SEXUAL MEDICINE REVIEWS

Prevalence of Female Sexual Dysfunction Among Premenopausal Women: A Systematic Review and Meta-Analysis of Observational Studies

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ABSTRACT

Introduction: Epidemiologic research in female sexual dysfunction (FSD) has gained momentum in recent years, particularly in clinical populations and in menopausal women. However, sexual dysfunction also affects premenopausal women in general populations. Previous literature reviews have been unable to quantify the burden of FSD in general populations. This has been due in part to different definitions of dysfunction, heterogeneous study design, and the wide variety of measurement tools used.

Aim: To provide a meta-analytical estimate of the prevalence of FSD in premenopausal women.

Methods: Observational studies that assessed the prevalence of FSD in premenopausal women were systematically sought in relevant databases (January 2000 through July 2014). Publications that reported the prevalence rate for at least one domain of FSD were included. A meta-analysis of prevalence rates was performed and a meta-regression was used to analyze factors of study design.

Main Outcome Measures: Estimated prevalence rates of FSD and its domains (hypoactive sexual desire disorder, sexual aversion disorder, female sexual arousal disorder, lubrication difficulties, female orgasmic disorder, and pain disorders).

Results: After screening 9,292 results, 440 publications were retrieved for full-text review. Of these, 135 studies were included in the systematic review. Ninety-five of these studies were assessed further in a meta-analysis. There was substantial heterogeneity among studies. The prevalence of FSD in premenopausal women was estimated to be 40.9% (95% CI = 37.1−44.7, I^2 = 99.0%). Prevalence rates of individual sexual disorders ranged from 20.6% (lubrication difficulties) to 28.2% (hypoactive sexual desire disorder). Further analyses showed significantly higher rates of FSD in studies in Africa, studies that used non-validated assessment tools, and studies without pharmaceutical funding.

Conclusion: Prevalence estimates of FSD vary substantially. Nonetheless, results show that FSD is a significant public health problem that affects 41% of premenopausal women around the globe. More research and improved standardization are needed in this field.

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Key Words: Epidemiology; Female Sexual Dysfunction; Female Sexual Difficulties; Meta-Analysis; Prevalence; Systematic Review

INTRODUCTION

Sexual function is an essential component of life. For this reason, sexual dysfunction can have a negative impact on the well-being of an individual. Sexual dysfunctions are a heterogeneous group of disorders that are typically characterized by a clinically significant disturbance in a person's ability to respond sexually or to experience sexual pleasure, according to the *Diagnostic and Statistical Manual of Mental Disease, Fourth Edition, Text Revision* (*DSM-IV-TR*).[1] Sexual dysfunction in women includes hypoactive sexual desire disorder, sexual aversion disorder, female sexual arousal disorder, female orgasmic disorder,

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and pain disorders.[1] Female sexual dysfunction (FSD) is related to age, progressive, and highly prevalent, affecting 30% to 50% of women.[2]

Although still far behind research on male sexual dysfunction, research on FSD has attracted more interest in the past few decades.[3,4] Several studies have examined the prevalence of sexual dysfunction in women with cancer,[5] diabetes,[6] and depression.[7] Older women also have been a major focus of research owing to increased interest in therapies that might decrease menopausal symptoms.[8] However, sexual dysfunction is not limited to clinical settings or to women going through menopause. It is an important health issue that affects younger women in general populations.

Several literature reviews have been performed in the past 30 years, yet none has been able to quantify the overall number of premenopausal women who report sexual dysfunction.[9-11] In 1986 Nathan[9] performed an epidemiologic analysis of 22 studies (1929−1981) that assessed sexual dysfunction in men and women in the general population. In the 19 studies that included women, prevalence rates for inhibited desire (in women) ranged from 1% to 35% and from 5% to 15% for inhibited female orgasm. No estimate could be given for inhibited sexual excitement (or arousal) because none of the studies inquired about adequate stimulation and the presence of lubrication problems. The sexual pain disorders, vaginismus and dyspareunia, had not been assessed in general populations until that point. In her analysis, Nathan struggled not only with limited epidemiologic data but also with a wide variety of tools that used heterogeneous definitions for sexual dysfunction.

The 1990 critical review from Spector and Carey[10] (1948−1990) identified 20 studies that measured FSD in various populations of women (minimum age = 11 years, maximum age = 85 years). Community samples indicated a prevalence of 5% to 10% for inhibited female orgasm, yet no stable estimates could be determined for female sexual arousal disorder, vaginismus, or dyspareunia. Spector and Carey encountered similar problems as Nathan did and encouraged future researchers to use a common classification system for sexual dysfunction "so that professionals can better compare and evaluate the literature using a common argot. (pg 406)"

In 2004, West et al[11] performed a systematic literature review (1966−2004) and identified 40 studies focusing on FSD (minimum age = 18 years, maximum age = 75 years). They found rates of sexual dysfunction that ranged from 1% to 50% for desire disorders, 4% to 48% for arousal disorders, 3% to 50% for anorgasmia, and 1% to 75% for dyspareunia. Like Nathan[9] and Spector and Carey,[10] West et al were unable to provide an overall prevalence estimate for FSD owing to the different definitions of dysfunction and the lack of standardized, valid assessment tools.

Currently, there is no global estimate of the prevalence of FSD in general populations of premenopausal women. Currently, the most frequently cited statistic for the prevalence of FSD stems from a 1999 study published in the *Journal of the American Medical Association.*[12] The prevalence rate of generalized FSD was estimated to be 43% in a U.S. population 18 to 59 years old.[13] However, to have a valid estimate of the global prevalence of a particular disease or disorder, a single study of a single population is not sufficient.

A robust epidemiologic analysis of prevalence rates of FSD is valuable not only for statistical purposes but also, more importantly, for its clinical relevance. Quantifying an illness is the first step in finding a possible cure for that illness, and this is true for FSD.[9] Establishing the prevalence of sexual dysfunction in premenopausal and menopausal women allows practitioners and administrators to use these data to determine the resources (eg, more research, improved training, etc) needed to alleviate a given disorder.[10] Thus, the aim of this systematic review was to provide a meta-analytical estimate of the prevalence of FSD in general populations of premenopausal women and to examine the factors that might affect these prevalence rates.

METHODS

Protocol and Registration

The methods for this systematic review and meta-analysis were developed according to recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements.[14] This protocol has been registered with the International Prospective Register of Systematic Reviews (PROSPERO; CRD42014009526) and is available in published form.[15]

Search Strategy and Selection Criteria

Data for this review were identified by searches of Medline, Embase, PsycINFO, Web of Science, and other relevant databases using the terms *sexual dysfunction, female,* and *epidemiology.* Searches were limited to studies of humans, to the English language, and from January 1, 2000 until July 10, 2014. The search was performed by an experienced medical research librarian (H.K.). A list of search terms that were used can be requested from the corresponding author. All titles and abstracts were screened for their relevance (M.E.M.). If there was any uncertainty about an abstract's relevance at this stage, the article remained included until the full text was reviewed. Articles identified through hand searches were considered for inclusion based on their titles.

A standard form was designed and used to evaluate the full-text publications for inclusion (see Supplementary Material). Two investigators (M.E.M. and A.Z.) independently assessed each publication for eligibility and compared their results. If there was a discrepancy in their assessment, a final decision was taken based on discussions with a third reviewer (C.A.). For multiple publications based on a single study, the most current and/or inclusive study was selected. A second hand search was

performed (A.Z.) using the reference lists of all included articles.

Cross-sectional, cohort, and case-control studies were eligible for this systematic review. Validation studies, reviews, reports, and commentaries were not included. Clinical populations or populations of women who were surveyed for a particular disease or illness were excluded. Studies that addressed FSD in infertile women or couples and studies that examined spouses and partners of men with erectile disorder also were excluded.

To be included, the study needed to report the prevalence of FSD or at least one domain of FSD according to the *DSM-IV-TR* (hypoactive sexual desire disorder, sexual aversion disorder, female sexual arousal disorder, female orgasmic disorder, or pain disorders), because this would have been the relevant diagnostic manual at the time of the studies (2000−2014).[1] In the *DSM-IV-TR,* female sexual arousal disorder was described entirely in terms of genital indices of a sexual response, namely the lubrication-swelling response.[1,16] However, since its publication in 2000, further evidence has been shown for differentiating central or subjective arousal from peripheral or genital arousal (ie, lubrication).[17,18] In their validated assessment tool, the Female Sexual Function Index (FSFI; 2000), Rosen et al[19] distinguished between measurements of subjective arousal and measurements of lubrication and assessed these aspects separately. Contrary to the *DSM-IV-TR,* the FSFI, which is widely used in population studies around the world,[20] used the term *sexual arousal* to refer to a woman's subjective arousal and the term *lubrication* to refer to the genital indices of a sexual response.[19] Owing to variation in classification and in measurement tools across studies, the authors chose to include any study that reported on *sexual arousal* and/or *lubrication.*

The research question focused on premenopausal women in the general population (ie, women beyond menarche and before menopause who were not pregnant or lactating). Any studies that focused primarily on menopausal, postmenopausal, pregnant, or lactating women were excluded. Because several epidemiologic studies covered a broad age range of women, a numeric cutoff was used for the studies that did not specify which women were premenopausal. Based on a recent systematic review, the age at onset of natural menopause (the time at which a woman's reproductive capacity ceases)[21] is estimated at 48.7 years.[22] Thus, studies were included if (i) all women surveyed were premenopausal, (ii) the age range of the participants was between menarche and 49 years, or (iii) data on women no older than 49 years could be extracted from the entire population.

