interval between ages 18–44. Respondents were censored at the time of tubal ligation or vasectomy, at the time of another sterilization operation that resulted in surgical sterility (e.g., hysterectomy) or, for those who did not experience a sterilization operation by the time of the survey, at the time of the survey. A second stage examined the marital status of female and male sterilization. I first described the distribution of the time-varying covariate marital status at the time of sterilization for sterilized individuals only. I then relied on Cox proportional hazards models (23) to predict the hazard of sterilization by marital status, and to examine if differential use of sterilization by marital status is explained by related sociodemographic and reproductive characteristics—most importantly, the time-varying covariate parity. *Model 1* estimated the unadjusted relative risk of sterilization by marital status. *Model 2* estimated the relative risk of sterilization by marital status while controlling for parity. *Model 3*, finally, added time-fixed covariates for early childbearing, education, race and ethnicity, and nativity to *Model 2*. I also included a time-varying covariate for historical period (1975–1994, 1995–2010) in *Model 3* to take account of temporal changes in union formation, fertility, and contraceptive use. Wald tests were used to identify variables that have a statistically significant effect ($p < .05$) in the Cox proportional hazards models. All analyses were conducted for the female and male samples separately, and carried out in Stata 12.

RESULTS

Table 1 shows the distribution of marital status, and of the other sociodemographic and reproductive characteristics in the female and male samples. This indicates the average percentage of months each sample spent in each category of the independent variables between age 18 and the time of sterilization or the survey (i.e., prior to censoring). Women, on average, spent longer periods of time in a first-order marriage (41.0% [39.5% – 42.5%] of person-months, versus 32.4% [30.8% – 34.0%] for men), and shorter periods of time never-married single (41.7% [40.1% – 43.2%] of person-months, versus 52.8% [51.2% – 54.5%] for men) and childless (55.5% [53.7% – 57.3%] of person-months, versus 65.8% [64.0% – 67.5%] for men), as compared to men. They were also more likely to have had an early birth (6.3% [5.4% – 7.1%] of person-months, versus 1.9% [1.4% – 2.4%] for men) and to have obtained a Bachelor's degree (34.7% [31.9% – 37.4%] of person-months, versus 28.4% [25.8% – 31.1%] for men), as compared to men.

The rate of sterilization was constant for both men and women (Figure 1). However, female sterilization stands out because of its early onset and high level. By age 45, 27.1% of females are projected to be sterilized, as compared to 'only' 13.3% of males.

Table 2 shows the distribution of marital status at the time of sterilization for sterilized individuals only. Nearly one in three tubal sterilizations were performed on unmarried women (30.4% [22.7% – 38.2%]), of which more than half were on *never-married* women (18.3% [14.0% – 22.6%]). Vasectomy was overwhelmingly performed on married men (92.1% [79.3% – 104.9%])—mainly on men in first-order marriages (77.6% [70.8% – 84.5%]). Unmarried men accounted for merely 7.9% ([0.5% – 15.3%]), and never-married men for merely 3.3% ([0.1% – 6.6%]) of procedures.

The Cox proportional hazards models (Table 3) reveal if differential use of sterilization by marital status is explained by differences in other sociodemographic and reproductive characteristics—most importantly, parity. In both the female and male samples, the effect of marital status was statistically significant throughout *Models 1, 2, and 3*. The models confirm that tubal sterilization was not limited to women in first-order marriages. The relative risk of sterilization was even higher for women in higher-order marriages (RR = 1.8 [1.5 – 2.3] in *Model 1*), as compared to women in first-order marriages, but not increased further among previously married women who were either single or cohabiting (RRs = 1.2 [0.8 – 1.6] and 1.4 [1.0 – 2.0], respectively, in *Model 1*). Parity and the other sociodemographic and reproductive characteristics reduced the higher relative risk of sterilization for women in higher-order marriages, though the difference remained statistically significant (RRs = 1.6 [1.2 – 2.1] and 1.5 [1.1 – 2.0] in *Models 2 and 3*, respectively). Never-married single women had a lower relative risk of sterilization (RR = 0.2 [0.2 – 0.3] in *Model 1*). Interestingly, this lower relative risk did not extend to never-married cohabiting women (RR = 1.1 [0.8 – 1.4] in *Model 1*), meaning that both never-married and ever-married cohabiting women had a risk of sterilization similar to women in first-order marriages. *Model 2* suggests that the lower relative risk of sterilization for never-married single women is fully explained by the fact that these women tend to have fewer children (RR = 0.8 [0.6 – 1.0]). However, after adjusting for all sociodemographic and

reproductive characteristics in *Model 3*, a lower relative risk of 0.7 ([0.5 – 0.9]) was observed.

