Applying the Female Sexual Functioning Index to Sexual Minority Women

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Abstract

Background: Available measurements of women's sexual function do not account for different sexual orientations; rather, instruments have been developed using heterosexual samples. The Female Sexual Functioning Index (FSFI) is a widely used instrument, applicable for sexually active or inactive women. We apply the FSFI to a sample of women who have or prefer women as sexual partners, defined as sexual minority women, and who vary with respect to their sexual activity.

Methods: A modified version of the FSFI was used in a sample of sexual minority women. Statistical analyses focused on examining associations between FSFI responses of no sexual activity and women's characteristics.

Results: Partner status and sexual frequency was significantly associated with reporting no sexual activity on the FSFI. A revised scoring of the FSFI allows for the use of this instrument among women who vary on sexual frequency and partner status, without biasing their scores towards sexual dysfunction. The desire subscale is independent of sexual frequency, partner status, and sexual orientation.

Conclusions: The modified wording of the FSFI and its revised scoring allow for the use of this instrument among sexual minority women. A separate reporting of the desire subscale will generate reliable and valid assessments of sexual minority women's sexual functioning.

Introduction

IT HAS BEEN SUGGESTED THAT sexual dysfunction affects as much as 43% of women in the population,¹ while others label this an overestimate and call for a distinction between sexual problems, distress, and sexual dysfunction.² In comparison, research findings on the prevalence of sexual dysfunction among women who engage in same-sex sexual activities, defined as sexual minority women (SMW), are not available. The reasons for sexual dysfunction are a presumed interaction between organic and psychological factors. To date, various medical conditions and their treatments, including cancer,³ depression,⁴ and urinary tract symptoms⁵ have been linked to sexual dysfunction. With recognition of female sexual dysfunction as a prevalent problem, several measures have been developed to assess sexual dysfunction from a woman's rather than a clinician's perspective.⁶⁻⁸ Among these instruments, the Female Sexual Functioning Index (FSFI)⁹ has been reviewed favorably⁷ and is widely used worldwide,¹⁰⁻¹³ given its availability in several languages. Its advantages include brevity; good psychometric properties (i.e., high reliability and validity); and the subscales

assessing desire, arousal, lubrication, orgasm, satisfaction, and pain, which are consistent with accepted domains of sexual dysfunction (desire disorder, arousal disorder, orgasmic disorder, and sexual pain disorder) as defined in the DSM-IV and ICD-10.^{6,7,9}

An FSFI total score of 26 or less indicates risk for sexual dysfunction.⁹ However, the scoring of the FSFI is problematic, because 15 of the 19 items of the FSFI have a 5-point response scale with a zero value for "No sexual activity" or "Did not attempt intercourse." Only the two questions that make up the desire subscale of the FSFI and two of the three questions that make up the satisfaction subscale provide answer choices that are independent of the occurrence of sexual activity. Clearly, a woman may have a variety of reasons other than sexual dysfunction that explain a 4-week period without "sexual activity or intercourse."^{14,15} For example, reasons other than sexual dysfunction that can cause a 4-week period of sexual inactivity are travel resulting in geographic separation from a partner or a partner's illness. Thus, zero scoring biases sexually inactive women towards greater measures of sexual dysfunction; this is a recognized problem, prevalent among women without a sexual partner.³ Some researchers

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address this problem by restricting study inclusion to women who report sexual activity over the 4-week time period.¹⁴ Another suggestion¹⁴ is to treat all zero scores as missing values. These changes have been positively received and validated by researchers.¹⁵

The scant literature on the sexual expression of SMW noted some differences compared with heterosexual women's activities, with more SMW than heterosexual women engaging in activities considered taboo, such as sexual activities at an early age, masturbation, fantasizing, more sexual partners, and greater sexual desire.^{16–18} No instrument has yet been developed that is specific to SMW,¹⁹ which impedes assessment of sexual dysfunction in this population. We selected the FSFI in our study because of documented strengths in the general population as well as prior use in a target population of lesbians in which it was shown to be a reliable measure.²⁰ Tracy and Junginger²⁰ expanded the FSFI time frame from 4 weeks to 6 months and removed the definition of intercourse from the introductory instructions. Because reliable data indicating lower sexual frequency among SMW compared with heterosexual women do not exist,¹⁹ we decided to retain the original 4-week reporting period. Similarly, there are no definitive population-based studies about the sexual repertoire of SMW, including the frequency of penetrative vaginal sexual activities.^{18,21} The original FSFI defined intercourse as penile penetration and included three specific inquiries regarding penile penetration. We omitted the term intercourse, and for the three items referring to penetration, we adapted the wording to SMW "Vaginal penetration is defined as penetration (entry) of the vagina with any object (fingers, sex toys)" (see Appendix A). We retained the original wording of the remaining 16 items in the FSFI, which inquire about sexual interest, desire, arousal, and sexual activity.

