

# Effects of Tubal Ligation Among American Women

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**OBJECTIVE:** To examine 2 possible negative effects for women who have had a tubal ligation using a nationally representative sample.

**STUDY DESIGN:** Our research used bivariate statistics to profile women with tubal ligations as compared to those without tubal ligations and logistic regression models to examine the relationship between having a tubal ligation and 2 measures that indicate sexual dissatisfaction.

**RESULTS:** We found that women who have had a tubal ligation are more likely than women who have not had a tubal ligation to report (1) stress interfering with sex and (2) seeing a physician regarding sexual problems, controlling for relevant variables.

**CONCLUSION:** Women, their physicians and the public in general should have more detailed information regarding the effects of sterilization so that more informed decisions can be made about contraception and surgical sterilization procedures. (J Reprod Med 2007;52:263-272)

**Keywords:** female sterilization, psychosocial dysfunction, sexual problems, stress, tubal ligation.

As the number of surgical sterilizations continues to rise in the United States, many unanswered questions remain about the effects of tubal ligation. At present, about one third of women 18-59 years old use tubal ligation as their contraceptive method.<sup>1</sup> There are established differences between women who have decided to undergo tubal ligation and those who have not, such as feelings of regret and

loss and decreased sexual enjoyment. Regret especially has been a research focus on female sterilization among social scientists,<sup>2-5</sup> but there remains a need to examine more specific negative consequences that may relate to sexual satisfaction and women's well-being. In general, medical research has found few or no negative effects, while social science research has reported more evidence of regret and desire for reversal of the procedure. Below we expand on prior findings using National Health and Social Life Survey<sup>6</sup> data and consider 2 unintended consequences, stress interfering with sex and seeing a private physician about sexual problems.

We profiled women who have undergone tubal

**Tubal ligation has unintended negative consequences for sexual issues and should not be considered lightly.**

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ligation along key demographic variables, including age, race, marital and cohabitation status, education level, having a child under age 6, and religious orientation. Further, using logistic regression,

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***Women who have undergone tubal ligation are more likely to report stress interfering with sex in the previous 12 months and seeing a physician about sexual problems in the previous 12 months.***

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we examined the relationship between tubal ligation status and the above 2 possible negative consequences.

***Women Who Have Had Tubal Ligation and Effects on Sexual Satisfaction***

Research has been done on factors associated with obtaining tubal ligation, but less is known about the factors associated with subsequent sexual satisfaction. Is sexual satisfaction different among women who have undergone tubal ligation as compared with women who have not? Does the association persist after controlling for factors that influence who obtains a tubal ligation? Previous studies in the medical and sociological fields tend to focus on the positive associations of the tubal ligation procedure as a form of birth control or provided a comparative assessment across the vasectomy and tubal ligation procedures.<sup>7-13</sup> In contrast, limited research has evaluated the possible negative effects of undergoing tubal ligation.

Concern about possible negative effects of tubal ligation is important because the procedure is a well accepted and widely used form of contraception. Indeed, 11.5 of every 1,000 women are estimated to have undergone tubal ligation.<sup>1</sup> However, because there is no national reporting system for the number of tubal sterilization procedures performed each year, this is an estimate. Dryfoos<sup>14</sup> found that 11% of women aged 20-44 relied on tubal ligation as their preferred method of birth control. A substantial number of women choose the tubal ligation, yet there remains little research on the possible consequences. Further, private physicians hold considerable sway in women's decisions to undergo tubal ligations<sup>15-17</sup>; complete understanding of the range

of effects of tubal ligation on women is needed.

It is likely that many of the factors associated with who obtains a tubal ligation are also associated with the effects of tubal ligation. Therefore, it is important to control for these potential selection effects on sexual satisfaction to isolate the unique effects of tubal ligation. Prior research indicated that age, race, marital status, socioeconomic status, religious orientation and age of children all share a relationship with tubal ligation. For example, women in their late 20s are most likely to undergo tubal ligation (18.8 per 1,000 women aged 25-29), and women in their 40s are least likely (2.8 per 1,000 women aged 40-49).<sup>1</sup> Race is also associated with the likelihood of having a tubal ligation. Black women are more likely than white women to have undergone tubal ligation (13.4 black women as compared with 7.7 white women per 1,000).<sup>1</sup> Among black, Hispanic and non-Hispanic white women, sterilization is the second leading birth control method.<sup>18</sup>