Data Collection

Data were extracted from the included studies using an electronic data extraction form created in Access (Microsoft Corp, Redmond, WA, USA). The extraction form was predesigned and pilot tested (M.E.M. and M.A.T.). A pilot test was performed with 20 randomly selected publications on the prevalence of FSD. Based on the results of the pilot test, the form was revised by the investigators. If information necessary for the meta-analysis was not contained within the article, the corresponding author and/or coauthors were contacted personally. All authors were contacted in September 2014 and were reminded, if necessary. Where no reply was received or data were no longer accessible, the investigators listed the article in the summary table but did not include the study in the meta-analysis. After all data were extracted from the included publications (M.E.M., A.Z., and M.A.T.), the data were examined and verified by a second author (M.E.M., A.Z., and M.A.T.). Discrepancies in data entry were documented, discussed, and revised accordingly.

Classification of Sexual Disorders

For the data collection process, prevalence rates were extracted for FSD in general (eg, fulfilling a cutoff in the respective study) and any of its domains: hypoactive sexual desire disorder, sexual aversion disorder, female sexual arousal disorder, lubrication difficulties, female orgasmic disorder, and pain disorders.[1] Authors of previous systematic analyses were confronted with differences in terminology across studies and, in the end, used the term *female sexual dysfunction* to describe any self-reported sexual difficulty, regardless of duration, persistence, or level of personal distress.[9-11] Although the inclusion of personal distress has been shown to yield lower prevalence rates of FSD in population studies,[23-25] very few previous studies included the criterion of personal distress in their assessment of the prevalence of sexual dysfunction.[26] To provide a full scope of international prevalence rates, the authors of this systematic literature review considered all studies for inclusion, regardless of the duration of sexual difficulties or the assessment of persistence or of personal distress. Furthermore, solely for consistency purposes with the literature in the observed timeframe, the authors used the term *sexual dysfunction* for this systematic review.

Methodologic Quality Assessment

Methodologic quality was assessed for all studies included in the meta-analysis using a checklist from Prins et al.[27] Using the quality criteria, risk of bias was assessed for setting and dates of study, eligibility criteria, sampling methods, participation rate, description of participants, description of classification of sexual dysfunction, validation of assessment tool, and sources of funding for each study. Each study was assessed independently by two investigators (M.E.M. and A.Z.). In case of disagreement, consensus was reached through discussions with the senior researcher of this study (C.A.).

Statistical Analyses

A meta-analysis of the prevalence rates of FSD was performed for overall FSD and for each domain using a quality effects model (M.E.M.) and a random effects model (C.R.).[28,29] Further statistical analyses were performed by an experienced epidemiologist (C.R.). Cochran Q and I^2 statistics were used to test for heterogeneity of the studies.[30] Publication bias was examined using

the Begg rank correlation test[31] and the Egger correlation test.[32] Sensitivity analyses were performed by dropping one study at a time. A univariate meta-regression analysis[33] was performed for all six outcomes (FSD and five domains) and the following factors: region of the world, type of sexual regime,[34] method of data collection, sampling method, validation of assessment tool, reporting period of assessment tool, inclusion criteria on sexual activity, and pharmaceutical funding. Furthermore, the prevalence rates were correlated with the Gender Inequality Index to determine whether there was a relation between the prevalence of FSD and the level of gender inequality in a country.[35] Statistical analyses were performed using MetaXL. Meta-regressions were performed using STATA 12.0 (StataCorp, College Station, TX, USA).

RESULTS

Characteristics of Studies

Of the 19,442 citations retrieved through electronic and other references searches, 10,150 duplicates were excluded, leaving 9,292 titles and abstracts to be screened. Based on the title and/or abstract, 8,852 citations were excluded. The full texts of 440 publications were evaluated. In the end, 135 publications fulfilled all inclusion criteria.[23-26,36-166] Figure 1 presents a PRISMA flowchart with reasons for exclusion. Sixty-seven researchers were contacted for additional information for the meta-analysis; 37 of 67 responded (55%) and/or supplied additional data. The smallest population was 100 and the largest was 84,644. The mean study size was 2,420 participants and the median was 853 participants.

Table 1 lists the general characteristics of the included studies. Nearly all publications described cross-sectional studies. The number of premenopausal women in these studies was generally smaller than 2,000, with only three very large studies with more than 10,000 premenopausal women. A third of studies took place in European countries, followed by regions in the non-European West[167] (United States, Canada, South Africa, New Zealand, and Australia) and Asia. Seventy studies (51.9%) used paper questionnaires to collect data on reported sexual dysfunction. The FSFI from Rosen et al[19] was the most frequently used measurement tool (43 of 135, 31.9%). Thirty-six percent of studies used measurement tools with unclear validation or no validation.

Supplementary Table 1 lists specific characteristics of all studies in the systematic review (N = 135). Forty studies could not be included in the quantitative analyses owing to insufficient data on participants and/or prevalence rates. Therefore, the meta-analysis entailed 95 studies, comprising 215,740 participants. The prevalence of FSD was reported in 53 studies. In terms of the domains, the prevalence of hypoactive sexual desire disorder was reported in 62 studies, sexual aversion disorder in 5 studies, female sexual arousal disorder in 39 studies, lubrication difficulties in 36 studies, female orgasmic disorder in 53 studies, and pain disorders in 65 studies. Because the vast majority of studies did not include personal distress in their assessment of prevalence (90%, n = 85), the authors used the prevalence rates of sexual dysfunction without personal distress.

Study Risk of Bias

All studies included in the meta-analysis (n = 95) were assessed for their methodologic quality. The risk of bias for these studies is presented in Figure 2. Of the 95 studies, only 2 (1%) were judged as "low risk" on all risks of bias considered. The prevalence rates were judged as reproducible in 77% of the studies. In 37 studies (39%), the population observed was randomly selected or considered representative of the larger population. Fifty-nine studies (62%) used validated measurement tools, and 63 studies (66%) specified the reporting period of the measurement tool. However, 65 studies had a low response rate or did not provide sufficient information about the population of non-responders.

Meta-Analysis and Meta-Regression

Prevalence rates of FSD varied considerably among studies in the quantitative analyses. Wide ranges of prevalence were present in each domain of sexual dysfunction (hypoactive desire disorder, 6%–70%; sexual aversion disorder, 5%–24%; sexual arousal disorder, 1%–60%; lubrication difficulties, 1%–53%; female orgasmic disorder, 8%–72%; pain disorders, 1%–72%). A meta-analysis was performed for FSD and for each domain of FSD except for sexual aversion disorder, because there were not sufficient data for performing further stratification.

Table 2 presents the meta-analytical prevalence rates for FSD and its domains. The prevalence of FSD in premenopausal women was estimated to be 40.9% (95% CI = 37.1–44.7, I^2 = 99.0%). The quality effects model yielded a similar estimate of 40.4% (95% CI = 33.3–47.0, I^2 = 99.1%). Prevalence estimates varied in the specific domains of FSD (random effects model): 28.2% reported hypoactive sexual desire disorder (95% CI = 24.1–32.5, I^2 = 99.5%), 22.6% reported sexual arousal disorder (95% CI = 18.8–26.8, I^2 = 99.2%), 20.6% reported lubrication difficulties (95% CI = 16.9–24.6, I^2 = 99.2%), 25.7% reported female orgasmic disorder (95% CI = 22.6–29.0, I^2 = 99.1%), and 20.8% reported pain disorders (95% CI = 18.3–23.5, I^2 = 99.2%). Heterogeneity was high (I^2 < 95%) in all estimates; none of the factors analyzed could decrease heterogeneity substantially ($I^2 \leq 50\%$) for any outcome.

Further subgroup analyses showed significantly higher prevalence rates of FSD in Africa and the lowest rates in the non-European West. Studies performed in countries with gender-equal sexual regimes had significantly lower rates of lubrication difficulties, female orgasmic disorder, and pain disorders. This was supported by the correlation of prevalence rates with the Gender Inequality Index (Table 2). In all domains, there was a positive correlation, but a significant, positive correlation was