We see a significant need to determine SMW sexual dysfunction to ensure that these women receive appropriate clinical attention. Since we do not foresee development of a SMW-specific instrument of sexual functioning, we were interested in evaluating the use of the FSFI in SMW who vary with respect to their sexual frequency. Therefore, we report on our experiences with the FSFI's appropriateness in this population with a particular emphasis on critically examining the previously reported frequency of zero values on FSFI items.

Methods

We distributed promotional materials to a variety of organizations, print media, internet websites, and at events (e.g., lesbian, gay, bisexual, and transgender [LGBT] agencies) to alert potential participants to our study on sexual well-being in SMW. As an incentive, we offered participants \$20 for completion of an anonymous mail survey. Interested women who contacted us were screened by telephone for eligibility. Study eligibility depended on sexual minority status, which we defined as self-identifying as lesbian or bisexual or reporting a preference for a female partner. Women who were currently in a relationship with a male partner were excluded from the study. No other restrictions were imposed with respect to partnership status or sexual frequency.

Given our convenience recruitment methods, we cannot calculate a response rate. However, 323 women interested in participation contacted us, of whom 24 could not be reached for screening, while 23 were screened, but subsequently not

enrolled because we terminated data collection. Seventy screened ineligible. Ineligibility consisted of conditions we stipulated to have an effect on SMW's sexual function. These ineligibility reasons consisted of reporting a male partner or a preference for a male partner, currently undergoing cancer treatment, having undergone cancer treatment less than 1 year ago, having metastatic cancer, having had prophylactic oophorectomy or mastectomy, or currently using estrogen therapy. Another reason for exclusion was living outside of the United States. Surveys and consent forms were mailed to 206 eligible women. Seven opted out after receiving the survey, and 16 women did not return their surveys. Among the 183 returned surveys, we found 13 ineligible, which resulted in a sample of 170. All aspects of the study were approved by the authors' Institutional Review Boards.

Measures

Independent measures consisted of participants' demographic and clinical characteristics. From participants' responses, we derived their age and partner status, distinguishing between women with and without a partner. Race/ethnicity was categorized into white (non-Hispanic) and non-white. Socioeconomic status measures included education, categorized into high school or GED diploma, some college, graduated from college, or completed graduate school; individual income, which was collected in \$10,000 increments, ranging from less than \$10,000 to \$100,000 and above, and then categorized into <\$30,000, \$30,000 to \$69,999, and \$70,000 or more; and health insurance status, categorized as no health coverage, public coverage, or private coverage. Employment distinguished between respondents who were unemployed and employed, which included full or part-time employment. Because previous research linked medical conditions to sexual dysfunction, we assessed breast cancer history, defined as having receiving a diagnosis of nonmetastatic invasive breast cancer, and cardiopulmonary comorbidity, which is derived from respondents' self-reports of cardiopulmonary problems.²² Using the Hospital Anxiety and Depression Scale, we assessed likely clinical depression vs. none, focusing on scores of 11–21, which refer to an abnormal state, indicative of clinical depression²³ compared with lower scores.

We measured sexual frequency with the question "About how often did you have sex during the past 12 months?", allowing for the answer choices: "not at all, once or twice, about once a month, two or three times a month, about once a week, two or three times a week, and four or more times a week."²⁴

Outcome variable and different scoring methods

To measure sexual function we used the FSFI after adaptation as described above to increase its relevance to our target population. Rosen et al.,⁹ who developed the scale (Rosen scoring), recommended summation of response values and multiplication of the sum by a factor to obtain the FSFI score. The FSFI is a brief self-report measure of women's sexual function, which considers the multidimensional nature of sexual function. Its six subscales assess desire, arousal, lubrication, orgasm, satisfaction, and pain, by summing individual items that comprise the subscale and multiplying the sum by a

factor. Lower scores on any of the subscales or on the overall FSFI indicate worse sexual function.