Male sterilization was the near exclusive domain of married men (RRs = 0.1 [0.0 – 0.2], 0.3 [0.2 – 0.5], 0.0 [0.0 – 0.1] for never-married single, ever-married single, and never-married cohabiting men in *Model 1*, respectively). The relative risk of sterilization for never- and ever-married single men and never-married cohabiting men remained low throughout *Models 2* (RRs = 0.2 [0.1 – 0.6], 0.3 [0.2 – 0.6], and 0.0 [0.0 – 0.1], respectively) and *3* (RRs = 0.3 [0.1 – 0.8], 0.3 [0.2 – 0.6], and 0.0 [0.0 – 0.2], respectively), indicating that it is robust to differences in parity and the other sociodemographic and reproductive characteristics. More specifically, the adjusted risk of sterilization for never- and ever-married single men and never-married cohabiting men was about 3 to 25 times smaller than that for men in first-order marriages.

DISCUSSION

Using cross-sectional data of the female and male samples of the NSFG, this study finds that being unmarried at sterilization was much more common among women than men. In contrast to the findings for vasectomy, parity was more important in determining the likelihood of female sterilization than a woman's marital status or history.

Cohabiting women were as likely to have a tubal sterilization as women in first marriages, regardless of whether they had been previously married. That cohabiting women were generally not very concerned about maintaining the possibility of future childbearing is likely a result of the continued normalization of cohabitation as a birth context, especially among low- and moderately educated women (24), who tend to be at highest risk of female sterilization (1). A lower risk of sterilization was reported for never-married single women, and this was in part explained by the fact that these women tend to have fewer children than women in first marriages. Other reasons for their lower use of tubal sterilization may be their much lower risk of unintended pregnancy as compared to cohabiting women (25), as well as concerns about maintaining fertility in case of a future cohabitation or marriage. Women in higher-order marriages, finally, showed a higher risk of sterilization which was in part explained by the fact that they tend to have more children than women in first marriages. The experience of divorce and single parenthood, in addition, may have added to the appeal of using a permanent method of contraception for these women—though, apparently, not for ever-married single women and ever-married cohabiting women. Patterns of female sterilization by union context as reported in this study largely parallel the results as reported by Godecker and colleagues (10) for the early 1990s, meaning that there has been little change in recent decades, in spite of a continued weakening of the links between marriage and childbearing and the expanded availability of long-acting reversible contraceptive methods since the early 1990s.

Unmarried men accounted for merely 8% of vasectomies, a number that is only slightly higher than the 7% as reported by Bumpass and colleagues (9) for the 1980s. The low risk of vasectomy for unmarried men persisted even after adjusting for parity, indicating that parity matters little to explaining differential use of male sterilization by union context. Unmarried

men's tendency to maintain the possibility of future childbearing could be a consequence of the fact that society continues to assign greater responsibility to women for children (26). In addition, research shows that obligations to children from a prior union lower women's, but not men's, chances of union formation (27), and that previous biological children negatively affect women's, but not men's, intentions of having a child with a new partner (28). Future childbearing may also be less of a concern for women because of the stronger age constraints on their childbearing (29). Men, on the other hand, tend to partner with younger women, and this is likely to increase their chance of future childbearing in case of a new relationship. Of course men may also have less exposure or access to reproductive health services (30), though this would probably have resulted in a larger role of parity, and have differentiated single men from partnered men, rather than unmarried men from married men. Hence, the consistently low risk of sterilization for unmarried men is more in line with the idea that the use of male sterilization was limited in unstable union contexts (i.e., single or cohabiting men), whereas men in stable union contexts (i.e., married men) considered both female and male sterilization as viable options. This interpretation is also in line with research showing serious relationships to gradually shift contraceptive responsibility in the direction of couples rather than individuals (31), and with studies reporting a higher likelihood of male versus female sterilization at longer marriage durations (5,6,32).