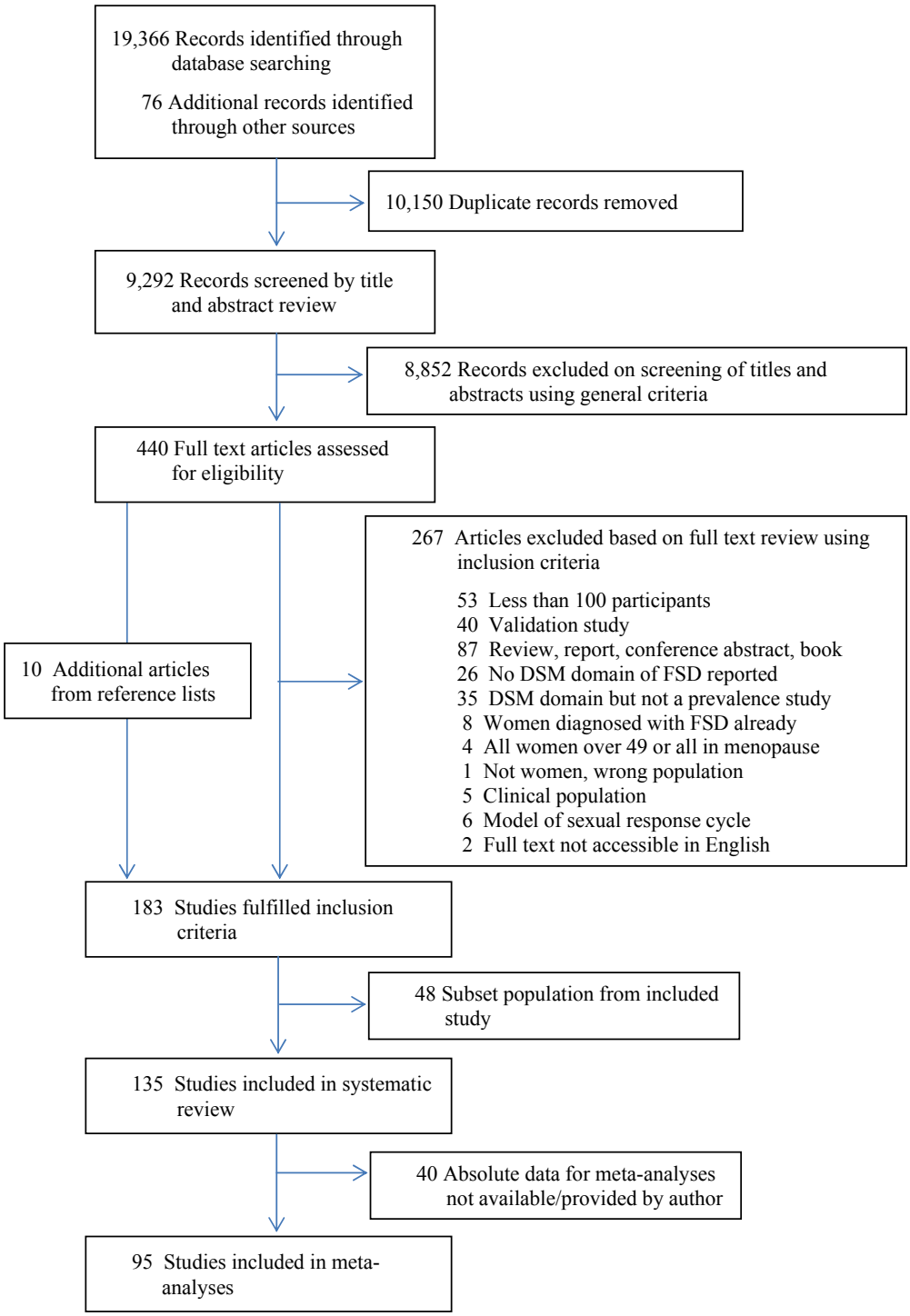

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Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart showing the number of citations retrieved from a systematic literature search in multiple databases. DSM = *Diagnostic and Statistical Manual and Mental Disorders*; FSD = female sexual dysfunction.

established in FSD, particularly female orgasmic disorder and pain disorders. Higher rates of sexual dysfunction were reported in studies that used interviews and questionnaires together to collect data. Random sampling and sampling from convenience populations in outpatient settings (convenience clinical) showed prevalence rates of 41%, but populations in the subgroup "convenience clinical" generally reported higher rates of sexual dysfunction in the individual domains. The validity of the assessment tool was examined, resulting in significantly higher prevalence rates in studies using non-validated tools and significantly lower rates in studies using validated tools. A further subgroup analysis tested the hypothesis that the widely used,

Table 1. Characteristics of included studies (N = 135)

Categorical variable	n (%)
Study design	
Cross-sectional	134 (99.3)
Cohort	1 (0.07)
Sizes of population: premenopausal women*	
00–499	55 (47.4)
500–1,999	44 (37.9)
2,000–9,999	14 (12.1)
10,000–84,644	3 (2.6)
Region	
Europe	45 (33.3)
Non-European West†	31 (23.0)
Asia	23 (17.0)
Central and South America	12 (8.9)
Africa	11 (8.1)
Middle East	10 (7.4)
Global	3 (2.2)
Method of data collection	
Paper questionnaire	70 (51.9)
Interview and questionnaire	23 (17.0)
Face-to-face interview	17 (12.6)
Online survey	14 (10.4)
Telephone interview	9 (6.7)
Computer-assisted interview	2 (1.5)
Validation of assessment tool	
Yes	86 (63.7)
No or unclear	49 (36.3)
Sampling method	
Convenience clinical‡	52 (38.5)
Random	50 (37.0)
Convenience community	32 (23.7)
Not clearly described	1 (0.7)
Pharmaceutical funding	
No	88 (65.2)
Yes	18 (13.3)
Funding not reported	29 (21.5)

*N = 116 studies; absolute numbers were missing for 19 studies.
†United States, Canada, South Africa, New Zealand, and Australia.
‡Women who were recruited in non-emergency clinical settings such as obstetric and gynecologic waiting rooms.

validated FSFI might yield different results from other validated assessment tools and non-validated assessment tools. No clear trend was apparent through this analysis. For reporting period, assessment tools that inquired about symptoms in the past month showed significantly lower prevalence rates, whereas studies with reporting periods of 2 to 12 months showed significantly higher rates. Studies that permitted only sexually active women to participate showed generally higher prevalence rates of sexual dysfunction compared with studies that did not exclude women based on their current sexual activity. Prevalence rates in studies with pharmaceutical funding were lower in all domains—in some cases, significantly lower.

No evidence for publication bias could be indicated through the Begg rank correlation test and Egger correlation test. Results from the sensitivity analysis showed no effect by a single study.

DISCUSSION

Prevalence Rates and Heterogeneity of Studies

In light of previous systematic reviews, it is clear that epidemiologic research in FSD has increased substantially during the past few years.[9-11,168] The systematic literature review (2000–2014) entailed 135 international studies, 95 of which were included in the meta-analysis. This review far exceeds the previous systematic review from West et al[11] (1966–2004), which entailed 40 studies in general populations of women. Considering that peer-reviewed publications on FSD only began to increase in approximately 2001,[4] previous systematic reviews could not provide the breadth and quantity of studies that this review has been able to achieve.

Furthermore, this is the first systematic review to provide an estimate for FSD and the individual domains, because previous systematic reviews could only provide broad ranges for the prevalence of FSD. The meta-analytical estimate of international prevalence studies indicates that 41% of premenopausal women report sexual dysfunction. The prevalence of the individual disorders of sexual dysfunction in premenopausal women ranges from 21% to 28% (hypoactive sexual desire disorder, 28%; female sexual arousal disorder, 23%; lubrication difficulties, 21%; female orgasmic disorder, 26%; pain disorders, 21%). These results are in line with those of Laumann et al's[13] frequently cited study, which estimated that 43% of women 18 to 59 years old report sexual dysfunction. The estimated prevalence rates for the various sexual disorders also were close to the ranges determined by Laumann et al for women 18 to 49 years old: 30% to 32% lacked interest in sex, 18% to 21% had lubrication difficulties, 22% to 28% could not achieve orgasm, and 13% to 21% experienced pain during intercourse.

Substantial heterogeneity in population studies (eg, study design, classifications of disorder, assessment tools, reporting period, cutoffs, funding, etc) hindered authors of previous systematic reviews on FSD from establishing a prevalence estimate.[9-11] Meta-analyses provide a tool by which prevalence rates can be quantified, yet heterogeneity is the main challenge in these types of analyses.[28] An I^2 greater than 95% is not uncommon in meta-analytical estimates of prevalence rates.[28] Subgroup analyses can provide possible explanations for the heterogeneous results, as can weighing the studies according to their quality (quality effects model). Thus, in addition to using stratification by subgroups, quality effects, and random effects methods, the authors performed multiple tests for biases including a risk of bias evaluation, correlation tests for publication bias, and sensitivity analyses. The methodologic assessment indicates that a risk of bias might be present in several studies owing to the non-representativeness of the populations. This

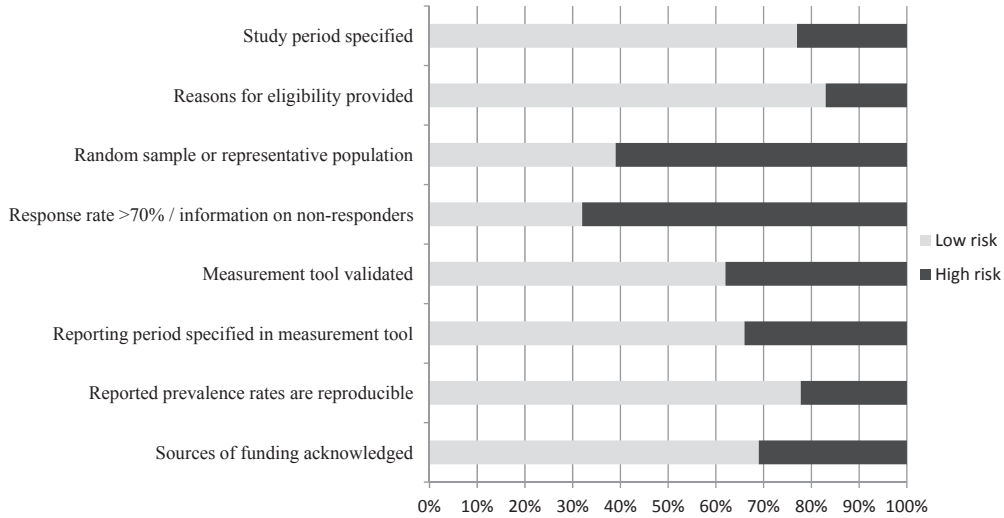

Figure 2. Risk of bias of included studies (n = 95) Studies identified as "low risk" provided the necessary information to fulfill a specific quality criterion. Studies identified as "high risk" did not provide sufficient information to make a conclusion or did not fulfill the specific quality criterion.

underlines the need for improved population sampling to avoid non-response biases and to compensate for the probability of selection biases among subgroups.