Further, research shows that "the probability of tubal sterilization is about 25% lower for single, never-married women than for cohabitating or married women."<sup>19</sup> Likewise, Mosher<sup>18</sup> reported that tubal sterilizations stand out as the leading method of birth control for married and ever-married women. Other research<sup>20</sup> indicated that both race and marital status together differentiate whether women undergo tubal ligation; white women are more likely to have a tubal ligation while married (79%) as compared to Hispanic women (66%) and black women (36%).<sup>19</sup> Black women are more likely to have a tubal ligation even if never married (46%).<sup>19</sup>

Socioeconomic status is also associated with sterilization among women. Because sterilization is more popular as a contraceptive method among lower-income women than higher-income women,<sup>18</sup> educational level should be included in an analysis of the possible effects of the tubal ligation procedure. Less educated, low-income, black and Hispanic women have increasingly opted for female sterilization over the intrauterine device, while college-educated, white women have increasingly relied on the oral contraceptive.<sup>18</sup> Across educational levels, African American women are more likely than white women to report having undergone tubal ligation as their primary method of birth control. In addition, religious orientation and ages of children are associated with obtaining tubal ligation. Bumpass<sup>21</sup> showed that Protestants are most

likely to have undergone the procedure and that Catholics are more likely to undergo tubal ligation as their children become older.

Existing research is unclear regarding the effects of tubal ligation on women's sexual satisfaction. Medical research reports few or no negative effects, but social science research indicates some risk of regret and desire for reversal of the procedure. These past studies have important limitations. Rosenfeld et al<sup>22</sup> reported that after tubal ligation, women rated their sex life as more enjoyable than before it, but the sample was only women who had undergone tubal ligation, and the question rating sexual satisfaction was not asked independently of the tubal ligation procedure. Women may be conflating their perceptions of satisfaction with their sex life with their perceptions of undergone the procedure. Similarly, Costello et al<sup>17</sup> followed a large sample of women who had having undergone tubal ligation over 5 years and found that tubal ligation did not have any apparent effect on sexual interest or pleasure. Using the same approach, Kjer<sup>23</sup> examined 659 Danish women who have had a tubal ligation and reported a mixture of results. He noted no difference in libido, coital frequency or several measures of sexual satisfaction across women who were satisfied or dissatisfied with tubal ligation, but he also found that those who were dissatisfied with tubal ligation were also likely to report 2 negative consequences: lack of excitement in their sexual life and perception of changed femininity.<sup>23</sup> Another medical study indicated that the magnitude of negative impact was small; Cooper et al<sup>24</sup> reported that 3% of women sampled expressed a decrease in sexual enjoyment after tubal ligation. Taken together, these medical studies suggest rather mixed results, ranging from mostly positive to a few negative.

Social science researchers found that there is regret among women who have undergone tubal ligation but that this regret is not felt uniformly. Age affects the likelihood of regret among women with a tubal ligation. Younger women are more likely to report regret than are older women.<sup>2-4,20</sup> These studies are useful for within-person change but do not provide a comparison between those with and without tubal ligations. Marcil-Gratton<sup>3</sup> suggested that regret is due more to the timing of sterilization to coincide with the birth of a child than with a lack of children over the life course. Other research<sup>5</sup> echoed this finding but explained that regret is due to the quick decision to undergo tubal ligation after the birth of a child. Much as age affects higher lev-

els of regret among women with a tubal ligation, we expect that younger women are more likely to report having stress interfere with sex or seeing a physician about sexual problems, all else being equal.

Partnership and intimacy may shape the decision to undergo tubal ligation. Women who are with a different partner than when they underwent tubal ligation are more likely to desire a reversal.<sup>25</sup> This indicates that feelings regarding the procedure may be influenced by changing partners. Hence, timing and intimacy both may play a part. Waite and Joyner<sup>26</sup> provided evidence of a connection between physical behaviors and emotional sexual satisfaction, which in turn may affect intimacy. Groat et al<sup>27</sup> noted a connection between sexual functioning and sexual identities or self-perceptions as people age. These studies suggest that sterilization influences sexual well-being and stress. There is an established relationship between the physical and emotional sides of sexual satisfaction, and we expect tubal ligation to alter sexual experiences and be related to negative effects.