This study shows that tubal sterilization—in contrast to vasectomy—was not concentrated among currently married individuals, thus supporting the idea that increased use of sterilization by unmarried women contributed to the predominance of female versus male sterilization since the 1970s (9,10). However, it should be kept in mind that, even among married couples, tubal sterilization is the more commonly used method (3). Related to this, it appears likely that two important risk factors for post-sterilization regret among women, being unmarried at sterilization (14) and having a change in marital status after sterilization (15), will increase in prevalence in the near future. Efforts could be directed to reduce the high risk of post-sterilization regret by better educating individuals on the permanency of the method—a study among women who had been sterilized in 2002–2008 showed that 36% of white and 62% of black women believed that sterilization reversal could easily restore fertility, whereas 23% of white and 60% of black women thought that a woman's sterilization would reverse itself after five years (33). In addition, women seeking sterilization could benefit from the increased availability of contemporary long-acting reversible contraceptive methods, which can offer similar levels of protection against unintended pregnancy (34), while at the same time enabling the achievement of women's often dynamic childbearing desires.

There are several study limitations that need to be kept in mind. First, this study relies on self-reported data, which is subject to recall bias. However, it seems unlikely that individuals would forget the events that were the focus of this study—sterilization, marriage, cohabitation, etc.—meaning that this problem is unlikely to significantly affect the results. Second, I considered sterilization as an individual decision, as censoring individuals at the date of partner's sterilization would have required more detailed information on current and previous co-residential partners than is currently available in the NSFG survey. Moreover, sterilization decisions often are driven by individual-level factors, at least for women who have a high risk of sterilization regardless of whether or not they are currently married. Even

in couples, one partner may feel more strongly about the decision to end childbearing and dominate the sterilization decision-making process (35,36). I performed sensitivity analyses censoring respondents who indicated that it is not physically possible for their current partner to have a baby for reasons other than surgical sterilization at the start of the cohabitation or marriage, and respondents who indicated that their current partner is surgically sterile at the start of the cohabitation or marriage or at the date of the operation (only available for the female sample), whichever occurred last. These additional analyses did not lead to substantively different conclusions. Third, I did not model being at risk of sterilization as conditional on the decision to end childbearing, but rather considered each individual at risk from age 18. Childbearing intentions are often dynamic (cf., post-sterilization regret), and not all sterilized individuals may be completely aware of the permanency of the method (33). Nevertheless, it should be kept in mind that results of this study could be interpreted as reflecting the effect of a covariate on the decision to end childbearing, and / or the effect of a covariate on the decision to use sterilization rather than use of—or access to—an alternative method. Finally, I did not examine reports of post-sterilization regret in the 2006–2010 NSFG by respondents' marital status at sterilization. This was beyond the scope of the current study, but will be an important direction for future work.

CONCLUSION

This study shows that low use of vasectomy, as compared to tubal sterilization, outside of marriage could partly explain the predominance of female versus male sterilization in the United States. Single and cohabiting men were unlikely to rely on vasectomy, regardless of whether or not they had children, whereas differential use of tubal sterilization by marital status was largely driven by differences in parity. The broadly distributed occurrence of female sterilization independent of marital status and history highlights the importance of better educating women on the permanency of tubal sterilization, as well as an opportunity for recent efforts to increase reliance on long-acting reversible contraceptive methods, as these low-cost, highly effective alternatives could better facilitate the achievement of women's often dynamic childbearing desires.

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REFERENCES

1. Jones J, Mosher W, Daniels K. Current contraceptive use in the United States, 2006–2010, and changes in patterns of use since 1995. *National Health Statistics Reports*. 2012; 60:1–25. [PubMed: 24988814]
2. Grimes DA. Forgettable contraception. *Contraception*. 2009; 80:497–499. [PubMed: 19913141]
3. Anderson JE, Jamieson DJ, Warner L, Kissin DM, Nangia AK, Macaluso M. Contraceptive sterilization among married adults: national data on who chooses vasectomy and tubal sterilization. *Contraception*. 2012; 85:552–557. [PubMed: 22133657]