Analysis of Factors

Worldwide, African studies reported significantly higher rates of FSD, whereas lower rates of sexual dysfunction were found in Europe and the non-European West. Several countries in these regions are considered to have gender-equal sexual regimes: Austria, Belgium, France, Germany, Spain, Sweden, the United Kingdom, Mexico, Australia, Canada, New Zealand, South Africa, and the United States. In gender-equal sexual regimes, prevalence estimates often were significantly lower than in Asian countries (China, Japan, and Thailand) and countries with male-centered sexual regimes (Egypt, Italy, Morocco, Brazil, Malaysia, and Turkey).[34] Particularly in male-dominated cultures, where sex might be viewed only as a method for procreation, women's sexual needs and pleasure are suppressed.[100] Extreme cases of this can be seen in African studies in which factors such as female genital mutilation, polygamy, and rape by the partner were significant risk factors for FSD.[69,75,121] High rates of FSD also were found in Asian countries, as seen in subgroups "region" and "sexual regime." In these cultures, a different mechanism is at work. Women who do not conform to traditional female roles can experience greater difficulties.[100] Higher education leads to increased awareness of sexual needs and rights; thus, highly educated women in Asia tend to feel more disappointment with sexual relationships, which can lead to poor sexual functioning.[63,142] A correlation could be seen between the Gender Inequality Index and prevalence rates (Table 2). For FSD, female orgasmic disorder and pain disorders, a significant positive correlation was found between increasing gender inequality scores (country scores of 0−1, with 1 being the greatest inequality) and increasing prevalence rates in a country. However, this correlation was not evident with hypoactive sexual desire disorder; in fact, prevalence rates of desire disorder were comparatively high in gender-equal sexual regimes and in Europe and the non-European West. In egalitarian societies such as these, correlates such as full-time employment and housework imbalance with a partner have been shown to be predictors of low sexual interest or decreased sexual desire in women.[137,152] Although it is not possible to draw conclusions about the causal association of gender (in)equality with sexual dysfunction, global studies have found that sexual functioning, emotional pleasure, and physical pleasure are rated higher in countries with greater gender equality; this holds true for women's and for men's sexual well-being.[34]

Study design was another major focus of this systematic review. Similarly to previous systematic reviews, many assessment tools were used to measure FSD; 49 of 135 (36%) had unclear validity. The validated FSFI from Rosen et al[19] was the most frequently used assessment tool, yet even studies using the FSFI applied various and/or non-validated cutoffs such as median values or lowest quartile. Subgroup analyses did not show clear differences between validated and non-validated instruments or greater precision with the use of the FSFI, as seen in the wide CIs. Thus, the large span in prevalence rates across studies might not reflect real differences, but might be due to the different tools and cutoffs that were used.[169] Furthermore, there was great variation in the reporting period. The FSFI asked about any symptoms in the past month, whereas other studies queried about symptoms in the past 3 months, 6 months, 12 months, or ever. Hayes et al[170] documented that even very minor differences in the reporting period have an impact on prevalence rates. Higher rates of sexual dysfunction were reported in studies that used interviews and questionnaires together to collect data.

Table 2. Prevalence estimates of FSD by factors of study design (n = 95)

Factors	Studies, n	FSD, % (95% CI)	Desire, % (95% CI)	Arousal, % (95% CI)	Lubrication, % (95% CI)	Orgasm, % (95% CI)	Pain, % (95% CI)
Total (QE)	95*	40.4 (33.9–47.0)	26.4 (20.0–33.3)	15.4 (9.9–21.8)	16.3 (11.6–21.6)	20.9 (16.1–26.1)	14.4 (7.3–23.4)
Total (RE)	95*	40.9 (37.1–44.7)	28.2 (24.1–32.5)	22.6 (18.8–26.8)	20.6 (16.9–24.6)	25.7 (22.6–29.0)	20.8 (18.3–23.5)
Meta-regression GII score slope (SE)	93	1.56 (0.65)	0.40 (0.71)	1.55 (0.910)	0.96 (0.95)	1.42 (0.55)	1.93 (0.59)
P value		.020	.577	.094	.320	0012	.002
Region							
Europe	36	39.1 (28.8–49.8)	27.0 (20.2–34.5)	16.3 (12.8–20.0)†	21.4 (17.5–25.5)	16.9 (12.8–21.4)	39.1 (28.8–49.8)
Non-European West	18	32.1 (21.1–44.2)	27.9 (18.9–37.9)	15.5 (8.8–23.6)	16.5 (8.4–26.7)	17.1 (10.1–25.5)	13.1 (8.6–18.3)
Asia	17	40.2 (31.4–49.4)	26.1 (20.6–32.1)	32.7 (25.8–40.0)	26.5 (17.9–36.0)	27.5 (19.5–36.3)	22.1 (16.7–28.0)
Central and South America	10	45.5 (30.2–61.2)	28.6 (14.8–44.7)	34.6 (11.8–61.3)	45.5 (30.2–61.2)	27.1 (12.9–43.9)	26.6 (18.0–36.2)
Africa	6	61.7 (48.6–74.0)†	26.2 (01.2–62.9)	21.2 (01.2–51.9)	-	52.6 (39.1–65.9)†	31.6 (16.5–48.8)
Middle East	8	47.0 (36.5–57.7)	38.8 (16.2–63.9)	32.5 (16.8–50.3)	25.4 (13.6–39.4)	29.9 (23.3–36.9)	35.3 (23.9–47.6)†
Type of sexual regime							
Gender equal	37	34.7 (28.1–41.7)	24.8 (18.6–31.4)	11.0 (08.1–14.3)	13.5 (09.1–18.6)†	16.8 (13.5–20.5)†	12.1 (08.6–16.1)†
Asian	9	49.8 (37.0–62.7)	22.1 (16.8–27.9)	27.4 (23.3–31.7)†	25.4 (14.8–37.6)	25.4 (15.1–37.4)	16.8 (09.2–26.0)
Male centered	15	34.6 (26.3–43.3)	36.0 (21.4–51.9)	39.3 (32.2–46.7)†	37.2 (29.7–45.1)†	31.6 (22.7–41.3)	35.0 (30.0–40.2)†
Method of data collection							
Paper questionnaire	51	37.3 (30.7–44.1)	26.2 (20.5–32.2)	24.0 (18.5–30.0)	21.7 (15.1–29.0)	24.6 (19.1–30.6)	22.0 (17.2–27.2)
Interview and questionnaire	16	53.2 (46.1–60.3)†	38.0 (31.4–44.8)	24.2 (13.5–36.7)	23.7 (12.9–36.5)	36.0 (27.3–45.2)†	26.0 (18.9–33.9)
Face-to-face interview	9	43.5 (37.3–49.8)	25.1 (16.5–34.8)	22.9 (09.4–39.8)	17.1 (11.1–24.2)	24.8 (17.7–32.7)	22.6 (17.2–28.4)
Online survey	10	37.3 (31.6–43.2)	25.5 (16.1–36.3)	16.5 (07.4–28.2)	16.3 (00.0–43.9)	21.0 (16.1–26.5)	12.7 (04.8–23.5)
Telephone interview	7	26.0 (03.4–57.2)	33.9 (12.1–59.6)	10.6 (8.5–13.1)	18.5 (9.5–29.5)	14.5 (5.2–27.1)	8.2 (1.5–18.6)
Computer-assisted interview	2	-	-	-	-	18.7 (1.0–46.7)	-
Sampling method							
Random	33	41.3 (33.8–48.9)	27.7 (20.8–35.1)	14.0 (10.2–18.4)	16.9 (12.3–22.0)	21.7 (17.0–26.8)	15.5 (12.5–18.7)†
Convenience clinical	37	41.2 (34.9–47.6)	32.2 (24.4–40.6)	29.5 (23.5–35.9)	23.0 (17.7–28.7)	29.6 (25.4–33.9)	27.0 (22.5–31.6)†
Convenience community	25	39.6 (31.8–47.7)	23.1 (18.4–28.2)	19.2 (11.1–29.0)	21.1 (05.5–42.1)	23.9 (18.2–30.2)	17.2 (09.6–26.2)
Validation of assessment tool							
Yes	62	37.3 (33.3–41.3)†	26.6 (21.9–31.5)	22.7 (18.3–27.4)	22.1 (17.2–27.4)	23.8 (20.1–27.6)	21.3 (16.9–26.0)
No or unclear	33	54.7 (46.6–62.7)†	31.3 (23.4–39.7)	22.3 (13.9–31.9)	16.3 (11.0–22.3)	29.9 (25.0–35.0)	20.1 (16.8–23.7)
Assessment tool							

(continued)

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Table 2. Continued

Factors	Studies, n	FSD, % (95% CI)	Desire, % (95% CI)	Arousal, % (95% CI)	Lubrication, % (95% CI)	Orgasm, % (95% CI)	Pain, % (95% CI)
FSFI	31	36.3 (30.7–42.2)	31.3 (20.8–42.9)	27.0 (19.1–35.6)	26.5 (18.2–35.6)†	28.3 (21.5–35.7)	24.9 (17.5–33.2)
Other validated tool	31	38.9 (32.4–45.6)	21.8 (17.5–26.4)	14.6 (11.6–17.9)	14.3 (10.3–18.7)	18.4 (15.1–22.0)	18.0 (13.0–23.7)
Non-validated tool	33	54.7 (46.6–62.7)†	31.3 (23.4–39.7)	22.3 (13.9–31.9)	16.3 (11.0–22.3)	29.9 (25.0–35.0)	20.1 (16.8–23.7)
Reporting period							
Past month	40	34.9 (29.4–40.6)†	29.9 (20.7–39.9)	25.7 (18.7–33.3)	25.4 (18.1–33.3)	26.9 (20.7–33.6)	23.2 (16.6–30.5)
Past 2–12 mo	26	50.0 (46.1–53.9)†	28.8 (21.8–36.4)	18.4 (09.5–29.3)	16.2 (12.2–20.5)	23.3 (19.4–27.4)	17.3 (13.8–21.2)
Not specified	29	46.9 (37.6–56.3)	24.7 (19.3–30.5)	19.3 (14.2–25.1)	13.1 (09.4–17.2)	27.1 (19.8–35.0)	22.0 (17.0–27.5)
Inclusion criteria							
Current sexual activity not specified	34	36.6 (30.3–43.1)	23.5 (17.6–30.0)	15.7 (11.8–19.9)	18.9 (13.4–25.0)	21.9 (17.3–26.8)	15.3 (11.3–19.9)†
Sexually active or only married women	61	41.5 (36.9–46.2)	31.2 (26.1–36.6)	25.9 (20.1–32.3)	21.5 (16.2–27.3)	27.6 (23.5–31.9)	23.7 (20.2–27.3)†
Pharmaceutical funding							
No	58	43.2 (38.5–48.0)	33.6 (26.7–40.8)†	25.1 (19.1–31.6)	21.0 (16.4–25.9)	27.9 (23.5–32.5)	43.2 (38.5–48.0)
Yes	17	32.4 (22.1–43.7)	18.0 (12.6–24.2)†	10.1 (9.6–10.6)	18.7 (10.5–28.6)	16.2 (10.8–22.3)†	14.8 (8.3–22.6)
Not reported	20	40.3 (33.2–47.6)	25.7 (20.0–31.9)	20.8 (13.3–29.4)	20.1 (14.2–26.7)	26.0 (20.4–31.9)	18.6 (12.1–26.1)

FSD = female sexual dysfunction; FSFI = Female Sexual Function Index; GII = Gender Inequality Index; QE = quality effects; RE = random effects; SE = standard error.
*Number of studies included in analysis for each domain: FSD, n = 53; desire, n = 62; arousal, n = 39; lubrication, n = 36; orgasm, n = 53; pain, n = 65.
†$P < .05$.