While feelings of regret and desire for reversal stand out as possible negative feelings, little research has examined the consequences of tubal ligation on sexual satisfaction. Tubal ligation research should consider consequences related to sexual satisfaction, such as whether women with a tubal ligation are more likely than women who are without it to report stress interfering with sex or seeing a private physician about sexual problems during the previous 12 months.

### *Theoretical Explanations*

The capability of reproduction for women has a clear "life span" in which women may or may not choose different methods of controlling their reproductive capabilities. Women may choose to delay pregnancy either periodically or permanently. When women choose a permanent method of birth control, it usually comes in the form of tubal ligation. Kjer's<sup>23</sup> finding that women who were dissatisfied with tubal ligation also reported a perception of changed femininity suggests that physical loss of reproductive capability may reshape women's sense of feminine self.

The work of Elson<sup>28</sup> may be useful here as she provides a theory to explain how women with a hysterectomy experience a change in their identification as a woman. The loss of reproductive capability can be viewed as analogous across tubal ligation

tion and hysterectomy. Similarly, across both procedures women are being medically advised and assisted. Elson<sup>28</sup> contends that women, following the loss of their reproductive capabilities, analyze their bodies as objects, resulting in changes in their psychosocial behaviors. Elson<sup>28</sup> further proposed that these changes may not become apparent to the women or others until long after the surgery has taken place. While there has been no direct application of Elson's<sup>28</sup> theory to tubal ligation, we can draw on the results of 2 Austrian studies that examined the relationships between tubal ligation and body image and self-esteem. Indeed, 1 study<sup>25</sup> found that women reported that tubal ligation reversal helped restore their body image and self-esteem. A follow-up study<sup>29</sup> concluded that women undergo tubal ligation reversal because they want to restore their body image; these women report feeling a sense of loss despite not wanting more children.

These sterilization goals and decisions mature and change over the life course of the women involved. The life course perspective, therefore, takes into account some of these various transitions and trajectories. With the life course perspective, trajectories are defined as pathways, while transitions are events that occur during the trajectories.<sup>2,30</sup> A trajectory of responsible motherhood may be marked by a transition to tubal ligation. For example, a woman in her teens and 20s may use condoms or oral contraceptives as a method of birth control; however, as time goes by, a more effective birth control method may be needed because an additional child would complicate the trajectory. Alternatively, this decision is a different one for women with the desired family size as compared with those who may not be sure that they had enough children. In addition, the life course approach allows us to consider that women who have a different partner from when they made the decision to undergo tubal ligation may feel differently about the procedure than women who are with the same partner. The life course perspective helps explain age and cohort variation in how some negative factors, such as reporting that stress interferes with sex or seeing a physician about sexual behaviors, may be related to having undergone tubal ligation.

#### *Research Questions and Hypotheses*

Recent research on the effects of tubal ligation is scant, and there remain several unanswered questions about what distinguishes women with a tubal

ligation and those without. What are the characteristics of women who report having stress interfere with sex during the previous 12 months? What are the characteristics of women who report having seen a private physician regarding sex problems during the previous 12 months? Are women with a tubal ligation more likely to report having stress interfere with sex or seeing a private physician about sexual problems while controlling for selection effects?

#### *Materials and Methods*

##### *Sample*

We used National Health and Social Life Survey (NHSLs)<sup>6</sup> data to examine the relationship between tubal ligations and sexual problems.

Using a random sample of the adult U.S. population (18–59 years old), the 1992 NHSLs<sup>6</sup> completed interviews with 3,432 respondents (1,511 male and 1,921 female), consisting of face-to-face and self-administered questionnaires. Blacks and Hispanics were oversampled and weighted to represent the racial composition of the United States.<sup>6</sup> There was a 78.6% response rate.<sup>6</sup> For the dependent variable stress interfering with sex, we restricted our analytic sample to 1,584 women who answered the questions on tubal ligation and problematic sexual behaviors. For the dependent variable, seeing a physician regarding sexual problems, we have an analytic sample of 828. This decrease in sample size is due to the skip pattern in the NHSLs questionnaire. Table I indicates that the total sample of women is comparable to the analytic samples for both dependent variables along key socioeconomic and demographic variables considered in this analysis.