The two items that make up the desire subscale do not allow for an answer option of no sexual activity. The three questions that make up the pain subscale include a response option "did not attempt vaginal penetration" within the past 4 weeks, which is scored as a zero value (non-missing). The remaining 12 of the 19 FSFI questions make up the arousal, lubrication, satisfaction, and orgasm subscales and contain an option of reporting "No sexual activity" within the past 4 weeks, which is scored as a zero value (non-missing). Previous work by Meyer-Bahlburg and Dolezal¹⁴ show that zero values can bias the score towards dysfunction, and therefore suggests transforming zeros to missing values (Meyer-Bahlburg scoring).

We implemented an alternative scoring method. Initially, we treated zero values as missing responses as suggested by Meyer-Bahlburg and Dolezal.¹⁴ We assigned a missing FSFI score to all surveys with more than 50% of the items treated as missing in the sense defined by Meyer-Bahlburg and Dolezal. For the remaining surveys, we used simple mean imputation²⁵ whereby we replaced each missing value with the mean of the remaining item scores from the same scale.

In the absence of instructions by Rosen et al. or Meyer-Bahlburg and Dolezal about missing data, we recalculated FSFI scores for each scoring method twice, after excluding surveys with 20% and 10% missing items respectively. For all scoring approaches, we retained the cut-off of a 26 FSFI score or less to indicate sexual dysfunction.

Analysis

We conducted all analyses using SAS version 9.1. We calculated frequencies and means to characterize the sample with respect to demographic and clinical characteristics (Table 1). To investigate the association of sexual frequency and partner status with FSFI score, we cross-referenced sexual frequency with the number of zero scores (out of 19 items) on each completed FSFI, where we categorized the number of zero scores as (1) less than three zeros; (2) three to five zeros; or (3) 10 or more zeros (Table 2). To investigate differences in missing FSFI scores by demographic characteristics, we used a repeated measures simple linear regression model, in which the demographic characteristic was considered the predictor of the average number of zeros within the FSFI score (See Table 3). We tested mean differences using two-sided hypothesis tests on the relevant regression coefficients with significance level of 0.05. We calculated Cronbach's alpha to estimate the reliability of the scoring in our sample (see Table 4).

Results

This sample of SMW was on average 51 years old, and the majority was younger than 60 years of age, including about 40% in their 50s. About two thirds of the SMW were partnered, and the majority reported white race. Almost half the sample was highly educated and two thirds of the sample reported an income of less \$70,000. The majority of SMW were employed and had health insurance. Half of the sample reported a history of breast cancer, reported on average more than one cardiopulmonary comorbidity, and about 5% of the sample was considered clinically depressed. Finally, this sample's average frequency of sex per year was 36.

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF OUR SAMPLE (N=170)

Characteristic	n (%)
Age categories	
< 50 years	67 (39.4)
50–59 years	73 (42.9)
> 60 years	30 (17.7)
Mean age (years) ± SD	51.3 ± 9.0
Partner status	
Partnered	116 (68.2)
Without partner	54 (31.8)
Race/ethnicity	
White	150 (88.2)
Non-white	20 (11.8)
Education	
High school or some college	29 (17.1)
Graduated from college	60 (35.3)
Completed grad school	81 (47.7)
Individual income	
< \$30,000	63 (38.4)
\$30,000–\$69,999	59 (36.0)
≥ \$70,000	42 (25.6)
Missing	6
Employment	
Unemployed	34 (20.1)
Employed (either part-time or full-time)	135 (79.9)
Missing	1
Health insurance	
No insurance	10 (5.9)
Public insurance	24 (14.1)
Private insurance	136 (80.0)
Mean comorbidity ± SD	1.4 ± 2.0
History of breast cancer	
History of breast cancer	85 (50.0)
Without any cancer history	85 (50.0)
Depression	
Clinical depression	9 (5.3)
No clinical depression	161 (94.7)
Sexual frequency per year	36.0 ± 50.8

Definitions provided to FSFI respondents clarify sexual activities according to both partnered and solitary activities (e.g., masturbation). The question about sexual frequency, "About how often did you have sex during the past 12 months?" suggests partnered sexual activities. While it is

TABLE 2. AMOUNT OF ZEROS BY SEXUAL FREQUENCY

Sexual frequency per year	FSFI where zeros are counted as non-missing ^a		
	Mostly incomplete (≥ 10 zeros)	Partially incomplete (3–5 zeros)	Mostly complete (< 3 zeros)
0	18 (43.9)	4 (9.3)	2 (2.4)
2	19 (46.3)	10 (23.3)	7 (8.2)
12	2 (4.9)	14 (32.6)	17 (20.0)
36	1 (2.4)	9 (20.9)	19 (22.4)
52	1 (2.4)	4 (9.3)	24 (28.2)
156	0 (0.0)	2 (4.7)	11 (12.9)
208	0 (0.0)	0 (0.0)	5 (5.9)

^aAll data are n (%). FSFI, Female Sexual Functioning Index.