However, the 9 of 16 studies in this subset were performed in the Middle East and Africa and had prevalence rates as high as 76.2%.

Approximately two-thirds of studies in the meta-analysis required women to have been sexually active in the past year. Excluding women based on sexual activity could create a bias in that these non-sexually active women might not engage in intercourse because of their sexual disorder.[110] Furthermore, some studies in Middle Eastern and African countries and India only allowed married women to participate. However, recent studies in these countries have shown that the restrictions surrounding marriage are loosening and women's sexual freedom is increasing.[171-173] Thus, studies including only married women might not clearly represent women's sexual health in the general population.

The final factor that was assessed in this meta-analysis was the impact of pharmaceutical funding on prevalence rates, because it has been shown that industry-sponsored research tends to yield pro-industry conclusions.[174] In 2003, as research on women's sexual health was beginning to gain momentum, the article "The making of a disease: female sexual dysfunction" by Moynihan[12] accused pharmaceutical companies and clinicians and researchers of fabricating an illness. However, this analysis clearly showed that studies with pharmaceutical funding had consistently lower prevalence rates than those not funded by pharmaceutical companies or those studies that did not report funding sources. The studies in this subset were primarily from Europe and the non-European West, which generally had lower—but not necessarily significantly lower—prevalence rates. Studies funded by pharmaceutical companies used validated questionnaires 70% of the time, as did those not funded by pharmaceutical companies (funding not reported 45% of the time). Pharmaceutically funded studies used random sampling methods more often than did those without funding or without reported funding (53% vs 36% and 15%, respectively). At closer examination of prevalence rates of hypoactive sexual desire disorder and orgasmic disorder, which were significantly lower, studies funded by pharmaceutical companies achieved larger numbers of participants per study. Furthermore, these studies had higher study quality and fewer biases compared with studies without pharmaceutical funding or without reported funding. Thus, the results of this analysis suggest that the prevalence rates provided through studies with pharmaceutical funding might be more robust than those without pharmaceutical funding.

Limitations of Included Studies

Although Spector and Carey[10] urged researchers to find a common classification system for sexual dysfunction, classification of FSD remains problematic.[12,175,176] Basic terminology proved to be inconsistent across publications. The terms *sexual difficulties, sexual problems, sexual health issues, FSD symptoms,* and *sexual disability* were used interchangeably with *sexual dysfunction.* Thus, it is clear that more standardization is needed "so that professionals can better compare and evaluate the literature using a common argot."[10]

Few publications in the present study assessed distress over sexual problems (10 of 95 studies in the meta-analysis, 11 of 135 in the literature review). Experts have argued that sexually related personal distress is a fundamental component of sexual disorders.[26,176] Indeed, several studies have shown that the inclusion of personal distress yields lower prevalence rates of FSD in population studies.[23-25] Owing to the scarcity of studies in this systematic review that assessed personal distress, the authors could not account for this variable. Once again, this illustrates the need for greater consistency and standardization in the assessment of sexual function in general populations.

A potential reporting bias within the studies should be mentioned. Several researchers indicated that the women in their studies (particularly in conservative cultures) might have been too shy to speak about sexual matters.[63,105,125] This could have resulted in an under-reporting of symptoms. Conversely, over-reporting might have occurred in populations in which women are more open and more interested in talking about their sexuality.[148] Social acceptability also can affect responses. For example, in some Asian cultures, desiring sex as a woman is associated with infidelity.[105] In contrast, in Western cultures, sexual impulses are welcomed and the lack thereof is perceived as a dysfunction.[177]

Limitations of Systematic Review

The present systematic review provides an analysis of factors that, based on previous systematic reviews, appeared to be pertinent to prevalence rates. Further factor analyses and subgroup classifications are certainly possible, yet these would exceed the scope of this particular review.

There were three limitations of the present systematic review. The literature search was limited to publications in English, decreasing the number of studies that might have been included. The present review also focused on women no older than 49 years; a review that included older women could have yielded different results, because sexual dysfunction has been shown to be related to age.[2] Because nearly all studies were cross-sectional studies, it is not possible to draw conclusions as to the causal associations of the investigated factors with sexual dysfunction.

CONCLUSIONS

This systematic review of the literature (2000−2014) and meta-analysis of 95 international studies showed that 41% of premenopausal women report FSD. These findings coincide with previous findings yet provide a far more robust estimate of the prevalence of FSD and the individual sexual disorders, while taking key factors of study design into account.

Considering that two of five of premenopausal women report some form of sexual dysfunction, all medical professionals need to take an active role in addressing sexual dysfunction with each patient across medical subspecialties. To corroborate these findings, future research should focus on conducting longitudinal studies with representative populations, comprehensive assessment of relevant cofactors, and validated assessment tools and cutoffs. Further studies are needed to understand better sexual dysfunction in women living in conservative cultures, women with bisexual and homosexual preferences, and adolescents.

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REFERENCES

1. Diagnostic and statistical manual of mental disorders. 4th ed., text rev. Washington, DC: American Psychiatric Association; 2000.
2. Berman JR, Berman L, Goldstein I. Female sexual dysfunction: Incidence, pathophysiology, evaluation, and treatment options. **Urology 1999;54:385-391.**
3. Giraldi A, Rellini A, Pfaus JG, et al. Questionnaires for assessment of female sexual dysfunction: A review and proposal for a standardized screener. **J Sex Med 2011; 8:2681-2706.**
4. Web of Science Core Collection. Publication search of term "female sexual dysfunction." Available at: http://apps.webofknowledge.com/CitationReport.do?product=WOS&search_mode=CitationReport&SID=R2H7nMTCLFgNxEwX2hZ&page=1&cr_pqid=1&viewType=summary&colName=WOS. Accessed February 21, 2016.
5. Traa MJ, De Vries J, Roukema JA, et al. Sexual (dys)function and the quality of sexual life in patients with colorectal cancer: A systematic review. **Ann Oncol 2012;23:19-27.**
6. Pontiroli AE, Cortelazzi D, Morabito A. Female sexual dysfunction and diabetes: A systematic review and meta-analysis. **J Sex Med 2013;10:1044-1051.**
7. Atlantis E, Sullivan T. Bidirectional association between depression and sexual dysfunction: A systematic review and meta-analysis. **J Sex Med 2012;9:1497-1507.**
8. Rossouw JE, Anderson GL, Prentice RL, et al. Risks and benefits of estrogen plus progestin in healthy postmenopausal women: Principal results from the Women's Health Initiative randomized controlled trial. **JAMA 2002; 288:321-333.**
9. Nathan SG. The epidemiology of the DSM-III psychosexual dysfunctions. **J Sex Marital Ther 1986;12:267-281.**
10. Spector IP, Carey MP. Incidence and prevalence of the sexual dysfunctions: A critical review of the empirical literature. **Arch Sex Behav 1990;19:389-408.**
11. West SL, Vinikoor LC, Zolnoun D. A systematic review of the literature on female sexual dysfunction prevalence and predictors. **Annu Rev Sex Res 2004;15:40-172.**
12. Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: Prevalence and predictors. **JAMA 1999; 281:537-544.**
13. Moynihan R. The making of a disease: Female sexual dysfunction. **BMJ 2003;326:45-47.**
14. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. **Open Med 2009;3:e123-e130.**
15. McCool ME, Theurich MA, Apfelbacher C. Prevalence and predictors of female sexual dysfunction: A protocol for a systematic review. **Syst Rev 2014;3:75.**
16. van Lunsen RH, Laan E. Genital vascular responsiveness and sexual feelings in midlife women: Psychophysiologic, brain, and genital imaging studies. **Menopause 2004; 11:741-748.**
17. Basson R. Recent advances in women's sexual function and dysfunction. **Menopause 2004;11:714-725.**
18. Basson R, Leiblum S, Brotto L, et al. Definitions of women's sexual dysfunction reconsidered: Advocating expansion and revision. **J Psychosom Obstet Gynaecol 2003;24:221-229.**
19. Rosen R, Brown C, Heiman J, et al. The Female Sexual Function Index (FSFI): A multidimensional self-report instrument for the assessment of female sexual function. **J Sex Marital Ther 2000;26:191-208.**
20. Mulhall JP, Incrocci L, Goldstein I, et al. Cancer and sexual health. New York: Humana Press; 2011.