In contrast to prior surveys asking about tubal ligations (e.g., one by Cosello et al<sup>7</sup>), NHSLs respondents were not asked specific questions about their tubal ligations other than whether they had undergone the procedure. As a result, their responses are not biased by perceived experiences regarding tubal ligation, and they included information about behaviors associated with aspects of their lives other than tubal ligation. The NHSLs data are especially useful for examining our research questions because the survey asks about potential sexual problems in independent questions.

##### *Variables*

We used 2 dependent variables in this analysis. One variable was whether a respondent reported stress

**Table 1** Women Who Reported Having Undergone Tubal Ligation, Stress and Sexual Problems

Characteristic	Do you have a tubal ligation?	Did stress interfere with sex?		Do you see a private M.D. about sex problems?	
	Yes (n = 1616) % tubal	Yes (n = 111) % tubal	No (n = 1473) % tubal	Yes (n = 85) % tubal	No (n = 743) % tubal
Women 18–59 yr in sample	30.0	46.0	29.1	43.5	31.9
Age (yr)					
18–24	1.7	16.7	0.9	9.1	1.8
25–29	19.1	33.3	18.2	44.4	23.2
30–39	27.4	41.3	26.1	46.9	27.0
40–49	47.9	61.5	47.2	47.1	53.0
50–59	42.2	66.7	42.6	56.3	44.1
Race					
White	28.3	40.2	27.6	42.9	29.2
Black	37.5	63.2	36.5	50.0	40.0
Other	29.2	60.0	26.2	40.0	36.5
Marital status					
Currently married	36.9	42.9	36.6	48.3	39.1
Cohabiting	24.0	55.6	21.1	42.9	25.0
Ever married	39.5	60.7	38.3	55.6	41.0
Never married	6.4	29.4	5.0	9.1	10.6
Education level					
Some high school or less	38.5	63.6	37.4	41.7	45.5
High school/general equivalency diploma	38.8	48.6	38.5	60.0	40.1
Vocational/some college	25.6	40.5	24.6	35.3	25.4
College or advanced degree	18.8	29.4	18.3	35.7	18.1
Child under age 6	32.1	39.2	31.5	47.2	34.8
Religious orientation					
Protestant/other religion	34.8	47.8	34.3	50.0	35.5
Catholic/Orthodox	20.7	35.3	19.8	28.0	27.0
No religious preference	26.6	75.0	23.1	50.0	24.7

Source: National Health and Social Life Survey, 1992.<sup>6</sup>

interfering with sex during the previous 12 months. This variable is a dichotomous one, with responses of “all of the time” and “most of the time” coded as 0, while responses of “some of the time” and “a little of the time” coded as 1. Seven percent of respondents reported stress interfering with sex all or most of the time (SD 0.26, results not shown). The second dependent variable was whether a respondent reported seeing a physician regarding sexual problems during the previous 12 months. This variable is a dichotomous variable with yes/no response categories. Nine percent of respondents reported seeing a physician regarding sexual problems (SD 0.30, results not shown). Given that both dependent variables established a set time limit of the previous 12 months, we excluded from all analyses any women who reported having a child under the age of 1; that eliminated 25 respondents in our sample. This exclusion of women who

had given birth in the previous year also makes sense as women with a child under 1 may be under the care of a physician and experience some sexual stress immediately after the birth of the child.

Table 1 presents age as a categorical variable to understand whether age is related to whether a woman has undergone tubal ligation. The mean age of all women in the effective sample was 37 years, while the mean age of women who reported having undergone tubal ligation was 42 (results not shown). For the logistic regressions, age is a continuous variable, with responses ranging from 18 to 59 years old.

We created dummy variables for race and ethnicity. The categories were white, black and other. Due to the low numbers, Hispanics, Alaskan natives, Native Americans and Asians were placed in the “other” category for the analyses. The white racial-ethnic category will be used as the reference group

in the logistic regression analyses.

Marital status was a dummy variable with 4 categories: currently married, currently cohabiting, ever married (not cohabiting) and never married. The ever-married category consisted of respondents who reported being divorced, separated or widowed and who were not currently cohabiting. The currently married category was the reference group in the logistic regression models.

We included a measure of socioeconomic status (SES), educational level of the respondents. We created a continuous variable to indicate the number of years of education respondents reported to include in the logistic regression analyses. We included only education as a measure of SES in our analysis because education and income are highly correlated, and 33% of the respondents had missing income data.