4. Anderson JE, Warner L, Jamieson DJ, Kissin DM, Nangia AK, Macaluso M. Contraceptive sterilization use among married men in the United States: results from the male sample of the National Survey of Family Growth. *Contraception*. 2010; 82:230–235. [PubMed: 20705150]
5. Forste R, Tanfer K, Tedrow L. Sterilization among currently married men in the United States, 1991. *Fam Plann Perspect*. 1995; 27:100–107. (+122). [PubMed: 7672099]
6. Kaufman G. Sterilisation of married couples: husband versus wife sterilization. *J Biosoc Sci*. 1998; 30:1–14. [PubMed: 9746810]
7. Mosher WD, Jones J. Use of contraception in the United States, 1982–2008. *Vital Health Stat*. 2010; 23(29):1–44.
8. Barone MA, Johnson CH, Luick MA, Teutonico DL, Magnani RJ. Characteristics of men receiving vasectomies in the United States, 1998–1999. *Perspect Sex Reprod Health*. 2004; 36:27–33. [PubMed: 14982674]
9. Bumpass LL, Thomson E, Godecker AL. Women men, and contraceptive sterilization. *Fertil Steril*. 2000; 73:937–946. [PubMed: 10785218]
10. Godecker AL, Thomson E, Bumpass LL. Union status, marital history and female contraceptive sterilization in the United States. *Fam Plann Perspect*. 2001; 33:35–41. (+49). [PubMed: 11271545]
11. Martinez, G.; Chandra, A.; Abma, JC.; Jones, J.; Mosher, WD. Hyattsville, MD: National Center for Health Statistics; 2006. Fertility, contraception, and fatherhood: data on men and women from Cycle 6 (2002) of the National Survey of Family Growth.
12. Martin, JA.; Hamilton, BE.; Sutton, PD.; Ventura, SJ.; Mathews, TJ.; Kirmeyer, S., et al. National Vital Statistics Report. Vol. 58. Hyattsville (MD): National Center for Health Statistics; 2010. Births: final data for 2007.
13. Hamilton, BE.; Martin, JA.; Ventura, SJ. National Vital Statistics Report. Vol. 62. Hyattsville (MD): National Center for Health Statistics; 2013. Births: preliminary data for 2012.
14. Hillis SD, Marchbanks PA, Tylor LR, Peterson HB. Poststerilization regret: findings from the United States Collaborative Review of Sterilization. *Obstet Gynecol*. 1999; 93:889–895. [PubMed: 10362150]
15. Wilcox LS, Chu SY, Peterson HB. Characteristics of women who considered or obtained tubal reanastomosis: results from a prospective study of tubal sterilization. *Obstet Gynecol*. 1990; 75:661–665. [PubMed: 2179781]
16. Chandra A. Surgical sterilization in the United States: prevalence and characteristics, 1965–95. *Vital Health Stat*. 1998; 23(20):1–33.
17. Grady CD, Schwartz EB, Emeremni CA, Yabes J, Akers A, Zite N, et al. Does a history of unintended pregnancy lessen the likelihood of desire for sterilization reversal? *J Womens Health*. 2013; 22:501–506.
18. Sharma V, Le BV, Sheth KR, Zargaroff S, Dupree JM, Cashy J, et al. Vasectomy demographics and postvasectomy desire for future children: results from a contemporary national survey. *Fertil Steril*. 2013; 99:1880–1885. [PubMed: 23541407]
19. Rind P. Vasectomy proves to be preferable to female sterilization. *Fam Plann Perspect*. 1989; 21:191.
20. Shih G, Turok DK, Parker WJ. Vasectomy: the other (better) form of sterilization. *Contraception*. 2011; 83:310–315. [PubMed: 21397087]
21. Groves RM, Mosher WD, Lepkowski JM, Kirgis NG. Planning and development of the continuous National Survey of Family Growth. *Vital Health Stat*. 2009; 1(48):1–64.
22. 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.
23. Allison, PD. Survival analysis using SAS: A practical guide. Cary, NC: SAS Institute Inc.; 1995.
24. Gibson-Davis C, Rackin H. Marriage or carriage? Trends in union context and birth type by education. *Journal of Marriage and Family*. 2014; 76:506–519.
25. Finer LB, Henshaw SK. Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspect Sex Reprod Health*. 2006; 38:90–96. [PubMed: 16772190]