21. Research on the menopause in the 1990s. Report of a WHO Scientific Group. **World Health Organ Tech Rep Ser 1996; 866:1-107.**
22. Schoenaker DA, Jackson CA, Rowlands JV, et al. Socioeconomic position, lifestyle factors and age at natural menopause: A systematic review and meta-analyses of studies across six continents. **Int J Epidemiol 2014;43:1542-1562.**
23. Christensen BS, Gronbaek M, Osler M, et al. Sexual dysfunctions and difficulties in Denmark: Prevalence and associated sociodemographic factors. **Arch Sex Behav 2011; 40:121-132.**
24. Burri A, Spector T. Recent and lifelong sexual dysfunction in a female UK population sample: Prevalence and risk factors. **J Sex Med 2011;8:2420-2430.**
25. Bancroft J, Loftus J, Long JS. Distress about sex: A national survey of women in heterosexual relationships. **Arch Sex Behav 2003;32:193-208.**
26. Witting K, Santtila P, Varjonen M, et al. Female sexual dysfunction, sexual distress, and compatibility with partner. **J Sex Med 2008;5:2587-2599.**
27. Prins J, Blanker MH, Bohnen AM, et al. Prevalence of erectile dysfunction: A systematic review of population-based studies. **Int J Impot Res 2002;14:422-432.**
28. Barendregt JJ, Doi SA, Lee YY, et al. Meta-analysis of prevalence. **J Epidemiol Community Health 2013;67:974-978.**
29. Doi SA, Thalib L. A quality-effects model for meta-analysis. **Epidemiology 2008;19:94-100.**
30. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. **Stat Med 2002;21:1539-1558.**
31. Begg CB, Mazumdar M. Operating characteristics of a rank correlation test for publication bias. **Biometrics 1994; 50:1088-1101.**
32. Egger M, Davey Smith G, Schneider M, et al. Bias in meta-analysis detected by a simple, graphical test. **BMJ 1997; 315:629-634.**
33. Knapp G, Hartung J. Improved tests for a random effects meta-regression with a single covariate. **Stat Med 2003; 22:2693-2710.**
34. Laumann EO, Paik A, Glasser DB, et al. A cross-national study of subjective sexual well-being among older women and men: Findings from the Global Study of Sexual Attitudes and Behaviors. **Arch Sex Behav 2006;35:145-161.**
35. Gender Inequality Index. United Nations Development Programme. Available at: http://hdr.undp.org/en/content/table-4-gender-inequality-index. Published 2013. Accessed September 22, 2014.
36. Abdo CH, Oliveira WM Jr, Moreira ED Jr, et al. Prevalence of sexual dysfunctions and correlated conditions in a sample of Brazilian women—results of the Brazilian Study on Sexual Behavior (BSSB). **Int J Impot Res 2004;16:160-166.**
37. Abdo CH, Valadares AL, Oliveira WM Jr, et al. Hypoactive sexual desire disorder in a population-based study of Brazilian women: Associated factors classified according to their importance. **Menopause 2010;17:1114-1121.**
38. Abu Ali RM, Al Hajeri RM, Khader YS, et al. Factors associated with sexual dysfunction in Jordanian women and their sexual attitudes. **Ann Saudi Med 2009;29:270-274.**
39. Adanu RM, Haefner HK, Reed BD. Vulvar pain in women attending a general medical clinic in Accra, Ghana. **J Reprod Med 2005;50:130-134.**
40. Adegunloye OA, Makanjuola AB, Adelekan ML. Sexual dysfunction among secondary school teachers in Ilorin, Nigeria. **J Sex Med 2010;7:3835-3844.**
41. Aggarwal R. Sexual dysfunction in women: An overview of risk factors and prevalence in Indian women. **J South Asian Fed Obstet Gynecol 2012.**
42. Amidu N, Owiredu WK, Woode E, et al. Incidence of sexual dysfunction: A prospective survey in Ghanaian females. **Reprod Biol Endocrinol 2010;8:106.**
43. Amidu N, Owiredu WK, Gyasi-Sarpong CK, et al. Sexual dysfunction among married couples living in Kumasi metropolis, Ghana. **BMC Urol 2011;11:3.**
44. Arasteh M, Alizadeh NS, Ghaderi E, et al. Survey of the prevalence of sexual dysfunctions in Kurdish women. **J Sex Marital Ther 2014;40:503-511.**
45. Aslan E, Beji NK, Gungor I, et al. Prevalence and risk factors for low sexual function in women: A study of 1,009 women in an outpatient clinic of a university hospital in Istanbul. **J Sex Med 2008;5:2044-2052.**
46. Avasthi A, Kaur R, Prakash O, et al. Sexual behavior of married young women: A preliminary study from north India. **Indian J Community Med 2008;33:163-167.**
47. Avellanet YR, Ortiz AP, Pando JR, et al. Relationship between loss of libido and signs and symptoms of depression in a sample of Puerto Rican middle-aged women. **P R Health Sci J 2008;27:85-91.**
48. Avellanet YR, Ortiz AP, Pando JR, et al. Dyspareunia in Puerto Rican middle-aged women. **Menopause 2009;16:742-747.**
49. Bachmann GA, Rosen R, Arnold LD, et al. Chronic vulvar and other gynecologic pain: Prevalence and characteristics in a self-reported survey. **J Reprod Med 2006;51:3-9.**
50. Bagherzadeh R, Zahmatkeshan N, Gharibi T, et al. Prevalence of female sexual dysfunction and related factors for under treatment in Bushehrian women of Iran. **Sex Disabil 2010; 28:39-49.**
51. Berglund AL, Nigaard L, Rylander E. Vulvar pain, sexual behavior and genital infections in a young population: A pilot study. **Acta Obstet Gynecol Scand 2002;81:738-742.**
52. Berra M, De Musso F, Matteucci C, et al. The impairment of sexual function is less distressing for menopausal than for premenopausal women. **J Sex Med 2010;7:1209-1215.**
53. Beutel ME, Stobel-Richter Y, Brahler E. Sexual desire and sexual activity of men and women across their lifespans: Results from a representative German community survey. **BJU Int 2008;101:76-82.**
54. Blumel JE, Chedraui P, Baron G, et al. Sexual dysfunction in middle-aged women: A multicenter Latin American study using the Female Sexual Function Index. **Menopause 2009; 16:1139-1148.**

55. Bodenmann G, Ledermann T, Blattner D, et al. Associations among everyday stress, critical life events, and sexual problems. **J Nerv Ment Dis 2006;194:494-501.**
56. Botros SM, Abramov Y, Miller JJ, et al. Effect of parity on sexual function: An identical twin study. **Obstet Gynecol 2006;107:765-770.**
57. Briedite I, Ancane G, Ancans A, et al. Insufficient assessment of sexual dysfunction: A problem in gynecological practice. **Medicina (Kaunas) 2013;49:315-320.**
58. Burri A, Rahman Q, Santtila P, et al. The relationship between same-sex sexual experience, sexual distress, and female sexual dysfunction. **J Sex Med 2012;9:198-206.**
59. Cain VS, Johannes CB, Avis NE, et al. Sexual functioning and practices in a multi-ethnic study of midlife women: Baseline results from SWAN. **J Sex Res 2003;40:266-276.**
60. Castelo-Branco C, Blumel JE, Araya H, et al. Prevalence of sexual dysfunction in a cohort of middle-aged women: Influences of menopause and hormone replacement therapy. **J Obstet Gynaecol 2003;23:426-430.**
61. Cayan S, Akbay E, Bozlu M, et al. The prevalence of female sexual dysfunction and potential risk factors that may impair sexual function in Turkish women. **Urol Int 2004; 72:52-57.**
62. Chen O. Prevalence of dyspareunia in healthy Thai perimenopausal women. **Thai J Obstet Gynaecol 2003;15:113-121.**
63. Choi H, Kim JH, Park JY, et al. Assessment of sexual dysfunction and determination of its risk factors in the Republic of Korea. **Int J Gynaecol Obstet 2014;125:60-64.**
64. Colson MH, Lemaire A, Pinton P, et al. Sexual behaviors and mental perception, satisfaction and expectations of sex life in men and women in France. **J Sex Med 2006; 3:121-131.**
65. Danielsson I, Sjoberg I, Stenlund H, et al. Prevalence and incidence of prolonged and severe dyspareunia in women: Results from a population study. **Scand J Public Health 2003;31:113-118.**
66. Echeverry MC, Arango A, Castro B, et al. Study of the prevalence of female sexual dysfunction in sexually active women 18 to 40 years of age in Medellin, Colombia. **J Sex Med 2010; 7:2663-2669.**
67. Elmerstig E, Wijma B, Swahnberg K. Young Swedish women's experience of pain and discomfort during sexual intercourse. **Acta Obstet Gynecol Scand 2009;88:98-103.**
68. Elmerstig E, Wijma B, Swahnberg K. Prioritizing the partner's enjoyment: A population-based study on young Swedish women with experience of pain during vaginal intercourse. **J Psychosom Obstet Gynaecol 2013;34:82-89.**
69. Elnashar A, Abdelhady R. The impact of female genital cutting on health of newly married women. **Int J Gynaecol Obstet 2007;97:238-244.**
70. Elnashar AM, El-Dien Ibrahim M, El-Desoky MM, et al. Female sexual dysfunction in Lower Egypt. **BJOG 2007;114:201-206.**
71. Elsamra S, Nazmy M, Shin D, et al. Female sexual dysfunction in urological patients: Findings from a major metropolitan area in the USA. **BJU Int 2010;106:524-526.**
72. Eplov L, Giraldi A, Davidsen M, et al. Sexual desire in a nationally representative Danish population. **J Sex Med 2007; 4:47-56.**
73. Erbil N. Prevalence and risk factors for female sexual dysfunction among Turkish women attending a maternity and gynecology outpatient clinic. **Sex Disabil 2011; 29:377-386.**
74. Evangelia N, Kirana PS, Chiu G, et al. Level of bother and treatment-seeking predictors among male and female inpatients with sexual problems: A hospital-based study. **J Sex Med 2010;7:700-711.**
75. Fajewonyomi BA, Orji EO, Adeyemo AO. Sexual dysfunction among female patients of reproductive age in a hospital setting in Nigeria. **J Health Popul Nutr 2007;25:101-106.**
76. Ferenidou F, Kapoteli V, Moisidis K, et al. Presence of a sexual problem may not affect women's satisfaction from their sexual function. **J Sex Med 2008;5:631-639.**
77. Fisher W, Boroditsky R, Morris B. The 2002 Canadian Contraception Study: Part 2. **J Obstet Gynaecol Can 2004; 26:646-656.**
78. Freeman EW, Sammel MD, Lin H, et al. Symptoms associated with menopausal transition and reproductive hormones in midlife women. **Obstet Gynecol 2007;110:230-240.**
79. Garcia-Perez H, Harlow SD, Erdmann CA, et al. Pelvic pain and associated characteristics among women in northern Mexico. **Int Perspect Sex Reprod Health 2010; 36:90-98.**
80. Geiss IM, Umek WH, Dungl A, et al. Prevalence of female sexual dysfunction in gynecologic and urogynecologic patients according to the International Consensus Classification. **Urology 2003;62:514-518.**
81. Ghanbarzadeh N, Nadjafi-Semnani M, Ghanbarzadeh MR, et al. Female sexual dysfunction in Iran: Study of prevalence and risk factors. **Arch Gynecol Obstet 2013;287:533-539.**
82. Gold EB, Sternfeld B, Kelsey JL, et al. Relation of demographic and lifestyle factors to symptoms in a multi-racial/ethnic population of women 40—55 years of age. **Am J Epidemiol 2000;152:463-473.**
83. Goshtasebi A, Vahdaninia M, Rahimi Foroshani A. Prevalence and potential risk factors of female sexual difficulties: An urban Iranian population-based study. **J Sex Med 2009; 6:2988-2996.**
84. Graziottin A. Prevalence and evaluation of sexual health problems—HSDD in Europe. **J Sex Med 2007;4(Suppl. 3):211-219.**
85. Grewal GS, Gill JS, Sidi H, et al. Prevalence and risk factors of female sexual dysfunction among healthcare personnel in Malaysia. **Compr Psychiatry 2014;55(Suppl. 1):S17-S22.**
86. Hamilton L, Kulseng-Berg A, Traeen B, et al. Self-reported frequency of feeling sexual desire among a representative sample of 18—49-year-old men and women in Oslo. **Scand J Sex 2001;4:25-41.**
87. Hassanin IM, Helmy YA, Fathalla MM, et al. Prevalence and characteristics of female sexual dysfunction in a sample of women from Upper Egypt. **Int J Gynaecol Obstet 2010; 108:219-223.**