The presence of young children in the household was determined by whether the respondent had a child under 6 in the household. This was established by subtracting the birth date of each child from the year that the interview took place. Once the age of the child at the time of the interview was determined, we created a new variable, child under age 6. This new variable selected all respondents who reported having at least 1 child under the age of 6 at the time of the interview. Overall, 51.5% of the total sample reported having at least one child under 6, while 48.5% with a child under 6 had undergone tubal ligation. Again, we excluded all women who reported having a child under the age of 1 in order to strengthen the analyses of our dependent variables.

We created 3 dummy variables for the current religious orientation of the respondent: Protestant/other, Catholics/Greek or Russian Orthodox, and no religious preference. We included all valid responses and blended the 7 respondents who reported other religious preferences into the Protestant/other category. Protestant/other was the reference group for the logistic regression analyses.

Table I presents the effective sample size of all women, of women who answered the variable of stress interfering with sex dependent and of women who answered the variable of seeing a physician regarding sex by key explanatory variables and the percentage of women who did and did not report having undergone tubal ligation. The variable of having undergone tubal ligation measured whether it was impossible for the respondent to give birth "due to a tubal ligation or other sterilization opera-

tion."<sup>6</sup> Those respondents who reported "yes" to having undergone tubal ligation were coded as 1, while those who reported "no" were coded as 0. Table I indicates that 30% of women aged 18–59 reported that they used tubal ligation as their method of contraception (using 1992 NHLS survey data<sup>6</sup>). This compares with 28% of women 14–44 years of age who reported having undergone tubal ligation in the National Survey of Family Growth.<sup>31</sup> This dichotomous variable indicating whether an individual had undergone tubal ligation is shown in Table I and is the focal variable in Tables II and III. Using Aneshenel's<sup>32</sup> concept of the "focal relationship," the focal variable, having undergone tubal ligation, should be viewed as the cornerstone of this analysis.

### Results

Bivariate results from Table I indicate that 30% of all women 18–59 years old reported that their contraceptive method was a tubal ligation. Further, the re-

**Table II** Odds of Women Reporting Stress Interfering with Sex in the Previous 12 Months

Characteristic	Model 1		Model 2	
	OR	SE	OR	SE
Tubal ligation	2.07***	0.20	2.11***	0.23
Age, women 18–59			0.99	0.01
Race				
White			R	
Black			0.82	0.28
Other			1.02	0.37
Marital status				
Currently married			R	
Cohabiting			1.13	0.39
Ever married			1.55*	0.25
Never married			0.94	0.34
Child under age 6			1.04	0.23
Educational level			0.93*	0.04
Religious orientation				
Protestant			R	
Catholic/Orthodox			1.16	0.23
No religious preference			0.80	0.39
df		1		11
–2 Log likelihood		791.22		781.08
N		1584		1584

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01.

This table presents logistic regression models with ORs and SEs.

OR refers to the log odds of reporting stress interfering with sex.

R = omitted category.

Source: National Health and Social Life Survey, 1992.<sup>6</sup>

Model 1 presents the focal variable with no correlates.

Model 2 presents the focal variable and introduces the control variables (age, race, marital status, having at least one child under age 6, education and religious orientation).

**Table III** Odds of Women Reporting Seeing a Physician About Sexual Problems in the Previous 12 Months

Characteristic	Model 1		Model 2	
	OR	SE	OR	SE
Tubal ligation	1.65**	0.23	1.79**	0.26
Age, women 18–59 yr			0.99	0.01
Race			R	
White				
Black			0.59	0.37
Other			0.58	0.50
Marital status			R	
Currently married				
Cohabiting			0.73	0.44
Ever married			0.40**	0.37
Never married			0.49*	0.40
Child under age 6			0.92	0.27
Educational level			1.04	0.05
Religious orientation			R	
Protestant				
Catholic/Orthodox			1.05	0.27
No religious preference			1.44	0.36
df	1		11	
–2 Log likelihood	543.45		527.18	
N	828		828	

\*p < 0.10, \*\*p < 0.05, \*\*\*p < 0.01.  
 This table presents logistic regression models with ORs and SEs.  
 OR refers to the log odds of reporting seeing a physician regarding sexual problems.  
 R = omitted category.  
 Source: National Health and Social Life Survey, 1992.<sup>6</sup>  
 Model 1 presents the focal variable with no correlates.  
 Model 2 presents the focal variable and introduces the control variables (age, race, marital status, have at least one child under age 6, education and religious orientation).