TABLE 3. AVERAGE NUMBER OF ZEROS PER FEMALE SEXUAL FUNCTIONING INDEX SCALE

Characteristic	FSFI	p value	Arousal	p value	Lubrication	p value	Orgasm	p value	Satisfaction	p value	Pain	p value
Age categories												
<50 years	3.4±5.3	0.11	0.7±1.5	0.20	0.8±1.6	0.19	0.5±1.3	0.20	0.4±0.5	0.30	1.1±1.4	0.03
50–59 years	4.0±5.1		0.6±1.3		0.9±1.6		0.6±1.2		0.4±0.5		1.6±1.5	
>60 years	6.5±6.2		1.3±1.7		1.6±2.0		1.1±1.4		0.5±0.5		2.0±1.4	
Partner status												
Partnered	3.4±5.2	<0.01	0.6±1.3	0.014	0.8±1.5	0.047	0.6±1.2	0.11	0.2±0.4	<0.01	1.2±1.5	<0.01
Without partner	6.1±5.6		1.1±1.7		1.3±1.9		0.9±1.3		0.7±0.4		2.0±1.3	
Race/ethnicity												
White	4.3±5.5	0.61	0.8±1.5	0.57	1.0±1.7	0.42	0.7±1.2	0.46	0.4±0.5	0.95	1.5±1.5	0.91
Non-white	3.7±5.1		0.6±1.4		0.7±1.5		0.5±1.1		0.4±0.5		1.5±1.5	
Education												
High school or some college	5.4±5.8	0.36	0.9±1.6	0.70	1.4±1.8	0.25	1.0±1.4	0.28	0.6±0.5	0.19	1.6±1.5	0.79
Graduated from college	3.7±5.3		0.7±1.4		0.8±1.5		0.5±1.1		0.3±0.5		1.4±1.5	
Completed grad school	4.2±5.5		0.8±1.5		0.9±1.7		0.7±1.2		0.4±0.5		1.5±1.5	
Individual income												
<\$30,000	5.2±5.9	0.27	1.0±1.6	0.19	1.3±1.8	0.15	0.9±1.3	0.25	0.4±0.5	0.84	1.5±1.5	0.80
\$30,000–\$69,999	3.7±5.2		0.6±1.3		0.8±1.6		0.6±1.2		0.4±0.5		1.4±1.4	
≥\$70,000	4.0±5.3		0.7±1.4		0.8±1.6		0.5±1.2		0.4±0.5		1.6±1.5	
Employment												
Unemployed	6.3±6.5	0.048	1.3±1.9	0.052	1.7±1.9	0.017	1.2±1.4	0.02	0.5±0.5	0.11	1.6±1.5	0.67
Employed (part-time or full-time)	3.7±5.1		0.6±1.3		0.8±1.6		0.5±1.1		0.4±0.5		1.4±1.5	
Health insurance												
No insurance	2.9±4.6	0.17	0.4±1.3	0.18	0.7±1.5	0.10	0.3±0.9	0.08	0.3±0.5	0.43	1.2±1.5	0.76
Public insurance	6.3±6.3		1.3±1.8		1.8±2.0		1.2±1.4		0.5±0.5		1.6±1.4	
Private insurance	4.0±5.3		0.7±1.4		0.8±1.6		0.6±1.2		0.4±0.5		1.5±1.5	
History of breast cancer												
Breast cancer history	4.9±6.0	0.12	0.9±1.6	0.17	1.2±1.8	0.056	0.8±1.3	0.055	0.4±0.5	0.09	1.5±1.5	0.88
Without any cancer history	3.6±4.9		0.6±1.4		0.7±1.5		0.5±1.1		0.3±0.5		1.4±1.5	
Depression												
Clinical depression	4.4±5.6	0.89	0.9±1.8	0.78	0.9±1.8	0.90	0.7±1.3	0.99	0.6±0.5	0.29	1.4±1.5	0.96
No clinical depression	4.2±5.5		0.7±1.5		1.0±1.7		0.7±1.2		0.4±0.5		1.5±1.5	
Simple regression model												
Comorbidity, □±SE	0.37±0.22	0.09	0.16±0.06	0.02	0.15±0.07	0.02	0.05±0.05	0.30	0.03±0.02	0.13	0.00±0.06	0.92
Sexual frequency, □±SE	–0.04±0.01	<0.01	–0.01±0.00	<0.01	–0.01±0.00	<0.01	–0.01±0.00	<0.01	–0.003±0.00	<0.01	–0.01±0.00	<0.01