88. Hayes RD, Dennerstein L, Bennett CM, et al. Risk factors for female sexual dysfunction in the general population: Exploring factors associated with low sexual function and sexual distress. **J Sex Med 2008;5:1681-1693.**

89. Hendrickx L, Gijs L, Enzlin P. Prevalence rates of sexual difficulties and associated distress in heterosexual men and women: Results from an Internet survey in Flanders. **J Sex Res 2014;51:1-12.**

90. Hisasue S, Kumamoto Y, Sato Y, et al. Prevalence of female sexual dysfunction symptoms and its relationship to quality of life: A Japanese female cohort study. **Urology 2005; 65:143-148.**

91. Ibrahim ZM, Ahmed MR, Sayed Ahmed WA. Prevalence and risk factors for female sexual dysfunction among Egyptian women. **Arch Gynecol Obstet 2013;287:1173-1180.**

92. Ishak IH, Low WY, Othman S. Prevalence, risk factors, and predictors of female sexual dysfunction in a primary care setting: A survey finding. **J Sex Med 2010;7:3080-3087.**

93. Jaafarpour M, Khani A, Khajavikhan J, et al. Female sexual dysfunction: Prevalence and risk factors. **J Clin Diagn Res 2013;7:2877-2880.**

94. Jahan MS, Billah SM, Furuya H, et al. Female sexual dysfunction: Facts and factors among gynecology outpatients. **J Obstet Gynaecol Res 2012;38:329-335.**

95. Jiann BP, Su CC, Yu CC, et al. Risk factors for individual domains of female sexual function. **J Sex Med 2009;6:3364-3375.**

96. Ma J, Pan L, Lei Y, et al. Prevalence of female sexual dysfunction in urban Chinese women based on cutoff scores of the Chinese version of the Female Sexual Function Index: A preliminary study. **J Sex Med 2014;11:909-919.**

97. Kadri N, McHichi Alami KH, McHakra Tahiri S. Sexual dysfunction in women: Population based epidemiological study. **Arch Womens Ment Health 2002;5:59-63.**

98. Klusmann D. Sexual motivation and the duration of partnership. **Arch Sex Behav 2002;31:275-287.**

99. Lau JT, Kim JH, Tsui HY. Prevalence of male and female sexual problems, perceptions related to sex and association with quality of life in a Chinese population: A population-based study. **Int J Impot Res 2005;17:494-505.**

100. Lau JT, Cheng Y, Wang Q, et al. Prevalence and correlates of sexual dysfunction among young adult married women in rural China: A population-based study. **Int J Impot Res 2006; 18:89-97.**

101. Lavy RJ, Hynan LS, Haley RW. Prevalence of vulvar pain in an urban, minority population. **J Reprod Med 2007; 52:59-62.**

102. Leiblum SR, Koochaki PE, Rodenberg CA, et al. Hypoactive sexual desire disorder in postmenopausal women: US results from the Women's International Study of Health and Sexuality (WISHeS). **Menopause 2006;13:46-56.**

103. Leiblum SR, Hayes RD, Wanser RA, et al. Vaginal dryness: A comparison of prevalence and interventions in 11 countries. **J Sex Med 2009;6:2425-2433.**

104. Lianjun P, Aixia Z, Zhong W, et al. Risk factors for low sexual function among urban Chinese women: A hospital-based investigation. **J Sex Med 2011;8:2299-2304.**

105. Lo SS, Kok WM. Sexual behavior and symptoms among reproductive age Chinese women in Hong Kong. **J Sex Med 2014;11:1749-1756.**

106. Lutfey KE, Link CL, Rosen RC, et al. Prevalence and correlates of sexual activity and function in women: Results from the Boston Area Community Health (BACH) Survey. **Arch Sex Behav 2009;38:514-527.**

107. Meana M, Lykins A. Negative affect and somatically focused anxiety in young women reporting pain with intercourse. **J Sex Res 2009;46:80-88.**

108. Mercer CH, Fenton KA, Johnson AM, et al. Sexual function problems and help seeking behaviour in Britain: National probability sample survey. **BMJ 2003;327:426-427.**

109. Mitchell KR, Mercer CH, Wellings K, et al. Prevalence of low sexual desire among women in Britain: Associated factors. **J Sex Med 2009;6:2434-2444.**

110. Mitchell KR, Mercer CH, Ploubidis GB, et al. Sexual function in Britain: Findings from the third National Survey of Sexual Attitudes and Lifestyles (Natsal-3). **Lancet 2013;382:1817-1829.**

111. Najafabady MT, Salmani Z, Abedi P. Prevalence and related factors for anorgasmia among reproductive aged women in Hesarak, Iran. **Clinics 2011;66:83-86.**

112. Najman JM, Dunne MP, Boyle FM, et al. Sexual dysfunction in the Australian population. **Aust Fam Physician 2003;32:951-954.**

113. Nappi RE, Albani F, Vaccaro P, et al. Use of the Italian translation of the Female Sexual Function Index (FSFI) in routine gynecological practice. **Gynecol Endocrinol 2008; 24:214-219.**

114. Nazareth I, Boynton P, King M. Problems with sexual function in people attending London general practitioners: Cross sectional study. **BMJ 2003;327:423.**

115. Nicolosi A, Laumann EO, Glasser DB, et al. Sexual behavior and sexual dysfunctions after age 40: The global study of sexual attitudes and behaviors. **Urology 2004;64:991-997.**

116. Nusbaum MR, Gamble G. The prevalence and importance of sexual concerns among female military beneficiaries. **Mil Med 2001;166:208-210.**

117. Nusbaum MR, Helton MR, Ray N. The changing nature of women's sexual health concerns through the midlife years. **Maturitas 2004;49:283-291.**

118. Nusbaum MM, Braxton L, Strayhorn G. The sexual concerns of African American, Asian American, and white women seeking routine gynecological care. **J Am Board Fam Pract 2005;18:173-179.**

119. Oberg K, Fugl-Meyer AR, Fugl-Meyer KS. On categorization and quantification of women's sexual dysfunctions: An epidemiological approach. **Int J Impot Res 2004;16:261-269.**

120. Ojanlatva A, Helenius H, Jokinen K, et al. Sexual activity and background variables among Finnish middle-aged women. **Am J Health Behav 2004;28:302-315.**