26. Cooke LP, Baxter J. "Families" in international context: comparing institutional effects across Western societies. *Journal of Marriage and Family*. 2010; 72:516–536.
27. Stewart SD, Manning WD, Smock PJ. Union formation among men in the US: does having prior children matter? *Journal of Marriage and Family*. 2003; 65:90–104.
28. Stewart SD. The effect of stepchildren on childbearing intentions and births. *Demography*. 2002; 39:181–197. [PubMed: 11852836]
29. Beaujouan E, Solaz A. Racing against the biological clock? Childbearing and sterility among men and women in second unions in France. *European Journal of Population*. 2013; 29:39–67.
30. Kalmuss D, Tatum C. Patterns of men's use of sexual and reproductive health services. *Perspect Sex Reprod Health*. 2007; 39:74–81. [PubMed: 17565620]
31. Fennell JL. Men bring condoms, women take pills: men's and women's roles in contraceptive decision making. *Gender and Society*. 2011; 25:496–521.
32. Clark MP, Bean FD, Swicegood G, Ansbacher R. The decision for male versus female sterilization. *The Family Coordinator*. 1979; 28:250–254.
33. Borrero S, Abebe K, Dehlendorf C, Schwartz EB, Creinin MD, Nikolajski C, et al. Racial variation in tubal sterilization rates: role of patient-level factors. *Fertil Steril*. 2011; 95:17–22. [PubMed: 20579640]
34. Trussell J. Contraceptive failure in the United States. *Contraception*. 2011; 83:397–404. [PubMed: 21477680]
35. Shain RN, Miller WB, Holden AEC. Factors associated with married women's selection of tubal sterilization and vasectomy. *Fertil Steril*. 1985; 43:234–244. [PubMed: 3967783]
36. Jamieson DJ, Kaufman SC, Costello C, Hillis SD, Marchbanks PA, Peterson HB. A comparison of women's regret after vasectomy versus tubal sterilization. *Obstet Gynecol*. 2002; 99:1073–1079. [PubMed: 12052602]

Figure 1.
Survival curves for female and male sterilization, by respondent's age.

Table 1

Percent distribution of person-month records by respondents' sociodemographic and reproductive characteristics.

	Female sample (N=1,439,980)		Male sample (N=1,253,038)	
	Percentage	95% CI	Percentage	95% CI
Marital status				
<i>Never-married single</i>	41.7%	40.1% – 43.2%	52.8%	51.2% – 54.5%
<i>Ever-married single</i>	4.7%	4.2% – 5.2%	4.0%	3.4% – 4.5%
<i>Never-married cohabitation</i>	7.6%	6.9% – 8.2%	6.5%	5.8% – 7.2%
<i>Ever-married cohabitation</i>	1.8%	1.4% – 2.1%	1.3%	1.0% – 1.6%
<i>First-order marriage</i>	41.0%	39.5% – 42.5%	32.4%	30.8% – 34.0%
<i>Higher-order marriage</i>	3.3%	2.8% – 3.9%	3.0%	2.4% – 3.6%
Parity				
<i>0</i>	55.5%	53.7% – 57.3%	65.8%	64.0% – 67.5%
<i>1</i>	21.3%	20.2% – 22.3%	16.5%	15.6% – 17.4%
<i>2</i>	15.2%	14.3% – 16.1%	11.6%	10.5% – 12.7%
<i>3+</i>	8.0%	7.1% – 9.0%	6.1%	5.4% – 6.9%
Early childbearing				
<i>No early birth</i>	93.7%	92.9% – 94.6%	98.1%	97.6% – 98.6%
<i>First birth before age 18</i>	6.3%	5.4% – 7.1%	1.9%	1.4% – 2.4%
Education				
<i>Less than high school</i>	14.1%	12.3% – 16.0%	19.4%	17.3% – 21.5%
<i>High school</i>	51.2%	48.9% – 53.5%	52.2%	49.6% – 54.7%
<i>Bachelor's degree</i>	34.7%	31.9% – 37.4%	28.4%	25.8% – 31.1%
Nativity				
<i>Native-born</i>	81.9%	79.7% – 84.2%	81.6%	79.3% – 83.8%
<i>Foreign-born</i>	18.1%	15.8% – 20.3%	18.4%	16.2% – 20.7%
Race and ethnicity				
<i>Non-Hispanic white</i>	62.9%	59.4% – 66.4%	61.5%	57.6% – 65.4%
<i>Hispanic</i>	16.0%	12.8% – 19.3%	18.4%	14.6% – 22.2%
<i>Non-Hispanic black</i>	12.3%	10.5% – 14.2%	11.0%	8.9% – 13.0%
<i>Other</i>	8.8%	7.0% – 10.5%	9.1%	7.2% – 11.1%
Period				
<i>1975–1994</i>	27.4%	26.3% – 28.6%	25.6%	24.4% – 26.7%
<i>1995–2010</i>	72.6%	71.4% – 73.7%	74.4%	73.3% – 75.6%