Data are presented as mean ±SD and between-group comparison *p* values are calculated from linear regression models. The desire subscale has no zero responses. Therefore it was not considered in the zero score calculations.

Significant *p* values are in bold font.

Boxes indicate coefficient placeholders.

TABLE 4. FSFI DOMAIN CHARACTERISTICS
CRONBACH'S ALPHA (RANGE -1.00 TO +1.00)

	<i>Rosen^a</i> <i>sample</i> (N = 131)	<i>Rosen scoring</i> <i>of SMW</i> <i>sample</i>	<i>Meyer-Bahlburg</i> <i>scoring of</i> <i>SMW sample</i>
Desire	0.89	0.94 (N = 169)	0.94 (N = 169)
Arousal	0.90	0.96 (N = 170)	0.94 (N = 130)
Lubrication	0.95	0.87 (N = 165)	0.61 (N = 123)
Orgasm	0.91	0.95 (N = 169)	0.90 (N = 128)
Pain	0.91	0.98 (N = 169)	0.92 (N = 83)
Satisfaction	0.92	0.85 (N = 134)	0.85 (N = 95)
Total FSFI Score	0.95	0.96 (N = 128)	0.88 (N = 69)

^aControl sample from Rosen et al.⁹

unknown to what extent participants adhered to these definitions, when responding to the various survey questions, we were interested in looking at self-reports of sexual abstinence on the FSFI, such as reports of no sexual activity or of not having attempted penetration, and its relationship to sexual frequency. Given the previously reported problems with the FSFI with respect to partner status and sexual frequency and FSFI reports of sexual abstinence, we first examined the relationship between sexual frequency and partner status. There was no significant association between sexual frequency and partner status ($p=0.61$). In Table 2, we related sexual frequency to zero scores on the FSFI. There is a relationship between the number of zero values and sexual frequency; an increase in sexual frequency reduces the number of zero scores on the FSFI.

In Table 3, we further examined the relationship between women's characteristics and their reports of sexual abstinence on the FSFI, which will result in missingness or inaccurate sexual function scores. For the full scale, partner status, sexual frequency, and employment had a significant relationship with zero scores. Specifically, lower sexual frequency, being without a partner, and being unemployed predicted a higher mean number of zero scores. The latter columns relate subject characteristics to each subscale of the FSFI with the exception of the desire subscale, which does not allow for a zero value. Partner status, sexual frequency, and cardiopulmonary comorbidity were significantly associated with the arousal subscale, indicating that lower sexual frequency, greater cardiopulmonary comorbidity, and absence of a partner are significantly associated with more zero responses. Partner status, employment, cardiopulmonary comorbidity, and sexual frequency were significantly associated with zero scores on the lubrication subscale. Sexual frequency and employment were significantly associated with zero values on the orgasm subscale, indicating that unemployed women and those with lower sexual frequency report more zero scores on the orgasm subscale. Partner status and sexual frequency were significantly associated with zero values on the satisfaction subscale. Finally, age, partner status, and sexual frequency were related to zero scores on the pain scale, in that women who were older, had no partner, and reported a lower sexual frequency reported more zero values.

Table 4 presents and compares psychometric properties of the FSFI. Column 2 displays the internal consistency coefficients for the FSFI and its subscales as reported by Rosen et al.⁹ In columns 3 and 4, we report the Cronbach's alpha, which

indicates reliability on the FSFI and its subscales for our sample of SMW, for which we modified the questionnaire. Coefficients in column 3 are based on the modified questionnaire, yet retain the scoring as described by Rosen et al.⁹ The last column shows coefficients for the Meyer-Bahlburg scoring. Since the Cronbach alpha is calculated for observations without consideration of missing data, we report the N for the subscales and the FSFI for columns 3 and 4. The reliability of the FSFI and its subscales in our sample of SMW is comparable to Rosen's (heterosexual) normative sample, with the exception of the lubrication subscale.