sults in column 1 indicate that tubal ligation appeared to be more likely with increasing age and was more prevalent among black women (37.5%) as compared to the white and other racial ethnic groups (28.3% and 29.2%, respectively). The cross-tabulations of marital status by tubal ligation indicate that there was little difference between currently married and ever-married women (36.9% and 39.5%, respectively) regarding whether they had undergone tubal ligation but that cohabiting and never-married women (24% and 6.4%, respectively) were less likely to have undergone tubal ligation. This suggests that marriage may affect tubal ligation in some respects. There is a strong bivariate relationship between educational level and having undergone tubal ligation; with increased education, a lower proportion of women had undergone tubal ligation. Also, those with at least 1 child under age 6 were less likely to have undergone tubal ligation

as compared with those who without. In agreement with prior research, Catholic/Orthodox women (20.7%) were less likely than Protestant women (34.8%) to have undergone tubal ligation.

Table I includes bivariate results, which differentiate women who had undergone tubal ligation and had sexual problems from those who had undergone tubal ligation and had not had such problems. The results run parallel to the results for women in general regarding baseline social and demographic characteristics but also show that there was a much higher incidence of tubal ligation among those who reported stress interfering with sex. Much as for stress, there was a higher incidence of reported sexual problems among those who had undergone tubal ligation.

Logistic regressions test the hypotheses about having stress interfere with sex in Table II. The OR can be interpreted as the log odds that an event such as having stress interfere with sex may occur. An OR farther from 1 indicates that a larger effect exists. For example, an OR of 1.5 means that it is 1.5 times more likely that an event—a woman will report having stress interfere with sex—would occur.

In model 1 of Table II, the focal variable, a report of having had a tubal ligation, is significant in whether a woman reported stress interfering with sex. Women who reported having undergone tubal ligation were twice as likely to report stress interfering with sex. In model 2 of Table II, we examine the focal variable and introduce the control variables (age, race, marital status, having at least 1 child under age 6, education and religious orientation). Having had a tubal ligation, having ever been married and education had significant relationships with whether a woman reported stress interfering with sex. As in model 1, a report of having had a tubal ligation continues to be significant in a similar direction and magnitude. Model 2 shows that being ever married is related to whether a woman reports stress interfering with sex, meaning that divorced, widowed and separated women are 1.55 times more likely than married women to have had stress interfere with sex. Years of completed education are also related to whether or not a woman reports having stress interfere with sex. With each incremental increase in education, women were 7% less likely to report having had stress interfere with sex. These results support our hypothesis regarding tubal ligations, marital status and education level.

In model 1 of Table III, we use logistic regressions to test the hypotheses regarding seeing a private

physician about sexual problems, first including our focal variable, a report of having had a tubal ligation. The focal variable is in the model. Women who reported having undergone tubal ligation were 65% more likely to report seeing a physician regarding sexual problems. This finding is in support of our hypothesis regarding tubal ligation and seeing a private physician about sexual problems. Model 2 of Table III includes the focal variable and a group of control variables—namely, age, race, marital status, having at least 1 child under age 6, education and religious orientation. In this model, our focal variable remains significant, with those who report having had a tubal ligation 79% more likely to report seeing a private physician regarding sexual problems. Being never or ever married also was significantly related to seeing a physician regarding sexual problems. Ever-married women were 60% less likely to report seeing a physician regarding sexual problems. Divorced, widowed and separated women were about 50% less likely than married women to have seen a physician regarding sexual problems. These findings do show support for the hypotheses regarding tubal ligation, never married and ever married, and seeing a private physician about sexual problems.