121. Ojomu F, Thacher T, Obadofin M. Sexual problems among married Nigerian women. **Int J Impot Res 2007;19:310-316.**
122. Oksuz E, Malhan S. Prevalence and risk factors for female sexual dysfunction in Turkish women. **J Urol 2006;175:654-658.**
123. Oniz A, Keskinoglu P, Bezircioglu I. The prevalence and causes of sexual problems among premenopausal Turkish women. **J Sex Med 2007;4:1575-1581.**
124. O'Sullivan LF, Brotto LA, Byers ES, et al. Prevalence and characteristics of sexual functioning among sexually experienced middle to late adolescents. **J Sex Med 2014;11:630-641.**
125. Padmadas SS, Stones RW, Matthews Z. Dyspareunia and urinary sensory symptoms in India: Population-based study. **J Sex Med 2006;3:114-120.**
126. Parish WL, Laumann EO, Pan S, et al. Sexual dysfunctions in urban China: A population-based national survey of men and women. **J Sex Med 2007;4:1559-1574.**
127. Peixoto MM, Nobre P. Prevalence and sociodemographic predictors of sexual problems in Portugal: A population-based study with women aged 18 to 79 years. **J Sex Marital Ther 2015;41:169-180.**
128. Peixoto MM, Nobre P. Prevalence of sexual problems and associated distress among lesbian and heterosexual women. **J Sex Marital Ther 2015;41:427-439.**
129. Pereira VM, Nardi AE, Silva AC. Sexual dysfunction, depression, and anxiety in young women according to relationship status: An online survey. **Trends Psychiatry Psychother 2013;35:55-61.**
130. Petrie KJ, Faasse K, Crichton F, et al. How common are symptoms? Evidence from a New Zealand national telephone survey. **BMJ Open 2014;4:e005374.**
131. Ponholzer A, Roehlich M, Racz U, et al. Female sexual dysfunction in a healthy Austrian cohort: Prevalence and risk factors. **Eur Urol 2005;47:366-375.**
132. Reed BD, Crawford S, Couper M, et al. Pain at the vulvar vestibule: A web-based survey. **J Lower Genit Tract Dis 2004;8:48-57.**
133. Reed BD, Harlow SD, Sen A, et al. Prevalence and demographic characteristics of vulvodynia in a population-based sample. **Am J Obstet Gynecol 2012;206:170.e1-170.e9.**
134. Richters J, Grulich AE, de Visser RO, et al. Sex in Australia: Sexual difficulties in a representative sample of adults. **Aust N Z J Public Health 2003;27:164-170.**
135. Rosen RC, Connor MK, Miyasato G, et al. Sexual desire problems in women seeking healthcare: A novel study design for ascertaining prevalence of hypoactive sexual desire disorder in clinic-based samples of U.S. women. **J Womens Health 2002;2012(21):505-515.**
136. Safarinejad MR. Female sexual dysfunction in a population-based study in Iran: Prevalence and associated risk factors. **Int J Impot Res 2006;18:382-395.**
137. Sanders SA, Graham CA, Milhausen RR. Predicting sexual problems in women: The relevance of sexual excitation and sexual inhibition. **Arch Sex Behav 2008;37:241-251.**
138. Shaeer O, Shaeer K, Shaeer E. The Global Online Sexuality Survey (GOSS): Female sexual dysfunction among Internet users in the reproductive age group in the Middle East. **J Sex Med 2012;9:411-424.**
139. Shifren JL, Monz BU, Russo PA, et al. Sexual problems and distress in United States women: Prevalence and correlates. **Obstet Gynecol 2008;112:970-978.**
140. Shindel AW, Ando KA, Nelson CJ, et al. Medical student sexuality: How sexual experience and sexuality training impact U.S. and Canadian medical students' comfort in dealing with patients' sexuality in clinical practice. **Acad Med 2010;85:1321-1330.**
141. Shindel AW, Rowen TS, Lin TC, et al. An Internet survey of demographic and health factors associated with risk of sexual dysfunction in women who have sex with women. **J Sex Med 2012;9:1261-1271.**
142. Sidi H, Puteh SE, Abdullah N, et al. The prevalence of sexual dysfunction and potential risk factors that may impair sexual function in Malaysian women. **J Sex Med 2007;4:311-321.**
143. Singh JC, Tharyan P, Kekre NS, et al. Prevalence and risk factors for female sexual dysfunction in women attending a medical clinic in south India. **J Postgrad Med 2009;55:113-120.**
144. Sobhgol SS, Alizadeli Charndabee SM. Rate and related factors of dyspareunia in reproductive age women: A cross-sectional study. **Int J Impot Res 2007;19:88-94.**
145. Song SH, Jeon H, Kim SW, et al. The prevalence and risk factors of female sexual dysfunction in young Korean women: An internet-based survey. **J Sex Med 2008;5:1694-1701.**
146. Stones RW, Padmadas SS, Guo S, et al. Dyspareunia, urinary sensory symptoms, and incontinence among young Chinese women. **Arch Sex Behav 2006;35:561-567.**
147. Stulhofer A, Gregurovic M, Pikic A, et al. Sexual problems of urban women in Croatia: Prevalence and correlates in a community sample. **Croat Med J 2005;46:45-51.**
148. Stulhofer A, Kuljanic K, Buzina DS. Sexual health difficulties in a population-based sample of Croatian women aged 18—35 and the effects of the dual (career and motherhood) role. **J Sex Med 2011;8:1314-1321.**
149. Sznajder KK, Harlow SD, Burgard SA, et al. Gynecologic pain related to occupational stress among female factory workers in Tianjin, China. **Int J Occup Environ Health 2014;20:33-45.**
150. Thomtén J. Living with genital pain: Sexual function, satisfaction, and help-seeking among women living in Sweden. **Scand J Pain 2014;5:19-25.**
151. Tracy JK, Junginger J. Correlates of lesbian sexual functioning. **J Womens Health 2002;2007(16):499-509.**
152. Træen B, Martinussen M, Öberg K, et al. Reduced sexual desire in a random sample of Norwegian couples. **Sex Relatsh Ther 2007;22:303-322.**
153. Traeen B, Stigum H. Sexual problems in 18—67-year-old Norwegians. **Scand J Public Health 2010;38:445-456.**
154. Vahdaninia M, Montazeri A, Goshtasebi A. Help-seeking behaviors for female sexual dysfunction: A cross sectional study from Iran. **BMC Womens Health 2009;9:3.**

155. Valadares AL, Pinto-Neto AM, Osis MJ, et al. Prevalence of sexual dysfunction and its associated factors in women aged 40–65 years with 11 years or more of formal education: A population-based household survey. **Clinics 2008;63:775-782.**

156. Vanwesenbeeck I, Bakker F, Gesell S. Sexual health in the Netherlands: Main results of a population survey among Dutch adults. **Int J Sex Health 2010;22:55-71.**

157. Varghese KM, Bansal R, Kekre AN, et al. Sexual dysfunction among young married women in southern India. **Int Urogynecol J 2012;23:1771-1774.**

158. Villeda Sandoval CI, Calao-Perez M, Enriquez Gonzalez AB, et al. Orgasmic dysfunction: Prevalence and risk factors from a cohort of young females in Mexico. **J Sex Med 2014;11:1505-1511.**

159. Wallwiener CW, Wallwiener LM, Seeger H, et al. Prevalence of sexual dysfunction and impact of contraception in female German medical students. **J Sex Med 2010;7:2139-2148.**

160. Weiss P, Brody S. Female sexual arousal disorder with and without a distress criterion: Prevalence and correlates in a representative Czech sample. **J Sex Med 2009;6:3385-3394.**

161. Wendt E, Hildingh C, Lidell E, et al. Young women's sexual health and their views on dialogue with health professionals. **Acta Obstet Gynecol Scand 2007;86:590-595.**

162. West SL, D'Aloisio AA, Agans RP, et al. Prevalence of low sexual desire and hypoactive sexual desire disorder in a nationally representative sample of US women. **Arch Intern Med 2008;168:1441-1449.**

163. Wiebe ER, Brotto LA, MacKay J. Characteristics of women who experience mood and sexual side effects with use of hormonal contraception. **J Obstet Gynaecol Can 2011;33:1234-1240.**

164. Worly B, Gopal M, Arya L. Sexual dysfunction among women of low-income status in an urban setting. **Int J Gynaecol Obstet 2010;111:241-244.**

165. Yanez D, Castelo-Branco C, Hidalgo LA, et al. Sexual dysfunction and related risk factors in a cohort of middle-aged Ecuadorian women. **J Obstet Gynaecol 2006;26:682-686.**

166. Zhang H, Yip PS. Female sexual dysfunction among young and middle-aged women in Hong Kong: Prevalence and risk factors. **J Sex Med 2012;9:2911-2918.**

167. Hayes RD, Bennett C, Dennerstein L, et al. Modeling response rates in surveys of female sexual difficulty and dysfunction. **J Sex Med 2007;4:286-295.**

168. Simons JS, Carey MP. Prevalence of sexual dysfunctions: Results from a decade of research. **Arch Sex Behav 2001;30:177-219.**

169. Hayes RD, Dennerstein L, Bennett CM, et al. What is the "true" prevalence of female sexual dysfunctions and does the way we assess these conditions have an impact? **J Sex Med 2008;5:777-787.**

170. Hayes RD, Bennett CM, Fairley CK, et al. What can prevalence studies tell us about female sexual difficulty and dysfunction? **J Sex Med 2006;3:589-595.**

171. Ghimire DJ, Axinn WG. Marital processes, arranged marriage, and contraception to limit fertility. **Demography 2013;50:1663-1686.**

172. Lindstrom DP, Kiros GE, Hogan DP. Transition into first intercourse, marriage, and childbearing among Ethiopian women. **Genus 2009;65:45-77.**

173. Smith DJ. Promiscuous girls, good wives, and cheating husbands: Gender inequality, transitions to marriage, and infidelity in southeastern Nigeria. **Anthropol Q 2010;83(1).**

174. Bekelman JE, Li Y, Gross CP. Scope and impact of financial conflicts of interest in biomedical research: A systematic review. **JAMA 2003;289:454-465.**

175. Lewis RW, Fugl-Meyer KS, Corona G, et al. Definitions/epidemiology/risk factors for sexual dysfunction. **J Sex Med 2010;7:1598-1607.**

176. Basson R, Berman J, Burnett A, et al. Report of the international consensus development conference on female sexual dysfunction: Definitions and classifications. **J Urol 2000;163:888-893.**

177. Catania L, Abdulcadir O, Puppo V, et al. Pleasure and orgasm in women with female genital mutilation/cutting (FGM/C). **J Sex Med 2007;4:1666-1678.**

SUPPLEMENTARY DATA

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