In Table 5, we report on different scoring methods and the implications of allowing for different amounts of missing values. The Rosen scoring, which counts zero values as such, results in 128 FSFI scores, after excluding all missing values. Applying this scoring would result in classification of the majority of our sample (63.3%) as suffering from sexual dysfunction. Allowing for 10% or 20% of missing items using the Rosen scoring, leads to increased FSFI scores of 167 or 169, respectively, lowers the mean FSFI score, and thereby further increases the proportion of the sample classified as having sexual dysfunction to 70%.

The Mayer-Bahlburg scoring, which changes any zero value to a missing value, artificially inflates the mean FSFI to 27.5 ± 4.7 . This reduces the prevalence of sexual dysfunction in the sample to about one third (33.3%) yet results in only 69 FSFI scores, in that 59.4% have missing FSFI scores. Allowing for 10% or 20% of missing items, increases the available Meyer-Bahlburg FSFI scores to 84 and 114, respectively, yet still results in 50.6% and 32.9% of the sample with missing FSFI scores.

The third FSFI scoring approach converts zero values to missing as suggested by Meyer-Bahlburg and Dolezal, yet also addresses the amount of missingness. Allowing for a maximum of 50% of missing values before excluding a survey results in 129 valid FSFI scores (compared to 128 from the Rosen scoring method). Our revision substantially decreases the Rosen tendency towards dysfunction: 48% of our sample was classified as having sexual dysfunction compared to 63% using Rosen. More restrictive versions of our revision allowing for either 10% or 20% of missing items yield a lower number of valid scores, replicating those of Meyer-Bahlburg and Dolezal (84 and 114, respectively). Allowing only 10% missing items results in 37% of the sample classified as dysfunctional (versus 39% using Meyer-Bahlburg); whereas allowing for 20% missing results in 48% of the revised sample classified as dysfunctional (versus 55%).

We further compared Rosen and Meyer-Bahlburg scoring for the FSFI subscales, taking a restrictive approach in which we required all items to have non-missing values. On each subscale with the exception of desire, which does not allow for zero values, the Meyer-Bahlburg scoring resulted in fewer available scores. The pain subscale proved to be the most problematic, in that 87 of the 101 (86.1%) subjects with a missing Meyer-Bahlburg score were missing the pain subscale. The satisfaction scale was missing in 75 of the 101 (74.3%) missing Meyer-Bahlburg FSFI scale scores.

Discussion

This study assessed sexual function in SMW using an adapted version of the FSFI. Our findings indicate that

TABLE 5. COMPARISON OF SCORES AND MISSINGNESS BY SCORING METHODS

	N = 170	Mean (SD)	Median (range)	Dysfunction, n (%)
FSFI				
Rosen scoring (zeros counted)	128	23.4 ± 10.3	23.4 (2.0–34.9)	81 (63.3)
(not allowing for missing)				
(allows for 10% missing)	167	18.8 ± 10.2	20.2 (1.2–34.9)	116 (69.5)
(allows for 20% missing)	169	18.7 ± 10.2	20.2 (1.2–34.9)	118 (69.8)
Meyer-Bahlburg (zeros = missing)	69	27.5 ± 4.7	28.4 (12.6–34.9)	23 (33.3)
(not allowing for missing)				
(allows for 10% missing)	84	26.8 ± 5.0	27.9 (12.6–34.9)	33 (39.3)
(allows for 20% missing)	114	23.9 ± 7.0	24.9 (5.6–34.9)	63 (55.3)
Revised (rescaled if 50% or more items non-missing and non-zero)	129	25.1 ± 6.3	26.2 (7.2–34.9)	62 (48.1)
(allows for 10% missing)	84	27.2 ± 4.9	28.0 (12.6–34.9)	31 (36.9)
(allows for 20% missing)	114	25.2 ± 6.3	26.2 (7.2–34.9)	55 (48.3)
Arousal				
Rosen scoring (zeros counted)	170	3.4 ± 2.1	3.9 (0.0–6.0)	
(not allowing for missing)				
Meyer-Bahlburg (zeros = missing)	130	4.2 ± 1.5	4.5 (1.2–6.0)	
(not allowing for missing)				
Desire				
Rosen (No Zeros In subscale)	169	3.0 ± 1.3	3.0 (1.2–6.0)	
(not allowing for missing)				
Lubrication				
Rosen scoring (zeros counted)	165	2.8 ± 1.9	3.3 (0.0–6.0)	
(not allowing for missing)				
Meyer-Bahlburg (zeros = missing)	123	3.7 ± 1.3	3.6 (1.2–6.0)	
(not allowing for missing)				
Orgasm				
Rosen scoring (zeros counted)	169	3.7 ± 2.3	4.4 (0.0–6.0)	
(not allowing for missing)				
Meyer-Bahlburg (zeros = missing)	128	4.8 ± 1.5	5.2 (1.2–6.0)	
(not allowing for missing)				
Pain				
Rosen scoring (zeros counted)	169	2.7 ± 2.8	2.0 (0.0–6.0)	
(not allowing for missing)				
Meyer-Bahlburg (zeros = missing)	83	5.4 ± 1.1	6.0 (1.6–6.0)	
(not allowing for missing)				
Satisfaction				
Rosen scoring (zeros counted)	134	3.8 ± 1.8	4.0 (0.8–6.0)	
(not allowing for missing)				
Meyer-Bahlburg (zeros = missing)	95	4.6 ± 1.3	4.8 (1.2–6.0)	
(not allowing for missing)				