### Discussion

Our findings suggest that tubal ligation has unintended negative consequences for sexual issues and should not be considered lightly. There is no evidence that the association is spurious because it exists even when controlling for likely selective effects. Women who have undergone tubal ligation are more likely to report stress interfering with sex in the previous 12 months and seeing a physician about sexual problems in the previous 12 months. These findings stand in contrast to those of medical research, which has generally noted some mixed but generally positive effects on women who have undergone tubal ligation.<sup>7,11,12,22,23</sup>

With our cross-sectional data, we cannot definitively establish causality, but a connection can be made between physical functioning and emotional/sexual well-being. An alternative explanation of our findings would be that women seeking surgical (more radical) solutions to problems are already more likely to be under higher stress levels and are more likely to be seeing a physician. In addition, there may be a confounding effect in that women who complain more are inherently more eager to seek surgical solutions to their problems. These al-

ternative explanations underscore a need for more detailed data to be collected longitudinally to examine these relationships. Our decision to include only women who have not had a child during the previous year bolsters our causality argument because we offer a time buffer for women who are likely to be under the care of a physician. The relationships established in this analysis between tubal ligation and the negative sexual consequences should be considered by physicians advising women about tubal ligation.

Prior research has consistently shown that less educated women are more likely to report having undergone tubal ligation. Our research found that less educated women are also more likely to report having stress interfere with sex. Additionally, ever-married women become more likely than married women to report stress interfering with sex. This may be the case as divorced, widowed and separated women are experiencing stress in other aspects of their lives in addition to the sexual aspect. These findings underscore that medical professionals need to have the latest and complete understanding of all effects, both positive and negative, of tubal sterilization as it may affect women in different ways.

Other research has indicated the priority of emotional factors when it comes to sexual functioning in women.<sup>33</sup> In this regard, for instance, marriage tends, presumably by consolidating the emotional bond between the partners, to increase sexual satisfaction among women. Once the emotional bond between the partners is broken for whatever reason, as is the case for ever-married women as compared to married women, there tends to be a dramatic increase in stress interfering with sex. Therefore, it is reasonable to ask whether tubal ligation in some way disrupts the emotional bond between the partners and in this way comes to be associated with an increase in stress interfering with sex. It is also reasonable to consider whether tubal ligation in some way disturbs a woman's self-concept and self-identity in a way that transcends mere physical gratification. As discussed above, past research shows that women with a tubal ligation have a tendency to report a kind of mutilated body image.<sup>25,29</sup> Elson's<sup>28</sup> theory regarding the connection between loss of reproductive capability and women's sense of self is especially useful. Our results extend the theoretical implications of Elson's work on women who have undergone hysterectomy and gender identity. Our results indicate that the negative dy-

dynamic at work among women who have undergone tubal ligation may go beyond their biologic capacity to conceive.

These relationships persisted even when we tested for underlying medical explanations. For example, one would expect individuals with health problems to be more likely to see a physician; however, we found no underlying associations between tubal ligation and self-perceived ill health (results not shown) or reporting pain or discomfort during sexual intercourse (results not shown). The absence of underlying medical relationships minimizes the potential medical effects and reveals the possible social effects of having undergone tubal ligation. Our results suggest that short- and long-term emotional effects of tubal ligation influence sexual functioning and sexual satisfaction in women. The needs and desires of women change over time with their individual life trajectory of decisions. Our bivariate results indicate that the life course perspective may be relevant in explaining how women at different stages vary in their propensity to have undergone tubal ligation. If we knew when women opted for tubal ligation, we would be better able to operationalize this theory and explain women's experience with tubal ligation.

Despite the positive assessments of the tubal ligation procedure in medical journals and medical research, as well as in some social science research, this study uncovered 2 negative consequences of the procedure, having stress interfere with sex as well as seeing a physician about sexual problems. Beyond the social science research on regret, women should consider the relationships we found with these 2 variables when deciding to undergo sterilization. With substantial rates of tubal ligation, physicians should discuss possible negative issues, such as these, with their patients prior to the procedure. As Winikoff and Mensch<sup>5</sup> asserted, "The rationales for commonly advocated postpartum family planning services and . . . the behavioral and biological assumptions on which they are based" need to be reevaluated.

As with all research, there were shortcomings in this study due mostly to the cross-sectional nature of the data. More detailed questions regarding both positive and negative behaviors should be asked in future surveys. Longitudinal research following the same women and their partners over time would also inform our understanding of possible negative effects among women who choose to undergo tubal ligation. Women, their physicians and the public in

general should have more detailed information regarding the effects of sterilization so that more informed decisions can be made about contraception and surgical sterilization. Because women rely on the knowledge of their trusted medical professionals when considering tubal ligation, this research sought to caution those who view that there are no or few negative effects of the procedure.

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