Note: The distribution of the female and male analytic samples by age at the time of interview is: 7.7% of females and 7.2% of males of ages 18–24 years, 14.5% of females and 14.3% of males of ages 25–29 years, 18.5% of females and 18.5% of males of ages 30–34 years, 27.9% of females and 27.0% of males of ages 35–39 years, and 31.4% of females and 33.0% of males of ages 40–44 years.

CI = confidence interval.

Table 2

Percent distribution of sterilized respondents by marital status.

	Female sample (N=1,618)		Male sample (N=359)	
	Percentage	95% CI	Percentage	95% CI
Never-married single	9.0%	6.8% – 11.3%	3.2%	0.2% – 6.2%
Ever-married single	8.3%	6.1% – 10.5%	3.3%	1.3% – 5.3%
Never-married cohabitation	9.3%	7.2% – 11.3%	0.1%	–0.1% – 0.4%
Ever-married cohabitation	3.8%	2.6% – 5.1%	1.3%	–0.8% – 3.4%
First-order marriage	59.9%	55.7% – 64.1%	77.6%	70.8% – 84.5%
Higher-order marriage	9.7%	7.6% – 11.7%	14.5%	8.5% – 20.4%

Note: CI = confidence interval.

Table 3

Relative risk of sterilization from Cox proportional hazards models assessing associations between selected variables and respondent's use of sterilization.

	Female sample (N=10,629)						Male sample (N=8,615)					
	Model 1		Model 2		Model 3		Model 1		Model 2		Model 3	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Marital status		***		**		*		***		***		***
<i>Never-married single</i>	0.24	0.18 – 0.32	0.79	0.60 – 1.02	0.70	0.54 – 0.92	0.06	0.02 – 0.17	0.21	0.08 – 0.59	0.28	0.10 – 0.79
<i>Ever-married single</i>	1.15	0.84 – 1.59	1.13	0.82 – 1.57	1.05	0.75 – 1.49	0.28	0.15 – 0.53	0.31	0.17 – 0.57	0.33	0.18 – 0.61
<i>Never-married cohabitation</i>	1.07	0.83 – 1.36	1.16	0.90 – 1.51	1.11	0.85 – 1.45	0.02	0.00 – 0.09	0.02	0.00 – 0.11	0.04	0.01 – 0.23
<i>Ever-married cohabitation</i>	1.37	0.96 – 1.96	1.05	0.66 – 1.64	0.91	0.56 – 1.49	0.31	0.06 – 1.65	0.30	0.06 – 1.64	0.35	0.06 – 1.96
<i>First-order marriage</i>	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
<i>Higher-order marriage</i>	1.81	1.45 – 2.27	1.61	1.23 – 2.13	1.46	1.09 – 1.95	1.48	0.87 – 2.53	1.28	0.74 – 2.20	1.20	0.69 – 2.11

Note: *Model 1* estimates the unadjusted relative risk of sterilization by marital status. *Model 2* estimates the relative risk of sterilization by marital status while controlling for parity. *Model 3* estimates the relative risk of sterilization by marital status while controlling for parity, early childbearing, education, race and ethnicity, nativity, and historical period.

Symbols in the first row indicate significance of association between the variable marital status and risk of sterilization (based on Wald tests; *** $p < .001$, ** $p < .01$, * $p < .05$).

RR = relative risk, CI = confidence interval, Ref = reference category.