changing three items from heterosexual language (intercourse) to a more inclusive definition of vaginal penetration resulted in comparable reliability to that shown in the heterosexual sample studied by Rosen et al.⁹ We conclude that the reworded FSFI can be reliably used in SMW populations.

The FSFI was developed in a sample that included women reporting no sexual activity within the last 4 weeks. Subsequently, it was noted that this instrument biases sexually inactive women towards greater measures of sexual dysfunction.^{3,14,15} Since our study included both partnered and unpartnered as well as sexually active and inactive SMW, we were able to examine these issues in detail. This is an important question in that prior studies of heterosexual women reported some surprising results, in that heterosexual women in relationships consistently report more frequent sexual activity compared to unpartnered women.^{26–28} However, studies also found greater sexual dysfunction among heterosexual women in relationships compared with women without relationships.^{29,30} In our sample of SMW, there was

no significant difference in self-reported sexual frequency by partner status, which is inconsistent with the findings based on heterosexual women, and there is a significant association between partner status and zero values on the FSFI, indicating greater sexual abstinence among unpartnered women.

Notably, only the desire subscale of the FSFI does not permit zero responses. The domain of desire transcends partner status, in that women without a partner are able to report desire regardless of the opportunity to act on it with a partner.³¹ This is important, as sexual difficulty in the desire domain is the most prevalent sexual concern expressed by women.^{32,33} In addition, the FSFI items that measure desire are free of a predetermined sexual orientation, in that respondents are simply asked to rate the frequency and intensity of their desire without reference to the gender of their object of desire. For all of these reasons, we advocate for inquiring about desire when assessing sexual function in women of unknown sexual orientation, including women without partners and with variance in sexual frequency.

For the full scale, partner status, sexual frequency, and employment status had a significant relationship with reporting zero responses. The zero responses of four FSFI subscales—arousal, lubrication, satisfaction, and pain—had significant associations with both sexual frequency and partner status, whereas the orgasm domain was associated with sexual frequency, but not partner status. This clearly is consistent with concerns that have been raised by others regarding use of the FSFI in samples of women who are sexually inactive or unpartnered.³ In our sample, we found additional associations between zero responses and subject characteristics. Cardiopulmonary comorbidities were significantly associated with more zero scores on the arousal and lubrication subscales. This makes clinical sense, in that major comorbidities (vascular, neurological) tend to have the greatest impact in the arousal domain, resulting in decreased genital sensitivity, blood flow, and lubrication.³⁴ Another intriguing finding was a relationship between unemployment and more zero responses on the lubrication and orgasm subscales. Several studies have reported that unemployed women are more likely to suffer from sexual dysfunction.^{13,35} Our results suggest this may be due to a higher rate of sexual inactivity reported on the FSFI, which biases towards a greater degree of sexual dysfunction.¹³ It is conceivable that unemployed women struggle with depression or experience stress, which may contribute to sexual inactivity.

Based on the aforementioned characteristics associated with zero scores on the FSFI and its subscales, we propose a revised scoring of the FSFI, which minimizes problems associated with missing data while avoiding inaccurate classification of sexual dysfunction. We found that the Meyer-Bahlburg scoring method biases towards normal sexual function, consistent with previous authors.¹⁵ In our study population, utilization of this scoring results in exclusion of SMW who report sexual abstinence. There are to our knowledge no data available on reasons for SMW's sexual abstinence. In this study, sexual frequency did not differ by partner status. However, women without a partner reported more zero scores on the FSFI, leaving it unclear whether sexually abstinent SMW experience more sexual dysfunction. As noted by Little and Rubin,³⁶ data are not missing at random and the estimated proportion of SMW who experience sexual dysfunction is therefore biased towards zero. Our revised scoring mitigates this problem, and indeed the extent of missing data was essentially identical to the original scoring procedure.

By combining elements from each of the previously developed scoring methods, we hope to gain from the strengths of both approaches. Excluding surveys with any missing items would drastically reduce the sample and likely bias any resulting estimates. We seek a middle ground by treating zero responses as missing, following Meyer-Bahlburg scoring, while using mean imputation to retain the same fraction of the sample as is available when using the Rosen scoring method.

Our data suggest that our revision maintains the internal reliability of the original instrument when applied to this new population. Nevertheless, our study has several limitations. Although we developed our revision to address a potential bias caused by Meyer-Bahlburg's treatment of missing items, under some circumstances the method of mean imputation can introduce its own bias, e.g. when individual items within a subscale have disparate mean values.²⁵ All items on the FSFI are scored identically so this caveat does not apply to the

present study, but with the data available to us, we could not validate our revised scoring method using an independent outcome or instrument. Further, our convenience recruitment methods mean that this is not a representative sample of SMW, and the absence of a clinical assessment of sexual function in our sample means that we cannot make conclusions regarding normative FSFI scores for SMW. Until a validated instrument specific to SMW is available, however, we believe that with a modification in wording, some adjustments in scoring practice, and perhaps a separate reporting of the desire subscale, the revised FSFI will generate reliable and valid assessment of sexual functioning in this population.

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Author Disclosure

There is no conflict of interest for any of the authors.

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APPENDIX A. ADAPTATION OF THE FSFI TO SEXUAL MINORITY WOMEN

Original FSFI

INSTRUCTIONS: These questions ask about your sexual feelings and responses **during the past 4 weeks**. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions the following definitions apply:

Sexual activity can include caressing, foreplay, masturbation and vaginal intercourse.

Sexual intercourse is defined as penile penetration (entry) of the vagina.

Sexual stimulation includes situations like foreplay with a partner, self-stimulation (masturbation), or sexual fantasy.

17. Over the past 4 weeks, how **often** did you experience discomfort or pain during vaginal penetration?
Did not attempt intercourse
Almost always or always
Most times (more than half the time)
Sometimes (about half the time)
A few times (less than half the time)
Almost never or never
18. Over the past 4 weeks, how **often** did you experience discomfort or pain following vaginal penetration?
Did not attempt intercourse
Almost always or always
Most times (more than half the time)
Sometimes (about half the time)
A few times (less than half the time)
Almost never or never
19. Over the past 4 weeks, how would you rate your **level** (degree) of discomfort or pain during or following vaginal penetration?
Did not attempt intercourse
Very high
High
Moderate
Low
Very low or none at all

Modified FSFI

INSTRUCTIONS: These questions ask about your sexual feelings and responses **during the past 4 weeks**. Please answer the following questions as honestly and clearly as possible. Your responses will be kept completely confidential. In answering these questions the following definitions apply:

Sexual activity -can include caressing, foreplay, masturbation and vaginal penetration.

Vaginal penetration is defined as penetration (entry) of the vagina with any object (fingers, sex toys,)

Sexual stimulation includes situations like foreplay with a partner, self-stimulation (masturbation), or sexual fantasy.

17. Over the past 4 weeks, how **often** did you experience discomfort or pain during vaginal penetration?
Did not attempt vaginal penetration
Almost always or always
Most times (more than half the time)
Sometimes (about half the time)
A few times (less than half the time)
Almost never or never
18. Over the past 4 weeks, how **often** did you experience discomfort or pain following vaginal penetration?
Did not attempt vaginal penetration
Almost always or always
Most times (more than half the time)
Sometimes (about half the time)
A few times (less than half the time)
Almost never or never
19. Over the past 4 weeks, how would you rate your **level** (degree) of discomfort or pain during or following vaginal penetration?
Did not attempt vaginal penetration
Very high
High
Moderate
Low
Very low or none at all

Underlined italics indicate modified text. All other bold or underlined text is taken from the original.